



PROJEKT REKUK

Vocation Training for Chefs and Executive Chefs of Large-Scale Kitchens in Sustainable Food and Kitchen Management

Sustainable Menu Handbook



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Table of contents

TABLE OF CONTENTS	1
1 GLOSSARY	5
1.1 General Glossary	5
1.2 Module specific glossary	6
2 SUSTAINABLE MENU DESIGN	7
2.1 Definition of communal catering	7
2.2 Benefits of sustainability in large kitchens.....	7
2.2.1 <i>Ecological dimension - CO2 output: Freshly cooks vs fast food; organic vs conventional</i>	8
3 REQUIREMENTS FOR ORGANIC FOOD.....	9
3.1 Fish	9
3.2 Social dimension	10
3.3 Seasonal menu.....	11
3.2.1 <i>Designation of origin</i>	15
4 MENU AND ECONOMIC ASPECTS.....	16
4.1 Challenges when changing the food plan	16
4.2 Convenience food in the 21st century, with focus on Austria	16
4.3 Economic aspects of fresh cooking	17
4.3.1 <i>Economical dimension - CO2 output: Freshly cooked Fast food, organic vs. conventional</i>	17
4.3.2 <i>Opinion of the kitchen management on optimized food (instruction manual)</i>	18
4.4 Best practice examples	19
4.4.1 <i>“Das Kuratorium Wiener Pensionistenhäuser (KWP)”</i>	19
4.4.2 <i>The Lower Austrian country kitchen</i>	19
4.4.3 <i>The "iPOPY" project and the "Pro.B.E.R." association</i>	20
4.4.4 <i>The healthy school project</i>	20
4.4.5 <i>The organic foods project for schools</i>	21
4.4.6 <i>The "Organic mentors network" project and the "Esprit canteen"</i>	21
4.4.7 <i>Summer and winter menus</i>	22

4.5	Nutritional physiology and nutritional values	22
4.5.1	<i>Food groups</i>	22
4.5.2	<i>Cereals</i>	22
4.5.3	<i>Legumes</i>	23
4.5.4	<i>Fruit and vegetables</i>	23
4.5.5	<i>Meat</i>	23
4.5.6	<i>Fish</i>	23
4.5.7	<i>Eggs</i>	24
4.5.8	<i>Milk and dairy products</i>	24
4.6	Plant-based protein vs animal protein.....	25
5	NUTRITION PLAN AND RESOURCE EFFICIENCY.....	28
5.1	Serving sizes	32
5.2	Protein and sources of protein.....	33
6	ATTACHMENTS.....	35
6.1	Annex 1: Recipes for the preparation of a seasonal menu.....	35
6.1.1	<i>Recipes for the spring (March to May)</i>	35
6.1.2	<i>Recipes for summer (June to August)</i>	36
6.1.3	<i>Recipes for autumn (September to November)</i>	37
6.1.4	<i>Recipes for the winter (December to February)</i>	38
6.2	Annex 2.....	39
6.2.1	<i>Unprocessed planted products and manufactured products</i>	39
6.2.2	<i>Vegetable products</i>	40
6.3	Annex 3: Recipes for preparing a menu from alternative crops.....	41
6.3.1	<i>Spelt (<i>Triticum spelta</i> L.)</i>	41
6.3.2	<i>Naked oat (<i>Avena nuda</i> L.)</i>	42
6.3.3	<i>Common millet (<i>Panicum miliaceum</i> L.)</i>	44
6.3.4	<i>Buckwheat (<i>Fagopyrum vulgare</i> Moench.)</i>	46
6.3.5	<i>Chickpea (<i>Cicer arietinum</i> L.)</i>	49
6.3.6	<i>Common chicory (<i>Cichorium intybus</i> L.)</i>	51
7	REFERENCES	53

1 Glossary

1.1 General Glossary

Chef: professional cook who often manages the kitchen, e.g. in restaurants, large-scale kitchens, hotels.

Communal catering/public catering: Large-scale catering facilities in the public sector. These include patient catering in hospitals and elderly residences, catering in educational institutions and businesses. In contrast to gastronomy the focus here is to provide well-balanced meals and maintaining cost efficiency, providing qualitative meals outside the home.

Executive Chef: Chef who has an overall responsibility for the kitchen: purchase, staff, menu, sometimes manager of several kitchens / restaurants. Sometimes referred to as kitchen manager.

Large-scale kitchen: Large-scale kitchen is a term for a kitchen that is used for commercial purposes and in which meals for numerous consumers get cooked, namely gastronomy and communal feeding (hospital, company canteen, nursing homes, halls of residence, student halls etc.).

Organic foods/produce: These products are produced within the scope of organic farming and has a certification marks which are regulated by law.

Regional food/ products: Regional food is food that is produced there where it is consumed. A common definition for regional or national products is that they are produced within a radius of 150 km around the processing commercial kitchen.

In fact, what is considered regional varies by country. In Italy the regions are geographically defined and it is common to use those definitions when referring to regionality. In other countries a max. distance of 150 km is determined. This distance was chosen because if the distance is greater the return benefits of sourcing produce locally diminish. In Germany and Austria, the word “regional food” is not regulated by law.

Seasonal foods: Foods available only at a certain time of the year from outdoor production (meaning available from local sources), typical fruits and vegetables. Some produce is available year-round as fresh or stock goods like onions, potatoes and apples.

Stakeholder: Member of an interest group.

1.2 Module specific glossary

Convenience products: These are products of which the producer performs certain process and processing steps and in this way enable that the product can be prepared in an easier and faster manner. Products with a level of processing of more than 50% rate are assigned to this category. These terms are explained in more detail in Section 1.2.

Processing steps: By convenience products is it the basis for the allocation of food in stages of processing.

Tray system: In this system, the dishes are portioned in the kitchen and distributed accordingly on individual trays on a tray conveyor.

Food serving systems (buffets): With this system, there is a continuous serving counter. Consumers take a tray and walk along the counter, past various offered dishes which are portioned according to the order of the service personnel.

2 Sustainable Menu Design

2.1 Definition of communal catering

Communal catering is a special form of catering and refers to the regular catering of groups. The difference between communal catering and the food service industry is that communal catering needs to work cost-effectively but does not have to generate any profits. In communal catering, a distinction is made between full and partial catering for the different groups.

In Austria, off-site catering and thus also communal catering are growing in importance. Reasons for this include increasing professional, spatial, and social mobility as well as the increase in the number one-person households as a result of the increasing mobility and increasing distances to the workplace. As a result, communal catering has an important role to play in the diet of the Austrian population; it influences their well-being as well as economic, social, and environmental factors of the environment.

Our decision for a particular type of food or meal can have ramifications on transport, natural resources (e.g. water), and workplaces. An energy-efficient and healthy way of preparation should be sought. In the long term, this will influence our general health. Creating sustainable food plans promotes a development towards a resource-conserving, future-oriented society. The economic, social, and environmental dimensions overlap and interact with each other. However, we will attempt to address them separately in this handbook.

2.2 Benefits of sustainability in large kitchens

The use of organic/regional/seasonal ingredients as well as a healthy diet plan offers benefits for several participants: Benefits for the participants

- Good food = quality of life
- Health interests are more likely to be satisfied
- Awareness of responsibility is supported
- Increasing transparency about the origin of the products used
- The use of local and fresh produce increases in proportion to convenience products
- Reduction of meat dishes because on average, a 25 % excess is consumed every day (Brunner et al., 2007)
- Seasonal products = best taste, because fully developed
- Variety in the menu: Spring, summer, autumn and winter dishes; benefits for farming
- Greater attractiveness of the food
- Higher customer satisfaction
- Higher customer frequency
- More efficient use of resources
- Direct contact with producer possible
- Less cost by eliminating the intermediary
- Improvement of the food quality
- Use expertise of staff through freshly cooked meals

- Higher employee satisfaction
 - Benefits for regional suppliers
- Short transport distances
- No quality losses through storage at intermediate retailers
- Direct contact with consumer (e.g. kitchen management) possible
- Value added is 100 % for producers
- By simultaneously informing the participant and presenting the suppliers in the kitchen, potential new customers receive social and environmental benefits
- Regional food culture and tradition are preserved and revitalized
- Preservation and creation of the labour force in the region
- Purchasing power and added value remain in the region
- Regional identity (e.g. Styria, Waldviertel region, Mostviertel region) is strengthened
- Animal welfare/quality of the product
- Lower CO₂ emissions due to shorter transport distances

2.2.1 Ecological dimension - CO₂ output: Freshly cooks vs fast food; organic vs conventional

There is a link between our diet and the global greenhouse problem. 20 % of all man-made CO₂ emissions are generated by food production. In order everyone in the world to be provided for equally, each would have an ecological footprint of 1.8 hectares [Austria, 2013].

Furthermore, organic meat emits more eq CO₂/kg. However, this is due to the lower productivity of organic farming per hectare. This does not include the other positive aspects that organic farming entails.

3 Requirements for organic food

What distinguishes organically produced food from conventionally produced food? Among all farming practices, organic farming is considered the most environmentally friendly. The avoidance of monocultures and the preservation of diversity and habitats for numerous animal species are also part of organic farming. So are holistic networked thinking and closed circuits. Natural resources are spared and preserved for future generations.

The following principles are considered with respect to organic agriculture in Austria in accordance with EU regulation (EC) number 834/2007:

- A lower use of external energy (e.g. dispensing with artificial fertiliser, which consumes a lot of energy in production).
- The use of natural self-regulating mechanisms (e.g. diverse crop rotation, use of beneficial organisms, gentle soil treatment).
- The feeding of the soil and not of the plant (e.g. by spreading compost and operating waste, if possible without buying from external sources).
- Closed material cycles wherever possible (e.g. the reuse of manure from farms).
- Animal-friendly production

Pests are kept in check as part of the ecological balance. Where necessary, natural plant protection agents are used, e.g. oils in fruit growing. Likewise, animals can only be fed with organic feed.

Products made of genetically modified material must not be labelled with "ORGANIC". This is so far that even animal feed and processing aids (e.g. rennet in cheese factories) should not come from genetically modified organisms [BMLFUW, 2001].

So that it can be declared an organic product, a product must completely (i.e. 100%) originate from organic farming. The only exception are ingredients that are not available in organic quality [BMLFUW, 2001].

For this purpose, there is a list in the Organic Foods Regulation. This can be found in Appendix 3. These include edible fruits, nuts and seeds, spices and herbs, fructose, and some other raw materials.

Likewise, processing aids and food additives (E numbers) may only be used to a very limited extent. Only about 30 food additives are permitted in organic food – around 300 are permitted in conventional food. These include enzymes, flavourings vitamins, amino acids, and minerals [BMLFUW, 2001].

3.1 Fish

In principle, fish should be purchased based on general quality criteria such as skin, eyes, mouth, gills (pressure test) and fins. In Austria, it is recommended to buy local fish from sustainable breeding: A list of Austrian dealers from sustainable breeding is given in Appendix 1.

In Austria, fish from organic breeding must fulfil the following criteria:

- Appropriate keeping in natural ponds.
- The plant feed must come from controlled organic farming.
- The proportion of animal feed components is reduced as much as possible and replaced by plant products.

Popular domestic fish are: grayling, tench, char, mountain trout, alpine salmon, pike, pike-perch, and carp. However, because of the cost-covering nature of community food storage facilities as opposed to other organic foods, it is often not possible to integrate fish from domestic production into the food plans without additional costs.

If this is not possible, it is OK to fall back on Austrian fish from conventional production. However, from the point of view of sustainability, fish or seafood from aquaculture should be avoided.

3.2 Social dimension

Sustainable food production and consumption has far-reaching social impacts. It concerns not only farmers, but also processors in the region, traders and consumers, and indirectly also the population of the whole region. We are increasingly confronted with information on food quality problems in our market and at the same time with the declining share of domestic agricultural production under the pressure of cheaper imported food. Globalization of food production and competitive struggle between producers, processors and traders sometimes leads to the use of raw materials or practices that do not conform to the principles or norms of proper nutrition. The European Union has in many cases higher standards of quality and food security. By distancing the farmer from the consumer there is a loss of authenticity. Food produced under our domestic conditions can have consumers and inspection inspections much better in the eyes and thus indirect pressure on manufacturers to maintain the quality of their products at a high level.

It is also about building proper eating habits, especially for the younger generation, which help to improve the lifestyle and thus reduce the cost of health care. The incidence of obesity, allergies and other civilization diseases, often largely due to unhealthy eating, has increased significantly in recent years. At the same time, there are increasing concerns about the presence of high-risk substances in the food chain for fast food, and shops full of highly processed packaged ready meals. Many people have no relation to the food they eat.

The relationship between the health status of society and the change of lifestyle shows information from Austria:

Approximately 40% of adults aged 18 to 64 are overweight (52% of men and 28% of women). Of these, 12% are obese (15% of men and almost 10% of women). On average, approximately 2% of adults are weighted. Trends in overweight, including obesity, increase significantly with age; 68.5% of men and 45% of women aged 51 to 64 are overweight or obese. About 27% of adults have too high a percentage of body fat - most often men aged 51-64 (55%). Women aged 25-50 were the least likely to have excessive body fat (9%).

In most age groups, energy consumption complies with relevant low-activity guidelines. While fat intake is too high, carbohydrate intake is too low. Adults also consume many satu-

rated fats and too little polyunsaturated fat. Sucrose intake is within a tolerable range. However, in all groups the fiber intake is lower than the minimum reference value. The amount of alcohol consumed is within the tolerated range. The intake of calcium and iodine is insufficient for all subjects. Receiving iron for women under 50 is also inadequate. Men consume on average the recommended amount of magnesium. On the other hand, too much sodium is consumed in the form of salty salt [Elmadfa et al., 2012]

By stably buying regional, fresh and organic raw materials and food, regional self-sufficiency will be strengthened, local farmers, food producers and suppliers will be able to grow. This is a prerequisite for maintaining or increasing employment, improving the quality of life of the population, and strengthening their links with their own region. Purchasing raw materials from local finance producers does not leave the region, on the contrary, it multiplies it. The use of regional suppliers can help to bring cities closer together with the countryside and educate all partners in the field of sustainable meals.

