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## **The Use of Organic Foods, Regional, Seasonal and Fresh Food in Public Caterings**

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Additional information is available at the end of the chapter

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### **Abstract**

The chapter focuses on possibilities to improve the quality of meals in public, especially school catering facilities. It presents the options for diet modifications towards a sustainable use of organic foods, local and seasonal food by optimizing portions of meat and meals prepared of fresh ingredients. From an economic, environmental and nutritional point of view, evaluation and comparison of the original and optimized meals can contribute to a more efficient use of foods and motivate staff in public catering facilities to comprehensive food assessment.

An overall evaluation shows that more favourable nutritional parameters may be achieved by the optimization of meals. A greater use of local, seasonal and organic foods, a reduction in meat portions and lower level of processing make energy and greenhouse gas emission savings and it is possible to sustain the costs within standard. The purchase during a season and shortened distribution channels may compensate the higher price of organic foods. The trend of increased use of ready-to-cook foods does not usually lead to a higher nutritional and health quality, lesser burden on the environment and an economic effect. However, it may be assumed that the expansion of knowledge of catering managers of nutritional quality and environmental impacts, with better experience in optimizing meals and with the proper motivation, parameters of meals in public catering facilities may be combined and thus contribute to the sustainable management in food services.

**Keywords:** School meals, nutritional quality, environmental aspects, economics, optimization

## 1. Introduction

The task of school meals is to provide proper nutrition to students during their stay at school and, at the same time, form positive nutritional, hygiene and social habits of students [1]. Generally, school meals should be an example of good nutrition and should make children acquainted with new meals that children do not know from home and, at the same time, teach them the food and dining culture [2]. It also aims at a change of wrong habits that children bring from their families. This includes, for instance, the insufficient consumption of fruit and vegetables, legumes, fish, wrong amount of food, less soup, higher consumption of sweet dishes, dumplings and fatty dishes. Consolidating and acquiring hygiene, cultural and social habits, which include personal hygiene (especially hand washing), the cultural and hygienic rules of dining, a proper use of cutlery, table manners etc., is also a part of this education [3]. Easy accessibility, mostly at the place of school attendance, and subsidized meals, which become available for all social groups, may be included among the positives of school catering. Certainly, mass catering has some disadvantages. These include a limited selection of dishes, poor quality of service (in essence, it is a self-service), often poorer quality of food, smaller portions, eating in haste, also the environment is not usually very calm and the optimal time and duration of a meal are not respected [4]. Catering managers, chefs and service staff, as well as methodological workers and educators, who train personnel for school catering facilities, are in a position to meet the considerable demands made of them due to efforts to eliminate the drawbacks.

The menu is the result of efforts to comply with the set of school food standards and regulations and also an operating plan of the facility for a certain period (usually a month). Menus are drawn up by school catering managers in collaboration with the executive chef in order to suit not only the principles of a healthy diet but also technical possibilities and staff deployment of the facility as well. They should be varied, creative, modern and meet the nutritional recommendations for children [5].

The principle of full use of seasonal market opportunities is very important. An executive chef must be familiar with the offer of foods, especially fruit and vegetables, and their prices. It is also important to take into account the operating conditions of the facility, technical and mechanical equipment of the kitchen, serving system, the number of staff and their qualification, the supply situation when drawing up a menu. The alternation of different cooking techniques is essential as well. Besides meat meals, the meals that contain vegetable protein (soufflés, vegetable, legume and cereal meals), meals accompanied by cheese, cottage cheese, dairy products should be put on the menu. Each lunch should be complemented by a vegetable side dish or a salad (excluding sweet meals), fruit or raw vegetables. In case of a necessary change of the menu, the alternative meal should be similar in the energy and biological content to the originally planned meal [6].

Menus in school catering facilities should be nutritionally balanced, offering tasty and attractive meals to diners not too financially demanding and, last but not least, manageable. The main tasks for the kitchen staff are:

- adhere the energy and biological values of the diet (reducing fat intake or sugar used),
- respect the age categories of children boarding in the facility (nursery, primary, secondary schools)
- take into account the season and the use of seasonal foods,
- provide the diversity of meals in relation to consistency, colour, taste and technological treatment,
- guarantee the greatest possible variety of foods from different groups in order to provide adequate intake of nutrients, vitamins and minerals through: including all kinds of meat – beef, low-fat pork, poultry and especially fish, changing side dishes and different kinds of vegetables regularly and avoiding using the same foods, that undertaken different technological treatment, in one day [7].

## 2. Literature review

### 2.1. The nutritional quality of meals

The nutritional quality reflects a content of substances, which has positive effects on human nutrition, their internal composition and proportions. The nutritional role of school lunches involves delivery of about 35% of the recommended daily energy intake [2]. In modern history, there have been changes in eating habits and physical activity. More meat, meat products and sweets are eaten, a lot of sweet, chemically flavoured drinks are drunk, a sedentary lifestyle prevails. Naturally, this lifestyle leads to overweight and obesity. Many school cafeterias and vending machines placed in the corridors of schools, whose range of goods resemble classic fast food restaurants, which children prefer to healthier alternatives offered in school catering facilities, contribute to the unhealthy trend. The main deficiency is the internal structure of meals, often dominated by animal products and an associated excess of animal fat, cholesterol. Another problem is the inadequate intake of certain vitamins and minerals.

The nutritional intervention aimed at the change of technological methods of food preparation, that would still respect traditional Czech cuisine at the same time, appears to be a quick way to make school meals healthier. The intervention program has been running since 1993 and its principles read:

- Meat – use rather less often, but of a high quality and fat-free. Do not use trimmed parts for further processing in school meals, use plant foods (legumes, oat flakes) to get quantity and energy value.
- Milk and dairy products – include as often as possible, choose low-fat products, e.g. in the form of drinks, sprinkles and baking with cheese, salads with yogurt. Provide dairy snacks.
- Vegetables and fruits – with each meal. Prefer raw vegetables (salads, side dishes), favour frozen vegetables to pickles during off-season

- Legumes – generally increase their share in the diet. Offer more frequently and in smaller portions (e.g. adding to soups, minced meat, soufflés and salads).
- Desserts – prefer healthier alternatives based on the processing of dairy products (cottage cheese, custard), use oat flakes, whole meal flour, reduce sugar and fat.
- Fat – keep animal fat to a minimum, use vegetable oils (sunflower), preferably without heat treatment (salads), reduce the use of roux [8].
- The nutritional quality of school meals is based on the recommended nutrient intakes provided in 1989. These focus on the issue of energy demands, the major nutrients and other essential factors for the human body. They are based on the physiological needs of a human body and are calculated for different categories according to age, physical activity and physiological condition [9].

Recommended nutrient intakes are guidelines for creating so-called consumer's basket. It describes the average food consumption calculated from the basic range of foods in the form of "as purchased" (i.e. it takes into account losses, e.g. when trimming vegetables, fruits, etc.). Food consumption is expressed as a percentage and should correspond to the monthly average with allowance of  $\pm 25\%$  [10]. The consumption of meat, fish, milk, dairy products, fruit, vegetables, potatoes, legumes, sugar and fat may be monitored by means of the consumer basket [11]. There is a rule that the average intake of vegetables, fruit, fish and legumes represents the lower limit, which may be exceeded, and the intake of free fat and sugar represents the upper limit, that is desirable to be decreased [10]. Czech School Inspectorate and Regional Hygiene Station monitor if the consumer basket is respected [3]. Recommended nutrient intakes are updated at regular time intervals. Currently, the Czech Republic has adopted a new list of recommended nutrient intakes from the German-speaking Central European countries – the so-called Reference values for nutrient intake (DACH - Deutschland, Austria, Suisse). These should be taken into account when developing new nutrition standards for school meals. However, setting up new consumer's baskets may not be as fast as it might occur. The reasons are economical, and perhaps political and social as well, also the current eating habits of our population may influence that. The recommended intake of protein is rapidly reduced (from current 2.4 g/kg of body weight to 0.9 g/kg of body weight) according to the DACH; therefore, it may cause some dissatisfaction of the part of diners within our eating habits [9].

The tool to combine different food commodities in order to meet the consumer's baskets is called "the recommended dietary variety". It is not officially set; however, it specifies the number of times in a month a certain type of food should be included on a menu: milk, legumes, fish, etc. [12]. Therefore, not only the fact that the consumer's basket is filled is observed but also the way it is filled in: e.g. preference of lean meat to fatty meat or smoked-meat products, raw or cooked vegetables to pickled, cutting down on sugary and fried meals (max. two per month), the inclusion of sufficient quantity of fish, legumes, substituting conventional side dishes with, for example, millet, buckwheat, couscous, oat flakes, etc., providing fruit and vegetables on a daily basis. The requirement for using different cooking techniques comes from the recommended dietary variety [6]. The different types of dishes should be included

usually only once a month. Exceptions are seasonal foods that may be used more frequently. In addition to classic recipes, school catering facilities may use their own or regional recipes but they must comply with all the principles mentioned above [13].