3.3 Seasonal menu

Seasonal analysis analyzes vegetable and fruit foods. Other products, cereals, milk and meat products, etc. are considered to be used year-round. Food is seasonal, if the main ingredient is seasonal.

Seasonal vegetables and fruits are such products that can mature in our climatic zone during the current season. Vegetables grown loose on the plot have a lower nitrate content compared to greenhouse vegetables, harvest in optimum maturity, and have the highest content of vitamins and other specific substances. Foods that are used at appropriate times need not be treated with preservatives or other substances. The optimum taste gets only mature products, the premature harvest even the smell cannot fully develop.

Efforts to year-round supply with certain products lead to their import or cultivation in a heated greenhouse or foil. They require high energy consumption that causes high greenhouse gas emissions. Organic vegetable production produces up to 34 times less energy and produces up to 18 times less greenhouse gases than growing the same vegetables in heated greenhouses. Such products can hardly be called seasonal. Extending the growing season allows the use of unheated foil trays. These can be accepted from the energy point of view, however, the used films create environmental stresses and additional costs (we can see in waste module).

In addition to products produced in the season, short-term products from the region can be also used. This makes it possible to save long and energy-intensive transport routes. The choice of food to the diet should be considered from all points of view. For example, laden, dried or preserved tomatoes are more suitable in the winter for nutritional, health and flavor, but especially for environmental rather than fresh (early harvested) greenhouse tomatoes.

When switching to sustainable meals, food prices should be continuously monitored and seasonal foods are preferred. With the measure package, up to 50% of organic food can be achieved (30-50%). The use of semi-finished products should be gradually reduced and, instead, freshly prepared food are being prepared.

The share of seasonal fruit and vegetables in Austria accounts for 24% and 44% of the total amount of food analyzed. On average, 33% of the total quantity of fruit and vegetables is delivered in the season. Foods that predominate in the season: strawberries, rhubarb, asparagus, topinambur, pumpkin and beetroot. The amount of seasonal fruit and vegetables is the decisive factor in the quantity of potatoes used. In the extreme case, potatoes account for up to 31%. Another important food in terms of quantity are apples, which account for up to 20% of the total amount of seasonal foods.

The proportion of seasonal fruits and vegetables varies from 30% to 60% in the Czech Republic. On average, it is 47%. Potato consumption is around 60%. Another important item is onion, cabbage, carrots, tomatoes and cucumbers. The most important fruits are apples and plums of domestic produce. It is worth mentioning that the second most frequently used fruit are bananas that do not meet the sustainability criteria, both seasonal and local, and it would be good to replace them with domestic fruits.

Table 1 demonstrates the much higher energy consumption and CO₂ emissions of vegetables from greenhouse cultivation compared to open-air cultivation. The energy input is up to 34 times higher, and CO₂ emissions are 18 times higher. They are also more costly and therefore more inefficient.

Some vegetables are well suited for growing them in unheated foil tunnels. Among those Chinese cabbage is particularly well suited because it is resistant to low temperatures. It can be cultivated year-round in unheated foil tunnels. Chinese cabbage is somewhat more pungent than mid-European palates are accustomed but is still thought to be quite tasty.

It is mainly cultivated in the period from November to March during which only a few vegetables are available. The leaves of the young plants are well suited for salads. The leaves of the older plants are well suited for cooking in soups, stewed, fried as a side dish

Table 1: Energy input and emissions for greenhouse and outdoor cultivation [Daxbeck et al., 2013]

	Energy MJ/kg food		CO ₂ equivalent g/kg food	
	Heated greenhouse horticulture	Field cultivation	Heated greenhouse horticulture	Field cultivation
Beans	97	1.8	6,360	220
Leek	82	1.4	6,430	190
Lettuce	67	1.1	4,450	140
Celery	55	1.5	3,660	190
Cucumber	35	0.5	2,300	170

Figure 1 and Figure 2 show the seasonality of fruit and vegetables in Austria. From the seasonal calendars, is evident that from November to March, fewer vegetables is available. This makes the menu planning with seasonal food that much more difficult. In order to

ensure sustainability, food plans must also include winter vegetables. Appendix 2 contains recipe suggestions with seasonal recipes for all four seasons. The individual recipes are freely accessible on the Internet under:

[http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20\(Vers.%201.6\).pdf](http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20(Vers.%201.6).pdf) .

In order for these participants to be accepted, it is necessary to justify and communicate this measure. This aspect will be dealt with in more detail in Module 5: Information and marketing

Figure 1 AMA seasonal calendar for fruit[AMA Marketing, 2010]

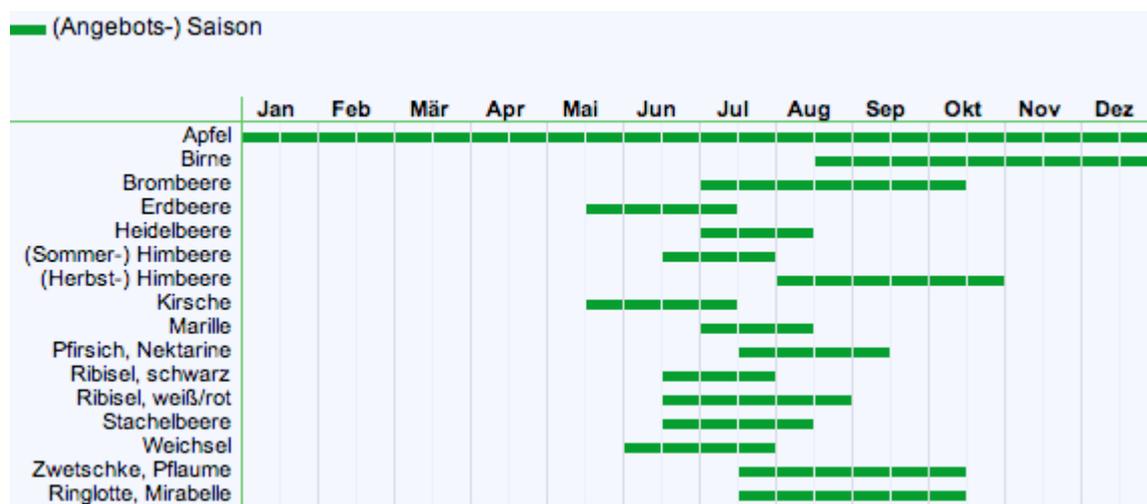
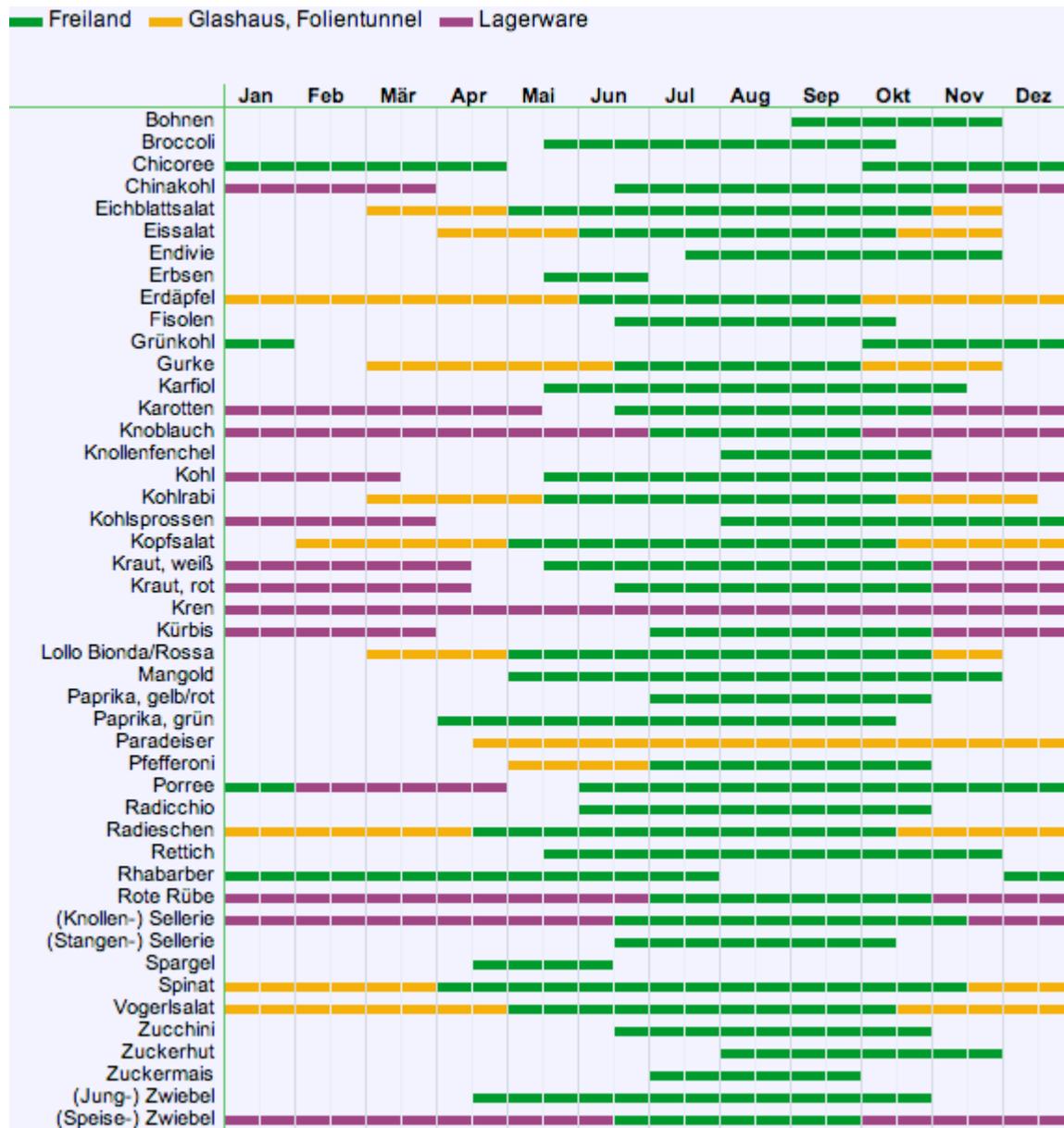


Figure 2: AMA seasonal calendar for vegetables[AMA Marketing, 2010]



3.2.1 Designation of origin

In Austria, a distinction is made between

- "Protected designation of origin" (e.g. Tyrolean mountain cheese) and
- "Protected geographical indication" (e.g. Styrian horseradish).

For the designation of origin, all production steps (from the raw material to the finished product) must be carried out in the specified area. For the geographical indication, it is sufficient if the product has been processed in the designated area – the basic product can come from another area.

The following Austrian foodstuffs are registered as "protected designation of origin":

- Gailtal mountain cheese
- Tyrolean Alp cheese
- Tyrolean mountain cheese
- Tyrolean grey cheese
- Vorarlberger Alp cheese
- Vorarlberger mountain cheese
- Wachau apricots
- Waldviertel grey poppy

The following Austrian foodstuffs are registered as "protected geographical indication":

- Gailtaler bacon
- Marchfeld asparagus
- Mostviertel perry
- Styrian horseradish
- Styrian pumpkinseed oil
- Tyrolean bacon

4 Menu and economic aspects

4.1 Challenges when changing the food plan

Other additional factors should be involved:

- Personal factors (target group, age, religion, physical stress)
- Nutritional knowledge (nutritional pyramids)
- Culinary requirements (varied, interesting)
- Basic technical rules (preparation methods, avoiding repetition)

Possible challenges when changing a food plan

- Recalculation
- Higher use of goods
- Higher professional qualification of employees necessary for implementation
- More time required/higher personnel costs
- Possible problems with delivery of regional product (availability in desired quantities, suitable for large-scale kitchens, processing step)
- Purchase of equipment

4.2 Convenience food in the 21st century, with focus on Austria

After the hunters and collectors, mixed farming spread which was again followed by the Industrial Revolution. The present condition can be referred to as the "Convenience era".

There are fewer and fewer people working in agriculture and the further processing of the foodstuffs is increasingly decoupled from the communal catering participants. The catering participants are accustomed to taking advantage of the time freed up because of this. Consumers and also large-scale kitchens are increasingly relying on industrially processed products in order to save labour costs and time. However, practice has shown that any savings will be offset by higher purchase prices. This point is discussed in more detail in Section 3.4 .

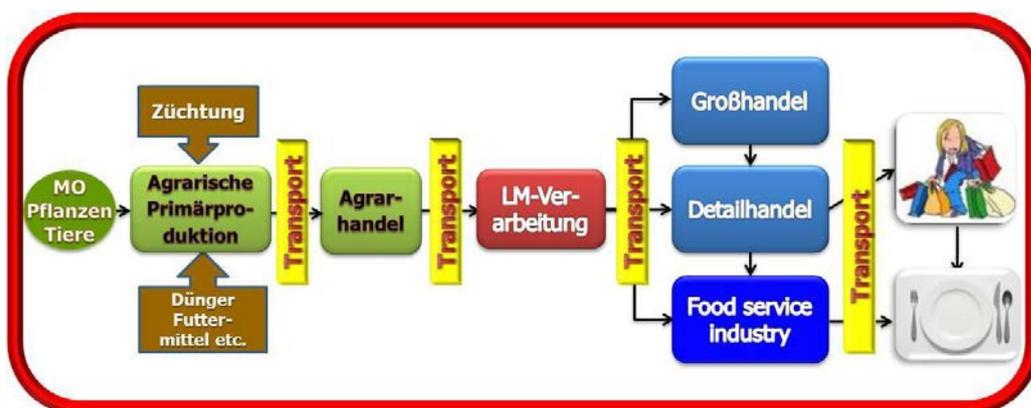


Figure 3: Schematic representation of the food supply chain according to Berghofer et al., 2016

In the food supply chain (Figure 3-1 ; breeding → primary agricultural production → agricultural trade → food production → food wholesale and retail, gastronomy), all members of the chain are affected by globalization.