When drawing up the menu, we are limited by the consumer basket and financial limit, and the recommended dietary variety is used as a guideline. Menu is usually drawn up by the catering manager in cooperation with the executive chef for a few weeks in advance, usually for a month, and later it is specified. It must conform not only to the principles of healthy nutrition but also financial, technical and personnel capabilities of the catering facility [5]. If, for any reason, a change is needed, an alternative dish should resemble the originally planned dish in terms of energetical, as well as biological aspects [6].

## 2.2. Ready-to-cook foods

There have been growing requirements in the area of food preparation, hygiene and final treatment and dining, that modern and classic gastronomy has to meet. There are four basic guidelines to prepare and distribute meals in a public catering facility:

1. Joint catering facility – dishes are prepared in a local kitchen of fresh ingredients, as well as ready-to-cook foods. Capital and operating costs are higher (staff, energy) and facility management must be professionally qualified. The more school uses fresh ingredients, the more hygiene must be respected. Demands on input check of goods, storage and preparation and needs for workspace increase. Preparing meals in their own kitchens is mainly a matter of boarding schools.
2. Cook & Chill - dishes are refrigerated and supplied by a professional food provider or from a central catering facility. Dishes are cooled to 3°C immediately after cooking, may be portioned and then stored in cool conditions (0–3°C) by an external supplier. The staff of the school catering facility provides only heating (which must not exceed 30 min) and distribution. There are strict hygiene requirements for the preparation and storage if the dishes are produced by a central catering facility. It must be cooled within 90 min and should not be stored for more than 3–5 days until being re-heated. Cooled products are used mainly at secondary schools.
3. Frozen system – a professional provider provides frozen dishes as individual portions or the whole menu. They are frozen to –18°C after cooking and the temperature is maintained during the transport. The cooling chain from the producer to the final treatment before being served must not be interrupted. Workers of a school catering facility provide heating; meals may be portioned for serving where necessary. After that meals must be continuously served. The advantage of this system is that the necessary investments to draw up a menu are low, as well as low demands on the qualification of staff. The system is mainly used at secondary schools.
4. Hot meals – dishes are provided already completely ready and warm by an external supplier – a catering company that provides distribution in the facility as well. Each serving of dish is put into a thermo box or a food container (larger amount) immediately after cooking. Thermo boxes retain the internal temperature of 70°C from the filling to the



distribution of meals. The temperature when served is then 65°C. For cold foods, the temperature should be in the range of 8–10°C. The system of hot meals (60%) dominates, followed by the joint catering facility (about 20%) at the full-time German schools.

In the Czech Republic, the system of the joint catering facilities still clearly dominates. In Europe and around the world, there are significant differences in terms of the range of school meals, support and forms of preparation and distribution of meals. The differences result from the traditions, economic strength and social policies of individual countries. Globalization trends have brought an increase in the use of ready-to-cook foods, convenience foods and ready-to-eat meals, which always have a higher degree of processing than the base material, in a number of countries and in the Czech Republic as well. These dishes or foods, convenient for immediate consumption, are in most cases frozen, canned or dehydrated and therefore they must be somehow processed before consumption. 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. Some facilities are unreasonably mistrustful of these foods and products. Partially, they may be put off a higher price of the ready-to-cook foods, even though the difference is relative in many cases. 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. Chlumská [14] points out a finding that the use of ready-to-cook foods or ready-to-eat meals is one of the most common complaints against the school board from conscious parents. According to her, school 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 school catering facilities must provide the preparation of meals with fewer employees than before.

### **2.3. Economic aspects of school meals**

Depending on how the school board is managed and how the state and municipalities participate, European countries may be divided approximately into three groups: the first one includes the states where school meals are provided to children for free (Finland and Sweden), the second one includes the states where school meals are organized centrally or regionally in some way and the costs are partly covered by the state or municipalities (France, Belgium), and finally in the third group there are states where school meals are not uniformly organized or not implemented in the way that we know in the Czech Republic [15].

School meals are not based on profit in most countries, thus differ from conventional manufacturing company in a market economy. Therefore, costs are one of the most important criteria and affect pricing greatly. The cost of providing food service may be, in terms of the types of costs, divided into the costs of foods, personnel costs – salaries, training and social statutory costs and operating costs – energy, other materials, services, depreciation, etc. [16].

In countries that support school meals, diners only cover a portion of the actual price of the meals. School facilities in the Czech Republic must follow nutritional standards, the average consumption of foods and financial specifications for the purchase of foods for each age group. The part of the price of a meal paid by parents (i.e. the price of foods) may be set differently

based on an agreement with parents at private schools. At schools that are run by municipalities, county or state, the price of foods is limited by so-called financial specifications, which are specified in the school food regulation [14]. The set financial specification must amount to the sum that enables a school catering facility to meet the requirements for the consumer's basket. It also specifies the financial spread – an amount of money that school facilities may use to make a lunch – i.e. soup, main course, salad, dessert and beverage [15]. At present, the cost for foods to make a lunch for one diner ranges from 14 to 37 CZK, which corresponds to 0.5 – 1.2 Euro, in the Czech Republic.

Personnel costs include wages and salaries of the employees of the facility, their further education and working instruments and are funded from the state budget.

Energy consumption, costs of services, costs of other materials and depreciation of tangible assets make up a significant portion of operating costs. These costs are covered by the institutor. Although the amount of personnel and other operating costs are based on a calculation, it is not a normative expense but a cost that may be influenced by an effective and efficient use of available resources [16].

From an economic point of view, the quality of school meals may be influenced in a few ways only, virtually through bargains, donations or grants as extra sources of money [1]. The more diners of a facility, the easier it may be to achieve beneficial agreements or quantity discounts for ordered foods. Purchase of seasonal foods, especially fruits and vegetables, is another way to influence the price of foods and respect the nutritional standards at the same time. Their price change regularly according to a season and thus to their availability. The money saved on purchase may be used to enrich and improve (pot. make cheaper) the diet [17].

## **2.4. Environmental aspects of school meals**

Our eating habits are created especially in the context of public catering. High-quality and healthy foods in catering facilities show not only the value chain of diners but also an environmental responsibility. A sustainable economic system must support especially environmental-friendly regional production and consumption of fresh natural foods.

Food production uses an increasing amount of energy with a corresponding negative impact on the environment. An important factor is the origin of foods, resp. transport distance from a producer to a consumer. A reduction in the proportion of meat on the menus and consumption of regional vegetable products allows caterers to reduce the impact on the environment. The negative impacts of the use of ready-to-cook foods or ready-to-eat meals, processed products and products stored for a long time outweigh their benefits due to the heating and cooling of foods, special packaging and transport costs [18].

Research shows that the use of local, seasonal and organic foods and the preparation of fresh meals of them may significantly reduce the proportion of greenhouse gas emissions (GHG) in catering facilities.

An indirect energy consumption, i.e. energy that comes from foods, their production, processing and trade, constitutes up to 63% of total GHG emissions in catering facilities. The largest



amount of GHG comes from meat in catering facilities. The use of meat and meat products in Austrian catering facilities makes up 14% of the total amount of the foods, therefore 63% share of GHG emissions in the indirect energy consumption is very high.

The implementation of sustainable diets and thus optimized meat portions and increases of the share of vegetarian dishes have also saving potentials within GHG emissions. Vegetarian dishes produce up to 99% less GHG emissions in comparison with meat dishes. Also the use of regional and seasonal foods and organic foods makes emissions savings. Local foods have the potential to save up to 50%. Using foods from an organic production can reach up to 40% savings. A level of food processing plays an important role in addition to the criteria of regionality, seasonality and organic farming with regard to the GHG emission topics. Each step represents a further production of GHG. One kilogram of fresh conventional potatoes produces 0.31 kg CO<sub>2</sub>eq, but one kilogram of potato chips produces 4.36 kg of CO<sub>2</sub>. The trend of an increased use of ready-to-cook foods in catering facilities has primarily economic reasons (e.g. less staff needed). However, this is often compensated by a greater need for goods. Constant heating and cooling, special packaging and food miles (mileage when transporting food to the kitchen) and often questionable additives as well have negative effects on the environment [18].