In case of production of semi-finished products, the higher the degree of processing, the lower the durability and the higher the price of the product. At higher levels of modifications, measures are needed to extend the shelf-life: drying, cooling, freezing, sterilization, etc. Many of these supplementary measures affect the color and taste of the food and reduce its nutritional value - especially the loss of some vitamins. For foods with a high degree of convention, we are more likely to encounter higher proportions of less suitable fats, higher salt or sugar content, or sweeteners, and also added dyes, and aromatic substances. Higher fat and sugar content concerns some prepared desserts or their pre-prepared ingredients (pasta, creams, soups). Especially beverage concentrates and instant tea blends are rich in sugar, sweeteners and dyes. High content of salt, aroma, and flavour enhancers is common in broths, soya sauces, instant soups, but also in some pre-prepared instant side dish mixes. Pre-fried semi-finished products and instant porridge usually have a higher glycemic index. Instant drinks that contain many additional and defective ingredients are also problematic.

The importance of using ready-to-cook foods has its benefits, especially in terms of time savings needed to prepare, workforce and costs, they extend the range of dishes, which would be difficult to prepare in ordinary kitchens, support the creativity of a chef. It is worth being aware, however, when the use of ready-to-cook foods is appropriate and in what cases we may do without them. According to her, communal catering facilities tend to use these products partly because the market offers an increasingly greater choice, as well as due to reduction of staff, when communal catering facilities must provide the preparation of meals with fewer employees than before. Fresh foods, especially in school canteens, should be preferred. Convenience of higher level of processing is not suitable for school meals. Convenience of higher level of processing does not require nor allow creative approach, that is why professional chefs choose semi-finished products very carefully to be able to apply their innovative approach and talent.

In the food retail sector, especially within the individual countries, there is also more focus on food retailers at the expense of small traders. Unfortunately, Austria occupies a rather disadvantageous position. In Austria, the top three grocery retail groups have a market share of 86 % [Berghofer et al., 2016].

4.3 Economic aspects of fresh cooking

4.3.1 Economical dimension - CO₂ output: Freshly cooked Fast food, organic vs. conventional

The prices for conventional foods do not reflect the environmental and social costs of their production and processing. The consequence is that these consequential costs must be paid indirectly by the society.

Costs of conventionally produced foods do not correspond to the reality. On the other hand, organic products do correspond largely.

4.3.2 Opinion of the kitchen management on optimized food (instruction manual)

Parameter	Opinion of the kitchen management on optimized food (instruction manual)
Suitability for communal catering facilities	Overall estimate This is a dish that can be prepared without difficulty even in large quantities, the cost of cooking is rather high or low, the food is easy to integrate into the daily menu, etc.; How many portions can be prepared - that is, from what number of portions it is no longer possible?
Dish costs	How do you assess the costs of optimized dish compared to other meals? Are the costs of longer-term integration in the menu OK or exceed the acceptable framework? Which raw material is the most expensive - can this raw material be replaced? Were large price fluctuations recorded during the year, for example, in case of vegetables - during which period it is not suitable to include the dish in the menu on the basis of higher costs?
Benefits of the dish	Why would you offer the dish, e.g. it has a positive response from the boarders, it is easy to prepare? Can a high proportion of organic food or regional food be reached?
Disadvantages of the dish	Why would you not offer the dish, e.g. excessive price demands, excessive labour demands compared to profitability? Do you have any improvement suggestions?
Will the optimized food be integrated into the menu in the future?	Yes/No - why not?
Suitable for organic dish	Is the optimized dish suitable for preparation in enhanced organic quality? Which raw materials are rather not available in organic quality or we cannot afford them?
Suitable for regional food	Which raw materials for preparation of the dish cannot be by no means or only with great difficulties purchased in Austria or in the region? Which raw materials can be easily purchase in Austria or in the region? Is it possible to exchange raw materials from abroad for regional raw materials?
Seasonality of the dish	Is the dish / raw material available even in winter months in seasonal quality or from Austrian stored goods? Otherwise, how can the dish be adjusted to winter months?
Freshness of ingredients	What raw materials of 'fresh' quality can be used in the kitchen during preparation of dishes? What raw materials are difficult to be used in 'fresh' quality in the kitchen during preparation of dishes? Where it is necessary to use frozen goods or semi-finished products?

4.4 Best practice examples

Here are some examples of kitchens that have transformed their meals plans to incorporate regional, seasonal, and organic food. The examples are from Italy, the Czech Republic, Germany, and Austria.

4.4.1 “Das Kuratorium Wiener Pensionistenhäuser (KWP)”

The KWP, which was founded in 1960, is run by the City of Vienna as a non-profit private legal fund. Five times a day, 365 days a year, around 9,000–9,500 people are provided with breakfast, morning snack, lunch, afternoon snack, and supper as well as tea, coffee, cocoa, and juices. The kitchens have around 750 employees of which 112 are chefs and 32 are apprentices. The KWP has 30 retirement homes with different structures (housing, assisted living, nursing department, innovative living). These 30 sites are operated as fresh kitchens on behalf of the City of Vienna. The use of goods per day and per resident is €3.40. (cf Schöberl interview, 2011).

The Department for the Procurement of Gastronomic Management provides the appropriate criteria for the selection of food. The vision behind this is ecology, sustainability, and the preference for indigenous food. In 2008–2011, the goods used (food quota) was reduced from €3.68 to €3.42. The ORGANIC quota was also increased from 17.89 to 21.27% in the same period. The proportion of semi-finished and finished products also fell from 5.32% in 2008 to 3.47% in 2011 (cf Kuratorium Wiener Pensionistenhäuser, 2011, pg. 30 f.).

In order to ensure a balanced diet for all residents, a “component meal plan” was drawn up. The respective main component was determined taking into account the following criteria:

- Nutrition
- Freshness
- Cost effectiveness
- Sustainability

4.4.2 The Lower Austrian country kitchen

The Lower Austrian country kitchen is located at the office of the Lower Austrian provincial government in St. Pölten. The employees of the state of Lower Austria as well as the branch offices (e.g. police, day-care, and clinics) are catered for. On average, this is 1,500 guests per day. Cooking is done from Monday to Friday, 52 weeks a year.

The country kitchen, which has been run by Chef Karl Grüber since 1987, relies heavily on organic, seasonal, and regional food. For example, the ORGANIC quota in 2011 was 67%. Beef, pork, veal, sausages, and smoked meat products are 100% organic. The first organic product – organic apples from the Waldviertel – was introduced in 1989.

The Lower Austrian country kitchen is now well known far beyond the borders of Lower Austria. It has a reputation of being managed particularly sustainably, which, among other things, is reflected in the corresponding media coverage.

4.4.3 The "iPOPY" project and the "Pro.B.E.R." association

The research project "Innovative Public Organic Food Procurement for Youth" or "iPOPY" (2007–2010) was part of the "European Research Area Network CORE Organic I" network. The focus of the project iPOPY was to provide organic food to youths in schools and other public places. A basic goal was to contribute to the increased consumption of organic food in Europe.

As part of the iPOPY project, a study was conducted to measure consumption of organic food in Europe. Especially in Italy, the consumption of organic food in schools is very high (40%).

The "Pro.B.E.R." association (C)

The Pro.B.E.R. (produttori biologici e biodinamici Emilia Romagna; organic and bio-dynamic producers of the region Emilia Romagna) association was an official project partner of "iPOPY".

It brought together 80% of the officially registered organic producers and processors from the region. The association was founded in 1994; the president is Paolo Carnemolla. The association has 10 employees. Among other things, they are concerned with the supply chain, the use of organic products in canteens, the production and processing of organic food, research, and the technical support of the producers.

The main focus of the association is the revaluation of organic products and research on and promotion of organic farming and organic products.

The objectives of Pro.B.E.R. are:

- Representation of the interests of regional players in the organic sector (members) at both the national and international level
- Promotion and coordination of technical support services for ecologically efficient enterprises based on local projects and food chains
- Promotion and coordination of initiatives to promote organic and bio-dynamic regional products
- Coordination of vocational training activities related to organic farming in cooperation with accredited bodies
- Promoting and coordinating research as well as providing information on organic and bio-dynamic agriculture

4.4.4 The healthy school project

The main idea of the project is to increase the consumption of high-quality vegetables by children. Around 1030 schools are currently participating in the project. The project was started in September of 2010.

The project aims to:

- Find new and attractive alternatives for vegetables provided in Czech schools.
- Explain the use of vegetables for children's food plans and provide practical examples.

- Make vegetables more appealing to children in a natural, playful, and informal manner.

The following are expected:

- The positive relationship to the vegetables is also transferred by the children to the families. In this way, the vegetable consumption of the whole population can be influenced, and the state of health can be improved in the long term.
- It is not a short-term project but rather a long-term and viable solution.

4.4.5 The organic foods project for schools

This pilot project was implemented as part of the project "Network of environmentally friendly information centres in South Moravia and the Vysočina region", which is funded by the European Social Fund (ESF). The project ran from August 2006 to February 2008.

Objective of the pilot project:

Support for the introduction of organic food in school kitchens. The pilot project aims to promote global thinking, global education, and environmental education. This should positively influence the use of organic food in school catering.

Another goal of the project was to network small regional and organic companies with the supplier network of school kitchens in two regions.

Benefits of the project:

- Provision of information to kitchen staff and the parents of the children to acquaint them with the basic principles of organic farming to demonstrate the benefits of using organic food when preparing meals.
- The cookbook "Cooking with organic food in large-scale kitchens" for the staff of the school kitchens.
- Event for the cooks of the school kitchens: "Reasons for preparing meals with organic food"

4.4.6 The "Organic mentors network" project and the "Esprit canteen"

The organic mentors are executives in communal catering and the food service industry. The network was founded in North Rhine-Westphalia in 2004 as part of the organic campaign "Nature on the plate".

The idea behind this was to practically support colleagues with the introduction of organic food. Organic mentors use ecologically produced foods of holistic quality, buy locally, and prepare the food themselves. Farms participate in the inspection procedure in accordance with the legislation on organic farming and have the organic certificate. In addition, products are procured from animal-friendly operations, fair trade, and sustainable fisheries. Organic mentors are active as multipliers in associations, associations, and specialist media in their respective regions. *The lighthouse projects pg. 9*

The organic mentor network is the official project of the UN World Decade Education for Sustainable Development. Organic mentors work as volunteers. The network is coordinated by the consulting company “a verdis”. The network was launched by Rainer Roehl, the managing director.

4.4.7 Summer and winter menus

Annex1 includes detailed examples of seasonal meal plans.

4.5 Nutritional physiology and nutritional values

4.5.1 Food groups

Diners are an important factor in the climatic balance. Handling the food, storage and preparation (cooling, cooking), presence of waste, for example a consumption of meals to go has a potential for CO₂ savings. Conscious purchases with regard to the environment and a conscious way of eating include a selection of seasonal, regional and organic products and a balanced diet with an emphasis on plant food. However, nutrition cannot be seen only in terms of greenhouse gas emissions. The nutritional pyramid also shows that animal products such as meat, milk and dairy products have a physiologically nutritional role in eating. Meat products cover 17 % of energy supply for humans and approximately 33 % of vitally needed protein (FAO 2006). Through shopping people do not only decide on the amount of greenhouse gas emissions but also on health in general, environmental quality, social and fair working conditions.

Foods of plant origin include cereals, legumes, fruits and vegetables. The group of fats and oils includes both animal (fats) and vegetable products. Foods of animal origin include meat, meat products, eggs, milk and dairy products.

4.5.2 Cereals

Cereals have a leading role in nutrition and are the basic food and source of energy for most people in the world. The most consumed cereals are rice and wheat followed by corn, sorghum, panicum, oats, rye and barley. In developed countries, cereals provide about 30 % of energy and 25 % of protein daily intake, in developing countries it is up to 80 % of energy daily intake, and in some countries cereals are only source of protein at all. According to the WHO, cereals should optimally cover half of the daily energy intake. All cereals have approximately the same nutritional value. They typically contain 7-14 % of proteins, up to 75 % of carbohydrates and 2-7 % of fats (more fats contained in oats and corn). Cereal protein is less valuable compared to animal proteins, especially for essential amino acid lysine deficiency (e.g. wheat), and for tryptophan deficiency of some cereal (e.g. corn). Cereals, especially whole grains, are a significant intake of fibre, minerals (potassium, calcium, magnesium, iron, zinc and most of the B vitamins). They contain a small number of other trace elements. From the fat-soluble vitamins spectrum, they only contain vitamin E.

4.5.3 Legumes

Legumes are valued for their protein and fibre content. Dry legumes contain 20-25 % of biologically efficient proteins. Protein contained in legumes is relatively rich in the essential amino acids tryptophan and lysine. When combined with cereals having the ratio the opposite of essential amino acids, the amino acids are well distributed through the whole spectrum. Legumes provide 1 400 kJ/100 g, which makes them a good source of energy, they also contain a relatively large amount of calcium, phosphorus, B vitamins, folic acid and iron (4-15 mg/100g), which is harder to absorb than iron contained in animal sources. They do not contain fat-soluble vitamins. Dry legumes do not contain vitamin C.

4.5.4 Fruit and vegetables

More than 500 kinds of fruits and vegetables are registered in the world. Vegetables and fruits are generally characterized by a high content of water (80-95 %), low fat, a small amount of proteins of relatively good quality (vegetables 1-2 %, dark green leaves 4 %), high levels of vitamins and minerals and high fibre content. The volume and low energy content help to reduce the risk of obesity. Epidemiological studies published in the 1980s and 1990s confirmed that there is a lower risk of developing cardiovascular disease, certain cancers and most micronutrient deficiencies in populations that receive 400 grams of vegetables and fruits a day. Antioxidants (carotenoids, vitamin E and C) from fruits and vegetables neutralize free radicals to an extent that minimizes cell damage and the risk of chronic disease. Minerals such as potassium, magnesium and calcium contribute to reducing the risk of hypertension. Vitamin C, often contained in many fruits and vegetables, improves the absorption of non-iron forms of iron found in legumes, cereals and leafy vegetables.

4.5.5 Meat

Meat is an important source of proteins (15 to 20 % of the weight), fats, vitamin B₁₂, potassium, phosphorus, magnesium, iron, copper and zinc. There are almost no carbohydrates contained in meat. The composition of meat depends on the ratio of fat and fatty parts, which determines not only the energy content, but also virtually all the nutrients that are in different concentrations in fat and lean parts. Inorganic components occur most in the lean parts of meat, therefore their fat content is lower. There are also fat-soluble vitamins (ADEK).

4.5.6 Fish

Fish are a source of high-quality protein and similar minerals contained in meat of warm-blooded animals. Fatty fish and fish liver contain significant amounts of vitamin A and vitamin D. They are a rich source of iodine and a source of omega-3 polyunsaturated fatty acids that are important in the prevention of cardiovascular diseases. They lower triacylglycerol levels in blood, LDL and the risk of thrombus formation. Some epidemiological studies indicate that the consumption of 1-2 fish meals per week has significant preventive effects. Consumption of fish, especially marine fish, is still very low in our population.

4.5.7 Eggs

Eggs are a high nutrient food. Egg yolk is rich in phospholipids with a high content of polyunsaturated fatty acids and cholesterol.

4.5.8 Milk and dairy products

Milk is the only initial food that contains all the nutrients needed for mammals to grow. The major proteins are casein, lactalbumin and a number of immunoglobulins. Highly biologically valuable proteins are rich in lysine, an essential amino acid deficient in cereals, therefore it is recommended to combine with cereals to prepare well-balanced meals (milk porridge, pasta and cheese). Milk and dairy products are the only source of milk sugar (lactose). Milk of ruminants contains of very little unsaturated fatty acids. Milk contains both fat and water soluble vitamins. Milk and dairy products are the source of 60 % of calcium found in our diet. Milk is also a source of phosphorus, potassium and magnesium, it may also contain iodine, if the is found in the feed for the cattle.

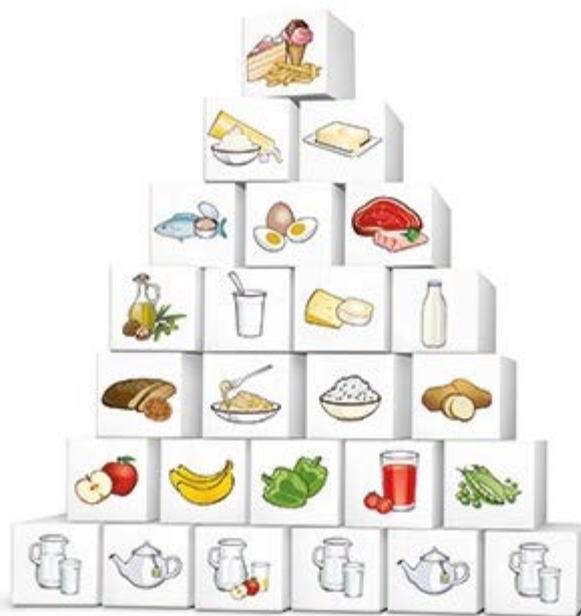


Figure 4: The Austrian food pyramid of the BMGF [Bundesministerium für Gesundheit, 2016]

The food pyramid in Figure 2-4 provides assistance in the selection of foods. The items at the base form the foundation for a balanced diet, while foods at the top should be consumed sparingly. It is constructed in such a way that each component corresponds to one serving of the food group per day.

The increased use of industrially processed products has led to a change in the structure of the diet. In the past, starchy staple foods dominated the diet. But now, there is a global trend

towards the higher consumption of vegetable oils, calorie-rich sweeteners and animal foods [Berghofer et al., 2016]. Ready-to-eat products often contain too little fruit and vegetables and too many processed fats, simple starches, and sugars.

According to the Austrian Society for Nutrition [2017], the following expert recommendations for different food groups apply:

- At least 1.5 litres of liquid per day. The best are non-alcoholic, low-energy drinks in the form of water, unsweetened herbal and fruit teas, or diluted fruit and vegetable juices.
- 5 servings of vegetables, legumes, and fruit per day. Ideally 3 servings of vegetables/legumes and 2 portions of fruit.
- 4 servings of cereal products – preferably whole grain – and potatoes per day
- 3 servings of milk and dairy products or milk substitutes enriched with vitamin B₁₂ and calcium per day.
- 1 to 2 servings of fish per week
- 2 to 3 servings of meat and sausages per week
- max 3 eggs per week
- minimal amounts of sugar and salt

Milk and dairy products can also be replaced by milk replacement products such as: soy milk, cereal milk, almond milk, and mung bean milk. These products contain no milk protein, vitamin B₁₂, and cholesterol and little low-grade calcium. To compensate for this, these products are enriched with vitamin B₁₂ and calcium.

Meat is not absolutely necessary for life. However, the recommended 2–3 portions of meat and sausage products per week would already be a considerable reduction for most Austrians.

It is also recommended to pay attention to a nutritive preparation as well as short cooking and warming times. This guarantees the best qualitative and sensory properties and prevents the formation of unwanted substances [Austrian Nutrition Society (ANS) (Österreichische Gesellschaft für Ernährung, 2017)].

Ready-to-eat products often fail to meet these requirements because the producers often resort to the cheapest foods as ingredients and take advantage of the fact that the origins of the ingredients do not have to be declared. Therefore, such products often contain poor quality food.

4.6 Plant-based protein vs animal protein

The economic and ecological aspects of an example meal are presented here. This is a meal consisting of smoked meat with mashed potatoes (reconstituted potato flakes) and roasted onion.

Up to 18 % (conventional) of CO₂ emissions can be saved if Austrian products are used. If organic food is used, a savings of up to 15 % (1.425 kg CO₂ in the case of import) is possible.

In this case as with every meal, there are several possibilities for making the food more resource-efficient as well as reducing costs and CO₂ emissions.

Ecological aspects:

1. Freshly prepared mashed potatoes.

In a large-scale kitchen, dispensing with mashed potato made from reconstituted potato flakes can lead to considerable savings in CO₂. Because of the additional need for potatoes for 1 kg of potato flakes and the processing, freshly cooked mashed potatoes emit 77 % less CO₂ than the convenient variant.

In the alternative meal "Smoked meat with mashed potatoes (freshly prepared) and roasted onion", savings of up to 25 % (Austrian, organic food) compared to the use of mashed potatoes are possible. In this example kitchen, the savings potential is up to 1.814 kg CO₂.

2. Vegetarian instead of meat

The greatest savings are possible when meat-based dishes are replaced with vegetarian dishes. Up to 94 % of CO₂ can be saved by using pasta with tomato sauce (instead of smoked meat). The output of up to 8,570 kg of CO₂ can be reduced (see Figure 2-5).

Pork from Austria emits about 4–5 kg of CO₂. The agricultural production of meat is responsible for up to 98 % of CO₂ emissions.

Regarding the vegetarian dish "noodles with tomato sauce", the trade with foreign origin is particularly important with the tomatoes. In the case of Italian origin, transport from Italy to Austria (including storage) accounts for almost 90 %.

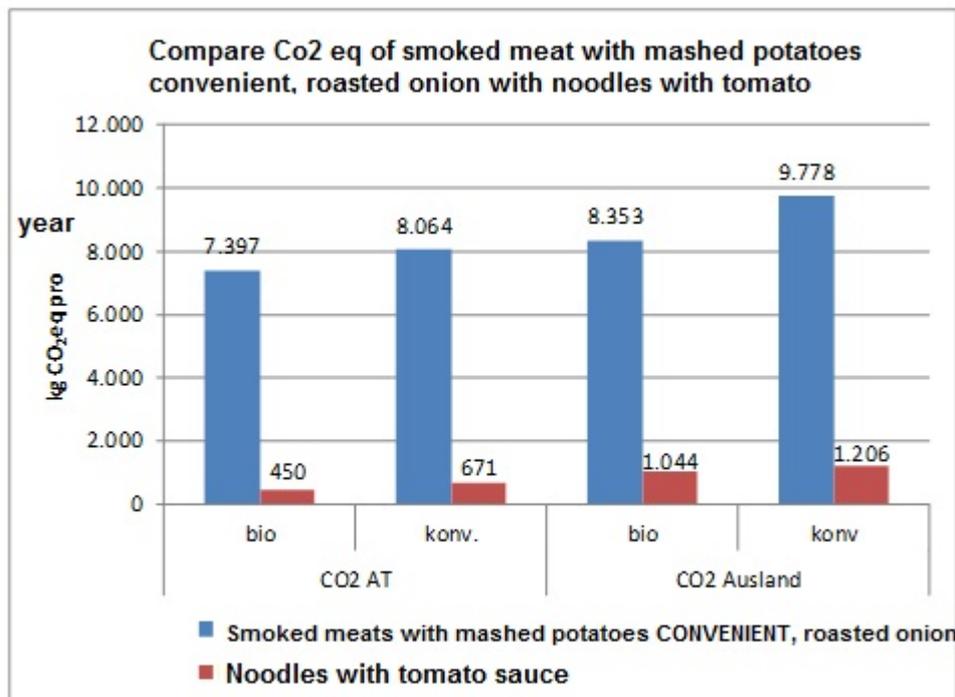
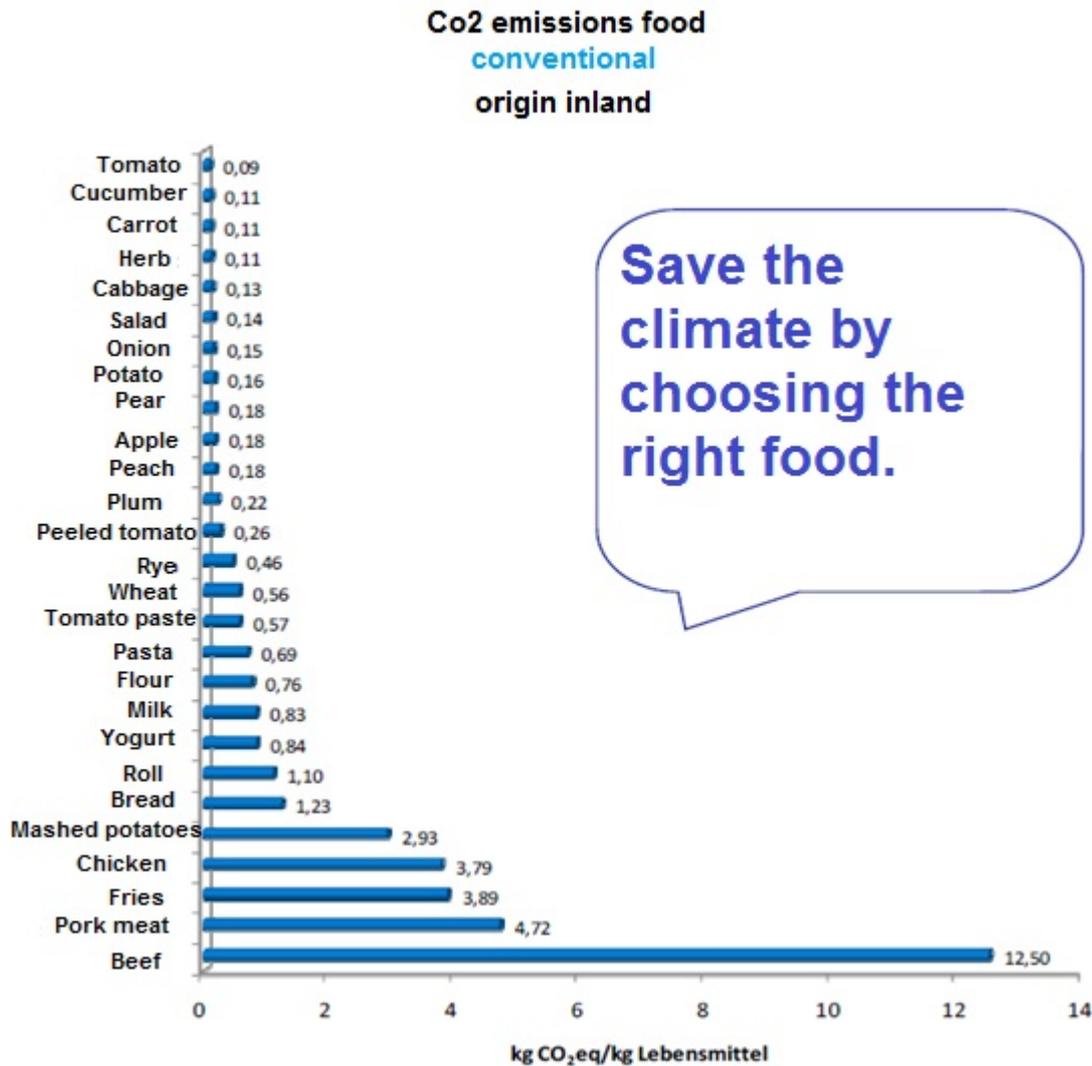


Figure 5: Comparison of the CO₂eq of both meals

All in all, it can be said that replacing meat dish with a vegetarian dish brings substantial CO₂ savings in large-scale kitchens.

Fig.6: CO₂eq emissions from plant production



[Daxbeck et al., 2011]

5 Nutrition plan and resource efficiency

Nutritional physiological quality demands a balanced, health-promoting composition of the diet.