## 2.5. Local foods

School catering facilities are one of the major purchasers of local products [19]. The reason for the preference of local foods is that these foods are much fresher due to short distribution routes than the foods that take long-distance routes. Therefore, fresher local foods generally tend to taste better and more valuable nutritional parameters. The fact that the closer the food is to the consumer, the lesser burden on the environment during their transport is also important. Reduction in the proportion of meat on the menus and consumption of local vegetable products allow caterers to significantly reduce environmental impacts, as well as take into account the financial aspect (Eagri-Regionální potravina, 2009–2013). An extension of the path that an agricultural product takes from the producer to the consumer may lead to a loss of authenticity. Consumers and also control bodies may supervise the foods produced in local conditions better and thus there is an indirect pressure on producers to maintain the quality of their products at a high level. Another reason for the preference of local foods is that these foods are much fresher due to short distribution routes than the foods that take long-distance routes. Therefore, fresher local foods generally tend to taste better and more valuable nutritional parameters. The fact that the closer the food is to the consumer, the lesser burden on the environment during their transport is also important [20]. A significant aspect to prioritize local foods is that it promotes employment in the region. Then prosperous farmers, processors and vendors represent a guarantee of maintaining or even expanding the number of jobs.

## 2.6. Organic foods

Reasons for the introduction of organic foods in schools are mainly attempts to encourage children to eat healthier and better diet. Equally important is the positive impact on dietary

habits and a healthy lifestyle. Organic foods are not used in school catering facilities in the Czech Republic very frequently. Currently, it is estimated that approximately 150–300 kindergartens and schools use organic foods in significant quantities, which represents about 1.5–3% of the total 10,500 schools (nursery, primary and secondary schools). The schools that have participated in one of the pilot projects for the introduction of organic foods in schools or alternative schools (especially Waldorf kindergartens and schools), where the use of organic food is a part of their philosophy, have been ahead [14]. The reason for the low interest in organic foods is their high price. Currently, no financial subsidies for their purchase are provided [21]. However, the price of school meals in the school catering facilities, which have introduced organic foods, has increased only very moderately by about 10%. Organic cereal products, legumes and dairy products are used most often. Conversely, baked goods, meat and meat products and other products are used in the smallest amounts in schools. Many countries have supported the use of organic foods in schools and other public catering facilities in various ways including legislative measures, subsidies and other incentives. For example, the Italian government has adopted a law requiring the use of organic products in school catering facilities. Therefore, the Italian legal system “creates direct and explicit relationship between local organic products and catering services.” This national law has created an environment that encourages many municipal authorities to start purchasing organic products. The support of catering facilities, while optimizing diets that account of local, seasonal, fresh and organic foods, will enhance regional economic structures, potential energy savings in catering facilities and offer healthier boarding

### 3. Objective of the study

The main objective of the UMBESA project is to support catering facilities when introducing sustainable diets. This can be achieved by increased use of organic, local, seasonal and fresh foods and reducing meat portions. These steps should support not only the environmental protection but also physiological and optimal nutrition. The project consisted of five main parts. The first part focused on the current consumption of foods and diet composition in school catering facilities, these documents should establish a basis for change. The second part dealt with the evaluation of similar projects, which aimed to introduce the above mentioned criteria towards sustainable diets and the objective was to identify the strengths and weaknesses of these projects. The third part aimed to identify the current networks of suppliers of school catering facilities and stakeholders who are involved in the field of public catering, at the same time, new stakeholders were identified and a new network, meeting the sustainability criteria (e.g. regional and organic suppliers), was proposed. The fourth part of the project had as its object assessment of opinions on the current state of catering services and the state after introducing some changes (see the fifth part of the project), a survey had been carried out. The fifth part of the project dealt with the actual implementation of changes and it is discussed in this chapter as the main output of the project.

As described before, the aim of the experiments within the project is an active support of the introduction of sustainable diet in catering facilities. In selected school catering facilities,

certain recipes were chosen (hereinafter original dishes) and modified (hereinafter optimized dishes) according to the criteria of sustainability (an introduction of ecological, local and fresh foods and a reduction in meat portions). These two dishes were evaluated and compared within the selected criteria. The aim of this part was to assess whether a change of diet contributes to sustainability and also answer the following questions:

- What measures can be realized in catering facilities to optimize towards sustainability?
- What economic, ecological and nutritional–physiological positives and negatives arise in catering facilities using sustainable foods?

## 4. Methodology

Methodical procedure briefly describes the methodology of the individual parts of the project, with the greatest focus on the methodology of experimental cooking and their evaluation.

### 4.1. Analysis of foods and menus

Lists had been drawn for each school, which grouped foods into appropriate groups using the annual statement of the shopping list of foods for the reference year of 2011, which included the price of foods, as well as their suppliers. At the same time, the lists had been drawn up and assessed according to their origin – regionality of foods, their seasonality, processing – frozen, fresh and ready-to-cook foods and also from the perspective of organic production. Furthermore, the lists of dishes according to the proportion of main ingredients – meat, vegetarian and sweet, as well as proportions of organic ingredients, ready-to-cook foods and local ingredients, had been drawn up according to the menu.

### 4.2. Search of similar projects

Two Austrian, two Czech and two international projects were selected to map out the initial conditions, implementation and factors for success and failure. The authorized representatives of these projects were interviewed; the interviews were subsequently evaluated and reduced in accordance with the summarizing criteria. The analysis according to Kotter's 8-Step Change Model "Leading Change" [22] was performed. The supporting factors, as well as inhibiting factors of success, were found.

### 4.3. Networking

In the first instance, the current network of suppliers in various catering facilities was identified as a part of search of the ingredient consumption, see Section 4.1. As a second step, a potential supplier network was found and an extensive list of suppliers in various regions and districts was drawn up. At the same time, the selected suppliers were questioned regarding their attitudes to the issue of regionality and seasonality of offered products while creating the potential network. The last activity within networking was to create groupings of regional

participants and set up the Steering Committee of the project that discussed the progress of the project and inclusion of dissemination of the results of individual project activities at regular meetings.

#### **4.4. Survey among diners**

The survey was carried out in the form of two questionnaires, one at the beginning and another one at the end of the project. The questionnaire included topics such as satisfaction with the catering facility, with its offer, attitude of staff, questions about eating habits of the respondents and, in conclusion, inquiries concerning the project itself. Descriptive statistics, factor and group analysis had been used to evaluate the results and a profile of borders that may be used to propose specific changes to catering facilities was set.

#### **4.5. Experimental cooking**

In the fifth part of the project, practical experiments in the context of experimental cooking were carried out, where an original and optimized dish was cooked and mutually compared. The recipes for the original and optimized dishes were presented and recorded by the chosen catering facilities. Relevant data including the preparation of foods, recipes, cooking process (time, equipment used, number of employees, water consumption) were collected during each cooking. The dishes were evaluated from several different vantage points.

##### *4.5.1. Environmental assessments*

Ecological assessment was performed by analyzing CO<sub>2</sub> emissions. CO<sub>2</sub> emissions of foods that had been identified within the SUKI project [23] were used as baseline data. The emission burden data of foods that had not been investigated within the SUKI project were complemented by the literature and the GEMIS database search. CO<sub>2</sub> emissions were determined within the ingredients that are most important in terms of quantity. It was necessary to determine CO<sub>2</sub> emissions by at least 50% of the ingredients for one dish.

##### *4.5.2. Economic assessments*

Economic assessment was performed by analyzing costs. The following costs were included into the analysis:

- Cost of foods: the current prices of foods including VAT were taken into account.
- Personnel costs: the period of active work was multiplied by the average hourly wage and the number of persons.
- Operating costs: i.e. costs of water and energy.

##### *4.5.3. Nutritional–physiological assessment*

The calculation of nutrients was made with the help of a nutrition consultant. The production method (biological, conventional) was not taken into account within the nutritional–physio-

logical assessment. Original and optimized dishes were compared with respect to the amount of calories, protein, fat, carbohydrates and fibre.

#### 4.5.4. *Organic – Regional – Seasonal*

The proportions of biological, local and seasonal ingredients were determined within the original and optimized dishes.

#### 4.5.5. *Qualitative assessment*

A sensory evaluation test was used. The test includes food tasting carried out either by the staff themselves or by diners. The results were discussed with the managers of the catering facilities.

## 5. Results

This part briefly describes the main results of each stage of the project with the greatest focus on the assessment of the experimental part of the project, i.e. experimental cooking.