Unlike in the past, most people have a sedentary job and are also less active. This is reflected in a diminished energy requirement.

The objective of communal catering scheme is to provide all catering participants (children, adults and seniors) with the nutrients they need in a cost-efficient manner.

For the majority of the facilities, this means a focus on low-energy foods with an optimised nutrient composition.

The German Nutrition Society (DGE) has developed quality standards for nutrition, among others, for schools, retirement homes and “meals on wheels”.

The aim of "quality standards" is to support those responsible in communal catering in the implementation of a needs-oriented and balanced diet.

In Austria, there are still no comparable quality standards or legal anchoring. However, the Federal Ministry of Health (BMG) has prepared a guideline for school cafeterias. This guideline is based on scientific standards and is intended to ensure the supply of essential nutrients

Excerpts from the guideline for school cafeteria according to [A. Hofer, 2011]:

- At least half of the beverage assortment consists of ideal thirst quenchers. The remainder includes products with moderate sugar content, without sweeteners, and azo dye free.
- At least two-thirds of the product range consists of products with a high proportion of whole grains. White bread/pastry is supplemented with a healthy topping
- A maximum of one third of the total offer consists of bread/pastries topped with sausages or meat products.
- At least two-thirds of the total offer consists of bread/pastries topped with cheese and/or other meatless toppings and/or spreads.
- There is varied daily offer with at least three different types of vegetables and three types of fruit.
- Milk desserts (highly sweetened and/or high fat products that count as sweets) are not offered.
- No fatty and sugary flour pastries are offered. No serving size exceeds the palm of one's hand.

- No conventional sweets are offered. The "alternative snacks" are not offered in packages over 30 g.
- No hot and salty hot snacks and food are offered. All warm snacks and meals are supplemented with vegetables or salad.

Furthermore, the Austrian Society for Nutrition (ÖGE) has developed a seal of quality for large-scale kitchens. The seal of quality can be obtained for individual meal lines. It is intended to make it easier for the communal catering participants to opt for nutrient-optimized meals.

How we can find savings potential?

In the first step will be carried out an existing analysis of commercial kitchens. Information on the possibilities of cuisine and the actual use of food will be gathered. Based on this analysis and discussions with kitchen managers, potential savings are identified it can be expected to increase the use of organic food.

In the second step the real possibilities of using fresh organic food are being evaluated. Selected foods are evaluate by cost analysis. The data come from test batches where the feasibility of the product is checked and the necessary information (eg food consumption, organic food, use of finished products) is collected. Seasonality and regionality are also considered.

Cost analysis compares conventionally produced finish products with domestic fresh products from certified organic farming. The cost analysis evaluates the operating costs, personnel costs, and food costs incurred in preparing food from fresh organic food and compares them with the purchase cost of the finished product.

The BIOFAIR project identified the following changes in costs when replacing finished conventional products with fresh organic products in food preparation.

Table 2: Saving potential for replacing conventional finished products with fresh organic food

Organic product	+/- in %*	Organic product	+/- in %*
Coleslaw	-45 %	Grammel dumplings	-58 %
Napkins	-47 %	potato mash	+25 %
Ham roll	+30 %	semolina dumplings	+18 %
Spinach dumplings	-70 %	apple compote	+16 %
Vegetable ore	-77 %	Eel salad	-26 %
Potato dumplings	-63 %	Eggs	+12 %
Vegetable bowls	-8 %	Potato dumplings	+15 %
Potato pancakes	-56 %	Flour	+132 % bis +169 %

* + / - = Use or savings potential for the exchange of conventionally produced finished products with fresh organic food

Table 2 shows the economic impacts of replacing finished products with fresh organic products. These are reference values that we need to be checked in the specific case. These benchmarks are primarily dependent on purchase and wage costs. In those cases where samples of the same food have been sampled in different kitchens and different results have been obtained, the range of results is given.

From the BIOFAIR project we can draw the following conclusions:

- It is appropriate to replace finished products with fresh and organic foods. After all the measures that have been evaluated, a significant increase in the proportion of organic food can be achieved by up to 37% in the monitored kitchens without burdening the food budget as a whole.
- A comparison of the operational, labor and material costs of the foods surveyed shows that the cost of purchasing food has the greatest impact on overall costs.
- To increase efficiency, it is desirable that the kitchens have the possibility of central coordination. In addition to central food purchases, this body could also provide information on prices and on regional and seasonal food availability.
- A successful and cost-neutral increase in the proportion of fresh, regional food and organic food requires a variety of different measures. In addition to a smart buying policy, it also includes a separate meal preparation instead of a ready-made purchase when it pays off economically.
- When we are planning new kitchens or renovating kitchens, it's better cooking with facilities such as fruit, vegetables, meat, fish or eggs should be considered. These considerations should be included in planning, at least for the preparation of potatoes and salads.

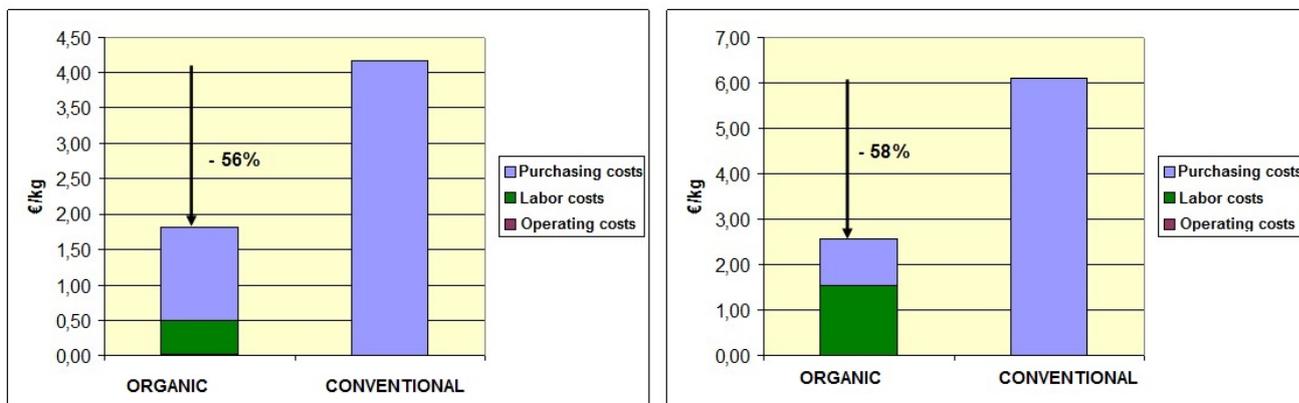
Potato pancakes

Preparing pancakes from bio potatoes compared to the finished product leads to a 56% reduction in costs. In both production systems, buying costs are the responsibility of generating total costs. The resulting wage and operating costs are irrelevant.

Grammel dumplings

Home dumplings are 58% cheaper than the finished product. Although labor costs are higher due to complex production, they can be made cheaper, as the purchase cost of the finished product is considerably higher.

Fig.7: Economic evaluation results of potato pancakes (left) and crackling dumplings (right)



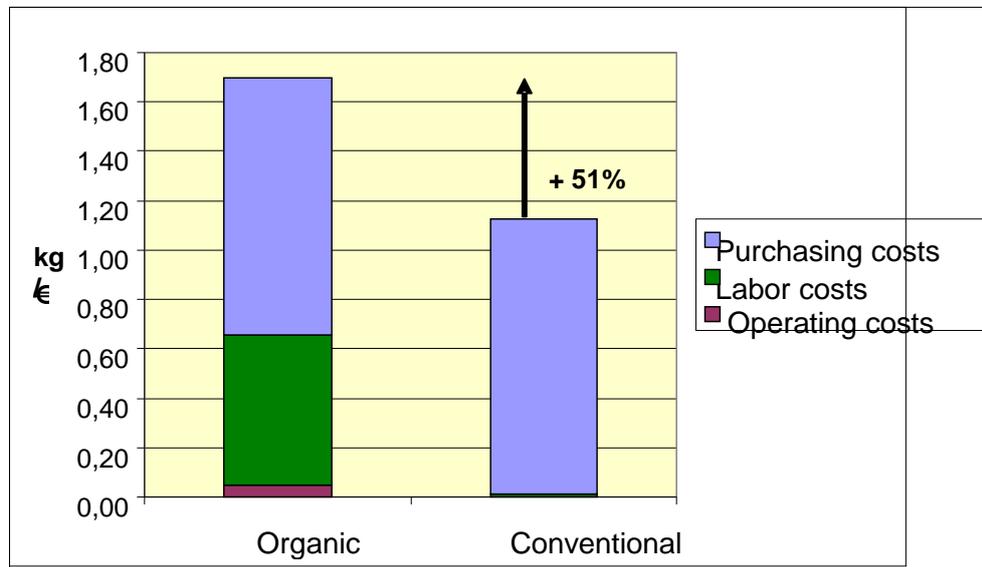
Potato dumplings

Using Potatoes for the production of organic potato dumplings come from controlled organic farming and account for 99% of the weight of the meal. Only spices salt, pepper and nutmeg are from conventional production. The data shows that the preparation of organic potato dumplings leads to a price increase of 51%.

Table 3: Costs comparison of organic and conventional potato dumplings.

Cost faktor	Organic	Conv.	Unit faktor	Cost Organic	Cost Conv.
Working time in min / kg	2,86	0,06	€ 12,75/h	0,61	0,01
Energy in kWh / kg	0,99	-	0,09 Cent/kWh	0,05	-
Water consumption in l / kg	0,51	-	1,18€/m ³	0,00	-
Purchasing costs / kg	1,04	1,11	€/kg	1,04	1,11
Total cost / kg				1,69	1,12

Fig.8: Costs comparison of organic and conventional potato dumplings.



The cost of self-production of bio-potatoes dumplings accounts for 36% of total costs. In particular it is potato scraping, because it is very labor-intensive. When we are buying conventional potato dumplings, the cost of working in the kitchen is only 1% of the total cost. The operating costs of preparing potato dumplings from bio-potatoes represent 3% of the total cost while 0% of the conventional finished product. Therefore, they do not play a significant role in cost items. The cost of purchasing bio-potatoes is 1.04 EUR / kg, the price of finished conventional potato dumplings is 1.11

5.1 Serving sizes

There are different output systems: Tray and scoop system. In the scoop, one can adjust the serving size individually but at the same time keep the serving sizes exactly the same by means of standardized output devices. However, because of the necessary reserve, there is often an overproduction of food.

In the case of tablet systems, the food is portioned in the kitchen, covered, and transported to the communal catering participant. The trays are custom fitted and portion sizes can be kept exactly the same by using standardized output devices. This system is often used in hospitals.

The serving size should be based on the energy needs of the communal catering participants.

The sample of the 2012 Austrian Nutrition Report was about 20% physically active employees; 70 % of employees with a sedentary occupation, and 10% other professions.

Physically active workers have a much higher energy requirement than those who are exclusively engaged in sedentary activities and make little effort to be active in their free time. This applies to a large proportion of office workers. It is thus particularly important to pay attention to a balanced diet, which is adapted to the low level of activity, and to prepare the meals accordingly [Elmadfa et al., 2012].

Full communal catering includes all of the daily meals. The recipients eat only what is offered by the institute. Partial communal catering usually comprises only one meal (e.g. lunch). This should supply just over one third of the daily energy requirements.

In situations with full communal catering, it is particularly important to provide sufficient energy and nutrients for the participants as well as provide a varied and balanced diet [Elmadfa et al., 2012].

5.2 Protein and sources of protein

Protein is found in both plant- and animal-based foods.

The consumption recommendation of the Austrian Society for Nutrition (ÖGE) is:

- 0.9 g/kg body weight for children.
- 0.8 g/kg body weight for adults.

By consuming dietary protein, the body is supplied with amino acids and other nitrogen compounds, which the human organism needs to synthesise endogenous proteins. The biological value indicates how balanced the amino acids contained in the food are and how well they can be utilized by the body. The food with the highest biological value is the chicken egg [ÖGE, 2007].

The average Austrian woman weighs 65.5 kg

- therefore has a daily protein requirement of 52.4 g

The average Austrian man weighs 82.6 kg

- therefore has a daily protein requirement of 66.08g

According to the 2012 Austrian Nutrition Report, the intake of protein in adults aged 18–64 was 1.1 g/kg body weight. These were achieved by the Society for Austrian Nutrition (ÖGE) without problems. Schoolchildren and senior citizens were also adequately supplied with protein [Elmadfa et al., 2012].

For example, each of the following contains 10 g of protein:

- 1½ eggs

- 300 ml of whole milk
- 40 g of Gouda
- 50 g of trout
- 50 g of chicken
- 1.3 litres of whey
- 55 g of chick peas, dried
- 67 g quinoa
- 80 g of pasta, egg-free, uncooked
- 154 g of parboiled rice, uncooked
- 500 g of potatoes (prepared with peel)
- 115 g of rolls
- 120 g tofu
- 137 g of whole grain rye bread

[ÖGE, 2007]

In industrial nations such as Austria, the protein requirement is usually met by the diet. A deficiency occurs almost exclusively by enzyme deficiency caused by various diseases (e.g. thyroid diseases, AIDS).

An extremely low protein diet can also lead to a protein shortage; however this mainly occurs in developing countries [D-A-CH, 2003].

The protein requirement does not increase with increased physical activity; however, pregnant and lactating women have a 20–30% increase in protein requirements [D-A-CH, 2003].

In Austria, grain and potatoes are the most important protein sources after meat products.

Milk and milk products are among the most nutritionally high-quality foods because milk provides a considerable amount of protein with high biological value, easily digestible fats and abundant calcium.

Fish and meat are an essential source of protein; sausages are often very rich in fat. Precise consumption recommendations of the Austrian Society for Nutrition (ÖGE) are given in Section 3.6 .

6 Attachments

6.1 Annex 1: Recipes for the preparation of a seasonal menu

[http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20\(Vers.%201.6\).pdf](http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20(Vers.%201.6).pdf)

6.1.1 Recipes for the spring (March to May)

Soups

- Wild garlic soup
- Spelt Soup
- Nettle soup
- Spring herb soup with potatoes
- Spring onion soup
- Carrot cream soup with ginger and sesame
- Kressesuppe with lime
- Beet soup soup with chili and coriander

Salads

- Head salad with Johurt dressing
- Dandelion apple salad

Main dishes

- Green spelled potato casserole
- Potato casserole
- Fine spinach dumplings
- Dumplings with mushroom sauce
- Dinkelloaf
- Gerstenloaf
- Potato plug-loaf
- Sesame loaf with chives
- Vegetable soup with root vegetables
- Green lasagne core
- Pasta asciutta with vegetables
- Pasta with leaf spinach, tomatoes and Parmesan
- Penne with asparagus
- Asparagus lasagne on saffron-Veltlinersauce
- Piquant pancakes
- Ramson Pancakes
- Carrot Buffer
- Wild garlic strudel with asparagus
- Potato swirl
- Millet pot medallions

6.1.2 Recipes for summer (June to August)

Soups

- Bortsch
- Buckwheat soup
- Pea puree soup
- Pea soup with lemon balm
- Yellow peppers soup with croutons
- Leek soup
- Pepper chervil soup

Salads

- Colorful salad plate
- Iceberg lettuce
- Cucumber salad with vinegar
- Cucumber salad with yoghurt
- Sour cream dressing
- Cold slaw
- Carrot salad with tomatoes
- Yoghurt dressing
- Cheese and egg salad
- Cabbage and carrot coleslaw
- Lollo Rosso with honey
- Mustard dressing
- Mediterranean cabbage salad
- Salad
- Sprout salad
- Tomato salad with balsamic dressing
- Wild herb salad with hemp nut oil recipe

Main dishes

- Broccoli Casserole
- Milletcasserole
- Potato-vegetable casserole
- Polenta bake with tomato and pepper ragout
- Stuffed kohlrabi
- Stuffed zucchini with sheep cheese and spinach
- Peppers filled with green peppers
- Cheese dumpling with tomato vegetables
- Vegetable soup on leaf salad with yogurt dip
- Rye bread with pineapple
- Green core loaf with Letscho
- Karfiolloaf
- Kohlrabi carrot loaf (surprise schnapps)
- Spinach and oat loaf with paprika

- Red cabbage salad with winter fruits
- Waldorf Salad of celery and apple walnut
- Vogerl salad with radish chesressing

Main dishes

- Potato Broccoli Casserole
- Cereals on cabbage
- Haferflockenloaf
- Potato Lasagna
- Piquant pancakes
- herb pancakes
- Pancakes with vegetables and herb mustard dip
- Spinach Pancakes
- Spicy roulades
- Broccoli syrup with tomato sauce
- Potato Leek Roulade
- Oatmeal celery buffer
- Cabbage strudel
- Savoy cabbage with fresh cheese filling, yoghurt and herbs sauce, potatoes

The individual recipes are freely accessible on the Internet and at:
[Http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20\(Vers.%201.6\).pdf](http://umbesa.rma.at/sites/new.rma.at/files/Projekt%20UMBESA%20-%20Rezeptsammlung%20(Vers.%201.6).pdf) available.

6.2 Annex 2

Non-organic / non-organic ingredients of agricultural origin in accordance with the European Organic Regulation COMMISSION REGULATION (EC) No 889/2008 of 5 September 2008

6.2.1 Unprocessed planted products and manufactured products

6.2.1.1 Edible fruits, nuts and seeds

- Acorns *Quercus* spp.
- Cola nuts *Cola acuminata*
- Gooseberries *Ribes uva-crispa*
- Maracuja (Passion fruit) *Passiflora edulis*
- Raspberries (dried) *Rubus idaeus*
- Redcurrants (dried) *Ribes rubrum*

6.2.1.2 Edible spices and herbs

- Pepper (Peruvian) *Schinus molle* L.
- Horseradish *Armoracia rusticana*
- Small Galgant *Alpinia officinarum*
- Safflower flowers *Carthamus tinctorius*

- Watercress *Nasturtium officinale*

6.2.1.3 Various

Algae, including seaweed, which may be used for the production of non-organic foods.

6.2.2 Vegetable products

6.2.2.1 Fats and oils, whether or not refined, but not chemically modified, from plants other than:

- Cocoa *Theobroma cacao*
- Coconuts *nucifera*
- Olive *Olea europaea*
- Sunflowers *Helianthus annuus*
- Palm trees *Elaeis guineensis*
- Rape *Brassica napus, rapa*
- Saflor *Carthamus tinctorius*
- Sesame *Sesamum indicum*
- Soy *Glycine max*

6.2.2.2 The following sugars, starches and other products of cereals and tubers

- Fructose
- Rice paper
- Oblates
- Rice and wax maize starch, not chemically modified

18.9.2008 EN Official Journal of the European Union L 250/53

6.2.2.3 Various

- Pea protein *Pisum spp.*
- Rum: only made from cane sugar.
- Cherry, made from fruit and flavorings as referred to in Article 27 (1) (c).

6.2.2.4 Animal products

6.2.2.5 Aquatic organisms, not from aquaculture, used in the manufacture of non-organic

Conventional foods.

- Gelatine
- Whey powder "Herasuola"
- Natural intestines

6.3 Annex 3: Recipes for preparing a menu from alternative crops

Alongside vegetables and fruits there are plenty of traditional agricultural crops as well as forgotten and rediscovered exotic plant species, which can help to expand the menu of school canteens.

In addition to gastronomic knowledge and experience, school canteens staff may be also interested in informative description of less-known crops, which are a source of many non-traditional products for preparing number of tasty dishes having a positive impact on the health of young people.

6.3.1 Spelt (*Triticum spelta* L.)

Spelt is considered to be a traditional crop. Thanks to a rising interest in healthy food products and ecological agriculture, spelt is being grown gradually more and more. Spelt originally comes from Southwest Asia (Iran, Mesopotamia). Old Egyptians, Greeks and Romans already grew it. Spelt was probably introduced to the rest of the Europe 4 000 years ago during Migration period.

St. Hildegard of Bingen had supposedly once said: "If a man could not eat anything and nothing helped him, spelt puts him on his feet." Modern medicine speaks about a positive effect of spelt on the stimulation of the immune system. At the same time, spelt is easily digestible and has a much lower allergic toxicity. Spade is not suitable for gluten-free diet. On the contrary, it is characterized by high protein content (14-19 %), essential amino acids, gluten content reaches 35-44 % and there is a disadvantage of low swelling ability and greater ductility. Grains are rich in phosphorus and iron and have high magnesium content. Spelt is simple to use and quick to prepare, it has a nice hazelnut flavour, it is easily digestible, due to its high nutritional value it may be use as a part of metabolic diet.

Very popular is spelt bulgur. It is a nutritionally high valued product (known for about 4 000 years) - a whole grain that has been cleaned, steamed, then dried and finally cracked. Especially in the Middle East, it is used to prepare a popular pilaf, different vegetable salads (tabbouleh), vegetable or meat dishes (falafel, kibbeh).

Spelt with chickpea and dried plums

200 g of spelt or "BIOHARMONIE" spelt kernotto cooked according to the product package, 100 g of boiled chickpeas, smaller celery, medium carrot, 2 onions, 1 teaspoon of raisins, 6 dried plums, 3 cloves, 6 tablespoons of white wine, 1 tablespoon of almonds (or walnuts), oil, salt, vegeta (condiment), parsley, vegetable broth

Pour white wine over dried plums and raisins. Heat the oil and braise the onions, add grated (or thinly sliced) celery, carrots and almonds. Let everything braise for a while, add boiled chickpeas and spelt, flavour with vegeta and salt. Add raisins and thinly sliced plums, pour the broth or water and stew for 10-15 minutes. Then add green parsley and flavour with vegeta or salt to your taste. Serve as on its own or with vegetable garnish or as a side dish to vegetable and meat meals.

Kernotto rissole

3/4 cup of kernotto, 2 cups of water, 1 onion, 2 eggs, 1 clove of garlic, 2 tablespoons of oil (e.g. sesame oil), bread crumbs, sea salt, marjoram

Heat the oil, add the chopped onion and brown it slightly, add kernotto, pour water, season and let it cook for 50 minutes. Let kernotto cool down and then mix together with garlic, marjoram, eggs and bread crumbs. Bring the mixture together and then shape it into the rissoles. Cover them in bread crumbs and fry.

Spicy salad with apple and horseradish

150 g of cooked spelt or kernotto, 1 small white yoghurt, 60 g of curd cheese, 1 soft cheese, 1 bigger apple, 3 teaspoons of grated horseradish, 1 teaspoon of sugar, salt, some lemon juice

Peel and grate the apple, sprinkle with lemon juice and add yoghurt mixed with curd cheese, horseradish and sugar. Add cooled spelt, season with salt, add sugar or lemon juice to taste and mix. Finished salad may be served on its own or you may add tomatoes, bell peppers or rolls of cheese.

Spelt potato pancakes

80 g of finely ground wholemeal spelt flour, 1 onion, 350 g of potatoes, 3 carrots, 1 egg, 3 tablespoons of cream, 2-3 cloves of garlic, chopped parsley or basil, marjoram, pepper, sea salt, frying oil

Chop the onion and fry it until golden. Grate the potatoes and carrots, add the egg, cream, smashed garlic, fried chopped onion, chopped herbs and flour. Flavour with marjoram, salt, pepper and knead the dough. Shape the dough into pancakes and fry.

Spelt "halušky" (dumplings)

200 g of finely ground spelt flour, 250 g of rough spelt flour, 2 teaspoons of salt, 2 eggs, 150 g of grated raw potatoes, 300 ml of water

Pour flour in the bowl, add finely grated potatoes, eggs, salt, and in steps pour in water. Knead the mixture properly. Dough must be smooth, easy to separate from the bowl and not too thin or dense. Make smaller batches of dough (approx. 1/4), and press them through "halušky" strainer into the boiling water forming small irregularly shaped lumps. We cook them for a while, and then remove them with a sieve.

6.3.2 Naked oat (Avena nuda L.)

It is assumed that naked oat comes from the mountain regions of China and Mongolia. Grains of cropped glumeless oat get separated from husks and glumes during the threshing process, thus it is possible for monogastric animals (humans included) to consume the grains directly. In the food industry naked oat is used to produce flakes and other products (muesli, sticks, bread, pastries, oatmeal, protein isolates, culinary oils, and even oils for cosmetic purposes). The high energy and nutritional value of oats results from a high protein content,

favourable amino acid composition, fats rich in unsaturated higher fatty acids, good carbohydrate composition, high content of easily soluble fibre, vitamins B1, B2, E, magnesium, iron and other minerals. Medicine verifies the beneficial physiological effects of oat diet on the organism as well as the prevention of cardiovascular, digestive diseases, diabetes, cancer and heart disease. An effective element of oats is bran. Beta-glucan content fluctuates around 15 %. Consuming oat bran products can achieve a reduction in blood glucose of up to 40 %, which is much more effective than wheat bran. It is a well-known fact that oat fibre, as well as wheat fibre, eases the bowel function. Oat bran is a definitive recommendation for a gluten-free diet!

You can use oat grain as a substitute for rice and oat flakes, muesli bars and bread may find their place in your pantry.

Basic preparation of glumeless oat

Rinse the oat grains, put them in a pot with salted water, add a drop of oil and cook under the lid without stirring. For crunchy texture, cook for about 30 minutes, for soft texture suitable for puddings, cook for about 60 minutes. Leave the oat grain to set for 5 minutes after cooking. Recipes of the PRO-BIO, s.r.o. company and recipes from the book "Česká biokuchařka" (Czech organic cookbook), author Anna Michalová

Colourful oat risotto with chicken breasts

300 g of cooked oat grains, 150 g of chopped onion, 3 cloves of garlic, 500 g of chicken breast, 1 pack of frozen vegetable mix, Soy and Worcestershire sauce, broth, 2 red and 2 green bell peppers, parsley, oil

Slice the chicken breasts into thinner strips and sauté. Add chopped onion, Soy and Worcestershire sauce, pour in water or broth, add beans, cooked oats and extruded garlic. Let it stew for a while and finally add chopped bell peppers and parsley.

Oatmeal pancakes

2 eggs, 500 ml of water, Soy sauce, pepper, herbal salt, 2 tablespoons of chopped parsley and chives (mix of herbs), 4 tablespoons of wheat or spelt flour, 400 g of boiled oat grains, oil, ketchup, grated cheese

Put oats, eggs, water, spices and herbs into a bowl. Thicken it with flour and mix it properly. Use a spoon to make small cakes then fry them on both sides. Best serve hot and sprinkled with grated cheese. Add ketchup to your taste.

Colourful oat salad

1 finely chopped red onion, 2 tablespoons of oil, 400 g of cooked oat grains, 2 cloves of garlic, 100 g of young radishes cut into thin slices, 100 g of bell pepper (red, green, yellow), 2 thinly sliced tomatoes, smaller Chinese cabbage, Worcestershire sauce, pepper, basil, salt, 2 tablespoons of vinegar, 2 teaspoons of sugar, sliced fresh parsley, cheese, water

Heat the oil, add the onion and fry until it become glassy, add salt, cooked oat grains and mashed garlic. Let it stew for a while and then let it cool down. Put sliced vegetables (radish, pepper, tomatoes, cabbage) into a medium bowl, add cooled mixture from the pan and stir well. Add pepper, basil, parsley, vinegar, sugar and flavour it with Worcestershire sauce. Season with salt or sprinkle it with oil to your taste. Let it set in the fridge for about 30 minutes. Serve with grated cheese on top. This salad is suitable not only as a supplement to the main dish but also as a light dinner.

6.3.3 Common millet (*Panicum miliaceum* L.)

Panicum belongs together with wheat and barley to the oldest cereal species grown by humans. It has been known since the Stone Age. It probably comes from the areas of Manchuria and Mongolia. *Panicum* was included among five basic crops along with rice, soy, foxtail and wheat by Chinese mythical emperor Shen Nung, who is also called "God Farmer" or "Five Cereals' God". Thanks to trade routes it was spread from China to India and then further to the West. According to preserved records, it was also cultivated in Babylon's Hanging Gardens of Queen Semiramis. To the Central and Western Europe, it got during the Migration period. Charles the Great (around 800) established common millet as Lenten fare. Because it required soils free of weedage, it became a very expensive cereal during the Middle Ages, much more expensive than wheat.

Panicum is a very valuable material in the pharmaceutical and food industry. Values of common millet grain are equal to naked oat grain. Nowadays, people are getting more and more interested in millet products. Hulled millet has a nutrient ratio close to the recommended ratio of protein, fat and carbohydrate, and it has high levels of vitamins A₁, B₁, B₂. Millet seeds have generally higher mineral and fibre content than wheat grains. Hulled millet is free of gluten and it is suitable for patients suffering from celiac disease. Soluble fibre helps to lower blood sugar and cholesterol levels. 12 % is proteins. The fat content is around 6 %, which is mostly composed of nutritionally beneficial unsaturated fatty acids (80 %). *Panicum* is also a very good source of minerals, mainly phosphorus, potassium, calcium, sodium and iron. *Panicum* seeds have generally higher mineral and fibre content than wheat grains. Prepared *Panicum* grains - hulled millet - work great both as a sweet and savoury dish.

Roasted pepper with hulled millet stuffing

Time of preparation: 60 minutes, number of portions: 5

1 cup, 1 big onion (preferably red), oil for roasting and frying, 500 ml of broth, 10 large peppers (red, yellow, green), 300 g of Gouda cheese, a handful of chopped herbs (parsley, wild garlic, lovage, ...), optionally 100 g of bacon or ham

Scald the hulled millet with boiling water twice and then strain excess water. Finely chop the onions and braise with oil on a hot pan. Add the hulled millet and let it roast for one minute. Keep stirring. Pour in the broth and, bring it to boil, lower the heat, cover with a lid and let it stew on low heat for about 15 minutes. Let the broth to cool down for 5 minutes, then add with cheese and herbs and mix. You can add rendered bacon or finely sliced ham to your taste.

Stuff the peppers with the prepared mixture and put in a roasting pan. Add the oil and pour in some water. Set the oven to 200°C, and roast the peppers uncovered until golden. For time

to time, turn the peppers in order to roast them evenly. Roast about 25-30 minutes to get a golden crispy skin on the peppers.

Serve on its own as a healthy dinner or with a vegetable salad, or as a side dish.

Hulled millet - spinach pudding

Time of preparation: 25 minutes, baking time: 25 minutes, number of portions: 5 portions

1/2 cup of BIOHARMONIE hulled millet, 1 and 1/2 cup of water, salt, 1 cup of fresh or frozen chopped spinach, 3 eggs, 1 cup of milk, 1/2 teaspoon of dried thyme, fresh chives, optionally cheese (smoked, goat, ...)

Properly rinse the hulled millet and scald with boiling water multiple times. Pour in water, season with salt and let it cook for about 15 minutes on medium heat with a lid on the hulled millet absorb all water.

Meanwhile, whisk the eggs with milk, add thyme, chives and season with salt. Cooked hulled millet mix together with spinach and put even portions in 5 smaller baking bowls greased with oil. Push the mixture in the bowls lightly. Pour in the whisked eggs and again gently push in with a spoon so that the whole mixture is covered with the eggs. Finally, decorate it with cheese to your taste and bake at 190°C for about 25 minutes.

Serve warm with vegetable salad on side as a light dinner.

Baked hulled millet with mushrooms

300 g of hulled millet, 300 g of fresh or handful of dried mushrooms, 4 rolls, 1/4 l of milk, 2 eggs, pepper, caraway, ginger, marjoram, garlic, salt

Cook the hulled millet in water (1 : 2.5 ratio) until soft. Slice the fresh mushrooms and stew for a while. Dried mushrooms must be soaked in warmish water before cooking. Slice the rolls and soak in milk. Put the cooked hulled millet, mushrooms and rolls soaked in milk together and mix gently, add the eggs and flavour with spices and herbs. Put the mixture into a baking bowl greased with oil, level the surface with a spatula and bake in a hot oven. You can sprinkle the baked hulled millet with cheese and serve with green salad or sterilised vegetables. You can eat it hot or cold.

Baked hulled millet with fruit and nuts

250 g of hulled millet, 0,5 l of milk, 100 g of sugar, 1 packet of vanilla sugar, salt, 250 g mixture of dried apples, plums, raisins, nuts, candied fruit, seeds, etc. , 4 eggs, 30 g of butter

Put the rinsed and optionally scalded hulled millet to the pot with milk flavoured with salt and sugar. Keep stirring gently and let it cook until soft. Add the fruit and nuts to the still hot mixture and let it cool down a bit. Then add the egg yolks, whip the egg whites and carefully mix everything together. Put the prepared mixture into a greased baking bowl or baking pan, smooth the surface with a spatula, cover it with thin slices of butter and bake in an oven on medium heat. You can also use fresh fruit (apples, strawberries, cherries). Finally, you can add a maple syrup, fruit juice, sour cream or whipped cream to your taste.

Hulled millet porridge with honey and nuts

300 g of hulled millet, 1 l of milk, a little bit of salt, sugar, vanilla sugar, cinnamon, honey, cocoa, butter, nuts

Rinse the hulled millet, optionally you can scald it with hot water and strain. Then pour in milk, add salt, vanilla sugar and let it cook on low heat. Flavour the cooked hulled millet with sugar, honey, add butter slices and sprinkle with cinnamon, cocoa and grated nuts.

6.3.4 Buckwheat (*Fagopyrum vulgare* Moench.)

Buckwheat is an old cultural crop. It comes from Central Asia (South Siberia, North China). In Japan, it is mentioned in writing in 772. Buckwheat was already known in the 12th century in our lands. Buckwheat spread from central Europe (Hungary, Poland, Bohemia) to Germany, Denmark, France and other countries. From the beekeeping point of view, buckwheat is a valuable source of nectar, it is also possible to make a herbal tea from a haulm or achenes. Buckwheat shells are often used as a pillow filling.

The excellent advantage of buckwheat is its nutritional value bringing the beneficial composition of proteins (albumins, globulins), fibre, minerals (Mg), riboflavin (vitamin B₂), rutin and flavonoid (vitamin P). This makes buckwheat suitable for optimal nutritional diet.

Achenes contain from 10.5 to 15 % of proteins significant for minimal prolamin content, thus they are easily digestible. The composition is similar to the protein complexity of legumes. Buckwheat is also suitable for people who suffer from celiac disease. Buckwheat starch is easily digestible. Achenes are also a valuable source of minerals. They are high in phosphorus, potassium, calcium, magnesium and iron. Furthermore, buckwheat is a source of manganese, zinc and copper. Finally, they are an important source of B vitamins (mainly B₁ and B₂) and vitamin E. 250 g of buckwheat is a sufficient amount for humans to cover the daily dose of vitamin B₁, B₂ and E. Buckwheat's achenes contain 2-3 % of lipids which are found in embryos and endosperm. The largest share is linolenic acid (30 %), which helps to lower blood cholesterol levels.

The whole plant is a source of bioflavonoid rutin. Anti-carcinogenic, anti-mutagenic together with antioxidant effects of rutin have been proven. It has a beneficial effect on vascular elasticity and vascular capillary permeability, thereby it contributes to lower the blood pressure. Rutin is used as an arteriosclerotic factor, it increases the nutritional and dietetic properties of buckwheat. The buckwheat plant also contains resveratrol which reduces blood pressure, prevents red blood cells agglutination and oxidative stress. The effect on preventing colon cancer has been proven too.

Groats, grits, flour, flour or flakes can be produced from buckwheat. Buckwheat groats are used as a side dish and they are suitable for preparing porridges, puddings, fillings, etc. Buckwheat groats are an ideal product for fast cooking, semolina is used for traditional porridges, puddings and spreads.

Buckwheat "kuba" (Traditional Old Bohemian dish)

250 g of buckwheat groats, 100 g of dried mushrooms, 1 onion, 2 cloves of garlic, sea salt, olive oil, parsley, pepper, bread crumbs

Soak mushrooms in water until soft and then cut them into smaller pieces after softening. Heat up the oil in a pan, braise the onion, add mushrooms, salt, pepper, pour in water and stew for a while. Add rinsed groats, grated garlic and add a required amount of water (1: 1.5),

let it cook for 5 minutes. Meanwhile, grease a baking pan and dust it with bread crumbs. Put the prepared mixture in the pan and bake for about 20 minutes. Serve with chopped green parsley and a vegetable on side.

Rice-buckwheat pudding with apples and walnuts

200 g of white long-grain rice , 150 g of buckwheat groats, 8 apples, 100 g of cane sugar, 25 g of walnuts, 2 eggs, 1/4 of butter, 1/2 of cinnamon sugar packet, bread crumbs

Cook the rice and buckwheat according to the basic recipe and then let to cool. Whisk the eggs, sugar and butter until it has a foamy texture. Peel and grate the apples on a coarse grater. Put together the rice, buckwheat groats and the foamy mixture. Grease a baking pan and dust it with bread crumbs. Put a layer of rice-buckwheat mixture on the bottom of the pan, then add grated apples mixed with cinnamon sugar and walnuts and finally a second layer of rice and buckwheat on top. Bake at 180 °C for about 45 minutes. Serve with sour cream or white yoghurt.

Basic preparation of broken hulled buckwheat

Rinse the buckwheat in cold water. Use a 1.5 (water) : 1 (buckwheat) ratio. Never strain the excess water to avoid losing rutin levels. Cook for 2-3 minutes and let it set for about 15 minutes. Do not stir.

Buckwheat porridge

2 cups of broken hulled buckwheat, 1 cup of Isola Bio almond beverage, 10 tablespoons of maple syrup or 5 tablespoons of cane sugar, 2 tablespoons of chia seeds, 1 teaspoon of cinnamon, a pinch of salt

Put the buckwheat in a bowl and pour in four cups of water and let it soak over a night (at least for 4 hours). Then rinse it properly with cold water. Put all the ingredients together and process it with a stick blender until smooth. Add seasonal fruit, nuts or seeds to your taste.

Spicy buckwheat rissoles with tuna

Time of preparation: 45 minutes, number of portions: 2-3

1.5 cup of cooked broken hulled buckwheat, 1 can of tuna in a natural juice, 1 finely chopped medium onion, 1 medium carrot - grated, 2 eggs, 200 g of grated cheese, 2 tablespoons of Dijon mustard, 2 tablespoons of ketchup or tomato paste, 1 tablespoon of linseed, salt, pepper

Put the ingredients in a bowl and mix everything properly. Use a small cup to shape the rissoles, then place them on a baking sheet. Bake in the oven at 180°C for about 15-20 minutes or until golden. Serve warm with vegetable salad on side or with yoghurt dip.

Farfalle with broken hulled buckwheat

Number of portions: 3, time of preparation: 50 minutes (preparation: 10 minutes, actual cooking: 40 minutes)

120 g pasta farfalle (bow ties), 3 large sliced onions, 4 tablespoons of extra virgin olive oil, 1 cup of chicken broth (or BIOLINIE chicken broth cube), 1/2 cup of broken hulled buckwheat, 1 egg, salt, pepper

Heat up the oil on a frying pan and braise the onion slices until brown. Remove the onion rings and put aside. Cook the farfalle in salted water. Then strain the excess water and rinse with cold water. Put the dry buckwheat with the egg in a bowl and mix, then add the mixture in a pot, add the broth in a ratio of 1: 2 (buckwheat: broth), bring to boil and leave for about 10 minutes under the lid. Put the cooked buckwheat, pasta and onion in the frying pan, heat it up, add salt and pepper to your taste and serve.

Quick strudel with buckwheat filling

One pack of puff pastry, broken hulled pastry, 1 soft curd cheese, grated apple or canned fruit, cane sugar, cinnamon, salt, vanilla (or organic vanilla sugar), oil, eggs

Roll the dough to a thin sheet. Blend the curd cheese with salt, sugar and vanilla, and then spread the mixture evenly on the pastry. Sprinkle with broken hulled buckwheat (dried), evenly spread the grated apple or fruit, and sprinkle with sugar and cinnamon and oil. Fold the pastry carefully, push the ends and put it in the baking pan. Smear the visible surface with beaten eggs and bake. You can alter the filling. You can use mix of different nuts or poppy seeds instead of curd cheese. If you intend to use dry mixture like these, increase the amount of fruit and oil, so the strudel will be nicely moist.

Buckwheat pancakes

0.5 l of milk, 200 g of buckwheat flour, 1 egg, pinch of salt, 1 tablespoon of sugar, frying oil, quality jam or marmalade

Pour milk in a bowl, add the egg, mix in the buckwheat flour, add salt and sugar. Let the mixture rest for a while. If the mixture is too watery, add more flour. When the pancake mixture is ready, you can start to fry. You can make thin or stronger cakes. Serve with jam or marmalade.

Buckwheat gugelhupf

250 g of buckwheat flour, 150 g of cane sugar, 250-300 ml of whipped cream or kefir, 1 packet of vanilla sugar, 1 packet of baking powder without phosphates, 3 eggs, 50 ml of sunflower oil, according to your preferences: - coconut, cocoa, raisins, nuts ...

Whisk the eggs with sugar and oil until foamy texture, pour in kefir and add buckwheat flour together with baking powder. Add seeds, dried fruits to your taste. Grease the mold and dust it with bread crumbs. Divide the mixture in 2:1 ratio, pour the bigger portion in the prepared mold, add two tablespoons of cocoa in the remaining portion, mix properly and then pour it over the first layer. Bake at 180 °C for about 40 minutes.

Vegetable buckwheat griddle cakes

Number of portions: 6 (approx. 24 cakes with a diameter of 7 cm), preparation time: 120 minutes

250 g of broken hulled buckwheat, 500 ml of water, 1 vegetable broth cube, 2 onions, 3 tablespoons of olive oil, 350-400 g of grated vegetables (carrot, celery + any seasonal ones: courgette, broccoli, peas, parsley, red beet ...), 4 cloves of garlic, 2 eggs, 100 g of grated cheese, 3 x 2 tablespoons of sunflower, pumpkin and linseed / sesame seeds, 4 tablespoons of finely ground flour, bread crumbs, salt, pepper

Put the broken hulled buckwheat in a bowl and pour prepared boiling broth over. Heat up the oil on a frying pan, braise a finely chopped onion, add vegetable, salt, pepper, 1/3 cup of water, blend everything together and stew until soft. Let it to cool down and then mix it with buckwheat, eggs, smashed garlic, grated cheese and seeds. Thicken with flour (e.g. spelt flour) and mix properly. Shape the cakes, cover them in bread crumbs and fry on both side until golden. Boiled potatoes or vegetable salad is a perfect side dish.

6.3.5 Chickpea (*Cicer arietinum* L.)

Chickpea (*Cicer arietinum* L.), also known as gram or Egyptian pea, has been domesticated a very long time ago and it is one of the earliest cultivated legumes. Chickpeas were probably bred 7 000 years ago in Southeast Turkey or Syria. As for the production of dry seeds, it occupies a fourth place behind soy, beans and peas. It is grown for the grains as legumes, but the whole shells, seeds and young sprouts are suitable for eating.

From a nutritional point of view, chickpeas are among the finest legumes suitable for humans. It is an essential component of vegetarian diet and it is especially recommended for children and pregnant women. The quality of the seeds is given by a high content of sugars, proteins and fibre. The most of the saccharides are starch (about 47 %) and soluble sugars 5-9 %. Chickpeas have 15-30 % of protein. In terms of amino acid composition, chickpeas are a good source of lysine (about 7 %). 6-7 % are fats, and there is a high level of linoleic acid. The amount of fibre is 5-19 %. Chickpeas are a rich source of calcium, manganese, iron (more than other legumes), vitamin E and B₁₅ (pangamic acid). Like other legumes, chickpea seeds also contain antinutritional substances adversely affecting digestibility. These effects can be eliminated if you soak the seeds in water, let them germinate and cooking. It is a crop suitable for food purposes - flour, consumption of whole boiled or roasted seeds, preparing chickpea porridges or soups. In India, it is common to prepare chickpea salad. One of the traditional chickpea delicacies is "hummus" and "falafel" made of mashed chickpeas and spiced chickpeas.

Summer chickpea salad with herbs

250 g of cooked or sterilized chickpeas, equivalent to about 100 g of dried chickpeas, 8 tomatoes (about a pound), 3 spring onion, 2-3 stalks of petiolate celery (e.g. 50-80 g), lettuce for four portions; for the dressing: 6 tablespoons of virgin olive or nut oil, 3 tablespoons of lemon juice, 2-3 cloves of garlic, a spoonful of salt, freshly ground pepper to taste, a bigger handful of finely chopped fresh mint (mint is necessary), a handful of finely chopped fresh parsley

Put all the ingredients for the dressing together, mix them properly and let it set for a while to emphasize the taste of herbs. Cut the tomatoes into smaller cubes, finely chop the celery

and spring onions and mix with chickpeas and prepared dressing. Wash the lettuce and dry - preferably in a salad spinner. Create a lettuce "bed" on the plates and put the chickpea salad in it. Season it with salt and pepper to your taste.

Chickpeas on tomatoes

3 cups of sprouted chickpeas, 1 onion, oil, ground coriander, turmeric, pepper, vegetable broth, 500 g of tomatoes, basil, 3 cloves of garlic, sour cream, parsley

Heat up the oil in a frying pan, braise the chopped onion, add sprouted chickpeas, spices, broth and stew until soft. Next add chopped tomatoes. Finally add sour cream, mashed garlic and parsley just before serving.

Chickpea pan

400 g of chickpeas, 1 and 1/2 l of water, 1 tablespoon of curry, 1 teaspoon of chili, 2 tablespoons of turmeric, 2 teaspoons of mustard seeds, 1 teaspoon of caraway, 2 tablespoons of butter, sea salt, 100 g of coconut, parsley

Soak the chickpeas in the water for 10-12 hours. Heat up a frying pan, melt the butter and braise curry, chili, turmeric, mustard seeds and caraway seeds for 5 minutes while stirring, then add chickpeas and let it cook for 1 and 1/2 to 2 hours at low heat. Allow the excess liquid to evaporate. Season, add roasted coconut and mix. Sprinkle with parsley.

Chickpea "eintopf"

1 tablespoon of olive oil, 1 cup of chopped onion, 3 cloves of garlic, 2 cups of sliced mushrooms, 1 cup of diced carrots, pinch of cinnamon, 3 cloves, 2 large tomatoes, 3 cups of boiled chickpeas, 1/2 cup of pitted olives, 1 teaspoon of thyme, 1/2 cup of chopped parsley, 1 tablespoon of lemon juice, white pepper, sea salt

Braise the onion and garlic on oil for 5 minutes on low temperature. Then add the mushrooms, carrots and stew for another 5 minutes. Next, add cinnamon, clove, white pepper, sea salt and chopped tomatoes, mix it and let it stew for 15 minutes. Finally, add chickpeas, olives, thyme, lemon juice and a half of chopped parsley. Let it cook for another 15 minutes. Sprinkle with the second half of parsley and serve.

Hummus

4 cups of boiled chickpeas, 2 cloves of garlic, 1/2 tablespoons of tahini (ground hulled sesame seeds), 1/2 cup of lemon juice, fresh mint leaves, 1 teaspoon of sea salt

Add some water and process all the ingredients with a blender until it has a smooth creamy texture. Optionally, you can season it with sea salt or flavour it with a soy sauce to your taste. Serve with fresh mint leaves.

Sprouted chickpea rissoles

100 g of sunflower seeds, 200 g of sprouted chickpeas, 50 g of wholemeal flour, marjoram, pepper, salt, bread crumbs, oil

Pour some water in a pot, add sunflower seeds and sprouted chickpeas, let it stew for a while and then process with a blender. Add flour, spices and salt. Knead tougher dough, shape it into rissoles and cover them in bread crumbs. Fry on hot oil. Serve with boiled potatoes and vegetable salad.

Chickpea spread

1 cup of chickpeas, 1 onion, a handful of chives, salt

Soak chickpeas in water and cook until soft, then process with a blender. Season with salt and add finely chopped onion and chives. Optionally, you can add a soy sauce to your taste.

Cheerful vegetable soup

200 g of chickpeas, 1 and 1/2 l of water, 4 cloves of garlic, 1 onion, 5 tablespoons of olive oil, vegetable broth, pepper, herbal salt, bay leaf, 1 bigger potato, 5 carrots, 1 small piece of celery, 1 kohlrabi, 1 leek, sea salt

Wash the chickpeas and soak in water overnight. Next day, cook the chickpeas for about an hour, then add the chopped garlic, chopped onion, olive oil, vegetable broth, herbal salt, pepper and bay leaf. Cut the potato into smaller pieces, slice the carrots, kohlrabi and celery into sticks and add to the soup. Finally, add chopped leeks, freshly ground pepper and salt. Total cooking time is 1,5 - 2 hours.

6.3.6 Common chicory (Cichorium intybus L.)

The origin of the chicory is unclear. Perhaps it comes from India, but it was also described by Egyptians, Greeks and Romans. Other sources state that it is an original European plant. Chicory can be grown almost all around the world. It is a very valuable medical plant. And it is also a valuable source of nectar. Chicory as a coffee substitute is grown for its roots, which contains 14 % or more of inulin. Inulin is an important source of dietary fibre with beneficial effects on the digestive tract activity. It also supports bifidobacteria and some other species (*Lactobacillus acidophilus*) and prevents the growth of unwanted microorganisms (*Salmonella*). It has been shown that inulin reduces cholesterol levels in the blood. Dried or fast-frozen chicory can be used for bakery production. One of the best sweeteners is fructose for which inulin is used.

Chicory is widely used as a vegetable. Chicory sprouts were already used by ancient Egyptians and Greek physician Galénos emphasized their healing and strengthening effects and called it "a friend of the liver".

Recently, special varieties of chicory have been bred. Chicory heads are used for a preparation of many tasteful salads. Heads are sprouts with leaves which are grown in dark environment. Therefore they are very light in colour, without green chlorophyll. Raw green chicory leaves are too bitter. Baking is the most common preparation of chicory heads. You can stuff them with cheese, sour cream, yoghurt, etc. (do not be afraid to add garlic too) and bake. Whole heads can be steamed and then baked on their own or wrapped in ham and be served with cheese or béchamel sauce. It makes a good side dish and it helps to digest meals with high fat content. A typical, slightly bitter taste of chicory may be unusual for someone, but if you learn how to cook it, it will surely become your favourite healthy delicacy.

Butter chicory

It is a simple recipe that best stands out for its delicious taste with hints of bitterness. Cut the chicory heads in half and put them in a pot in one layer. Add some water. Next, add slices of butter. Cover the pot with a lid and let it stew until soft. Flavour with few drops of lemon, add a pinch of nutmeg.

Baked chicory heads with ham

Cut the heads in half, sprinkle with olive oil, season with pepper and wrap them in ham or bacon. Put them in a preheated oven and bake for 10-15 minutes. Baking process sweetens the chicory heads and reduces its natural bitterness. Bake only for shorter time, so the leaves keep nice and crispy. Prior to processing, it is always necessary to remove the stalk and but also the harder heart of the head, which is particularly bitter.

Belgian salad

Ingredients: 4 chicory heads, 2 tablespoons of boiled raisins, 1 smaller red onion, 2 tablespoons of peeled almonds, 2 oranges, 4 tablespoons of mayonnaise or white yoghurt, 2 tablespoons of sour cream, 2 tablespoons of chervil or parsley, salt, ground white pepper

Procedure: Clean the heads and slice, mix it with sliced onion, add diced oranges and chopped almonds. Mix it with mayonnaise or yoghurt and cream, season with pepper, salt and finally add chopped chervil. Let it cool down and serve.

Baked chicory simple and easy

Number of portions: 2, time of preparation: 30 minutes

Ingredients: 2 chicory heads, salt, white pepper, 8 slices of bacon or ham, olive oil, 6 tablespoons of whipping cream

Procedure: cut out the hearts of the chicory, they are the bitterest part of chicory. Season it with salt and pepper. Place 2 slices of bacon on an aluminium foil (20 x 30 cm), put the chicory heads on the bacon and finally another two slices of bacon or ham on top. Turn the edges of the foil upwards, pour in olive oil and add 3 tablespoons of whipping cream. Bake at 200°C for 30 minutes.

7 References

A. Hofer, A. L., P. Lehner, P. Rust, M. Schätzler, V. Sgarbottolo, A. Wolf, A. Zilberszanc (2011) Leitlinie Schulbuffet BMGF.

AMA Marketing (2010) Saisonkalender. http://www.bgvoe.at/fileadmin/Media/Produktion/Vielfalt_der_Produkte/Saisonkalender.pdf. 15. 03. .

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

BMLFUW (2001) Biologische Landwirtschaft in Österreich. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (BMLFUW). Wien.

Bundesministerium für Gesundheit (2016) Die Ernährungspyramide im Detail - 7 Stufen zur Gesundheit. http://www.bmgf.gv.at/home/Gesundheit/Ernaehrung/Die_Ernaehrungspyramide_im_Detail_7_Stufen_zur_Gesundheit. 21.03.217.

D-A-CH (2003) Referenzwerte für die Nährstoffzufuhr. Vol. 3. Hrsg. v. Umschau/Braus. Bonn.

Daxbeck, H.; Brauneis, L.; Lixia, R.; Köck, B.; Ehrlinger, D. (2013) Erfassung der Speisepläne und Rohstoffverbräuche - Endbericht. Ressourcen Management Agentur (RMA). Initiative zur Erforschung einer umweltverträglichen nachhaltigen Ressourcenbewirtschaftung. Umsetzung der Nachhaltigkeit in Großküchen unter besonderer Berücksichtigung von regionalen, saisonalen, biologischen Lebensmitteln und frisch zubereiteten Speisen - Nachhaltiger Speiseplan. Projekt UMBESA. Wien.

Daxbeck, H.; De Neef, D.; Schindl, G. (2011) Möglichkeiten von Großküchen zur Reduktion ihrer CO₂-Emissionen (Maßnahmen, Rahmenbedingungen und Grenzen) - Sustainable Kitchen (Projekt SUKI). Wien.

Elmadfa, I.; Hasenegger, V.; Wagner, K.; Putz, P.; Weidl, N.-M.; Wottawa, D.; Kuen, T.; Seiringer, G.; Meyer, A. L.; Sturtzel, B.; Kiefer, I.; Zilberszac, A.; Sgarabottolo, V.; Meidlinger, B.; Rieder, A. (2012) Österreichischer Ernährungsbericht 2012. Bundesministerium für Gesundheit. Hrsg. v. Insitut für Ernährungswissenschaften der Universität Wien. Wien.

ÖGE, Ö. G. f. E. (2007) Nahrungsinhaltsstoffe Eiweiß.

Österreich, L. (2013) Der ökologische Fußabdruck Österreichs.

Österreichische Gesellschaft für Ernährung (2017) 10 Ernährungsregeln der ÖGE. <http://www.oege.at/index.php/bildung-information/empfehlungen>. 21.03.2017.