### 5.1. Analysis of foods and diets

- The analysis of food consumption in Czech catering facilities showed that the most used group of foods is vegetables (including potatoes) at 34%. The other most commonly used group consists of the cereal products at 16%. They are followed by meat and meat products, as well as dairy products at 14%. The proportion of fruit is 11%. The last group at 12% includes other products.
- The proportion of fresh ingredients is on average 78%, 6% of frozen ingredients and 16% of ready-to-cook products.
- Currently, organic foods are not used in Czech catering facilities or they are used in quantities of less than 1%. That is due to a limited budget for foods and prohibitive costs of organic foods. This corresponds to the total organic food market situation in the Czech Republic, which has not been sufficiently developed yet, the share of organic production on arable land is still too small to successfully compete with conventional products in catering.
- The proportional share of seasonal fruit and vegetables varies from 30 to 90%. It reaches 47% on an average. Undoubtedly, the potato consumption is the biggest item accounting for about 60%. Another important item consists of onions, cabbage, carrots, tomatoes and cucumbers. From fruits, the most important are apples and plums of our domestic production. It is worth noting that the second most frequently used fruits are bananas, which do not meet the criteria of sustainability, both seasonal and local, and it would be good to substitute them with domestic fruit.
- The proportional share of local products varies from 17 to 86%. The average is 39%. The analysis shows that the catering facilities in bigger cities use less local products than the



catering facilities in smaller towns, logically, the reason for that is a larger food market and offer in bigger cities. From the local production, meat, dairy products, cereal products, fruit and vegetables prevail. Most ready-to-cook and frozen products have their origins outside the region.

- The analysis of main meals shows that 62% of the main meals are meat meals. Vegetarian meals make up 21%, fish meals 7% and sweet meals 9%.

## 5.2. Search of similar projects

Based on a detailed analysis of six successful projects (Kuratorium of Vienna Retirement homes, the project in the catering facility of the Lower Austrian provincial office, German restaurant ESPRIT, Italian project iPOPY and the Prober Union, two Czech projects "Organic food for schools" and "School full of health"), there are these fundamental factors of success:

- Use of external influences for change (e.g. childhood obesity).
- Explanation of the meaning of the project to stakeholders.
- Extensive information campaign.
- Setting realistic and achievable targets in the short term.
- Perseverance despite the initial failure.
- Setting goals for the future.
- Building long-term relationships between the entities.
- Adapting the project to existing habits and structure.
- Constant communication with stakeholders.
- Gradual implementation of measures, smooth implementation of the objectives.
- Gaining supporters during the project.
- Value conviction of a person in charge.

## 5.3. Networking

An important outcome of networking was a catalogue of ingredient suppliers in each region that was provided to catering facilities in order to enable them to obtain ingredients from local suppliers. The project had been also promoted and consulted within the Steering Committee composed of representatives of the government, experts and business leaders. The survey among suppliers resulted in the following main conclusions:

- It is very important to document the origin of products according to the surveyed suppliers. About 74% of interviewed producers expect that the regionality becomes a sales argument in the future. The amount depends primarily on the size and trade tendency of the producer. Smaller producers try to show the quality of their products using the regionality. The current problem is too many regional brands, which people may find confusing, as well as selling

products under a foreign brand and a lack of awareness about the quality of local foods. More than a half of respondents think that the regional origin does not affect the price.

- The seasonality issue concerns mainly fruit and vegetable producers. A large group of the interviewed producers rely on stable buyers who are familiar with seasons when different kinds of fruits and vegetables ripen; therefore, they do not need to be further informed. They do not intend to include the seasonality as the sales argument.
- Regarding the expansion of product diversity, 70% of interviewed producers draw up their offer not concerning reactions of consumers. If we evaluate the cooperation of the producers, we find out that most of them have both stable and vague relationships, as well as regionally focused relationships, because these groups complement each other and eventually intersect, for example, when a customer becomes a stable client.
- It is gratifying to note that most local producers have an increasing interest in their products and that the society slowly begins to realize the true quality and value of local products.

#### 5.4. Survey among diners

About 703 diners of participating Czech catering facilities participated in the first wave of the survey and 713 diners in the second wave. Overall, it may be summarized that their satisfaction with the catering facility, its atmosphere and quality of food had increased.

#### 5.5. Experimental cooking

At least three experimental cooking of original and optimized meals, which were compared using several criteria, took place in each partner catering facility. As an example, the experimental cooking of tomato sauce with beef is being described here.

The original meal consisted of classic tomato sauce with beef and bread dumplings. The optimized meal included a reduced portion of meat and turkey meat substituted for beef, couscous for bread dumplings and some of the ingredients in an optimized meal came from organic production.

##### 5.5.1. *Economic assessment*

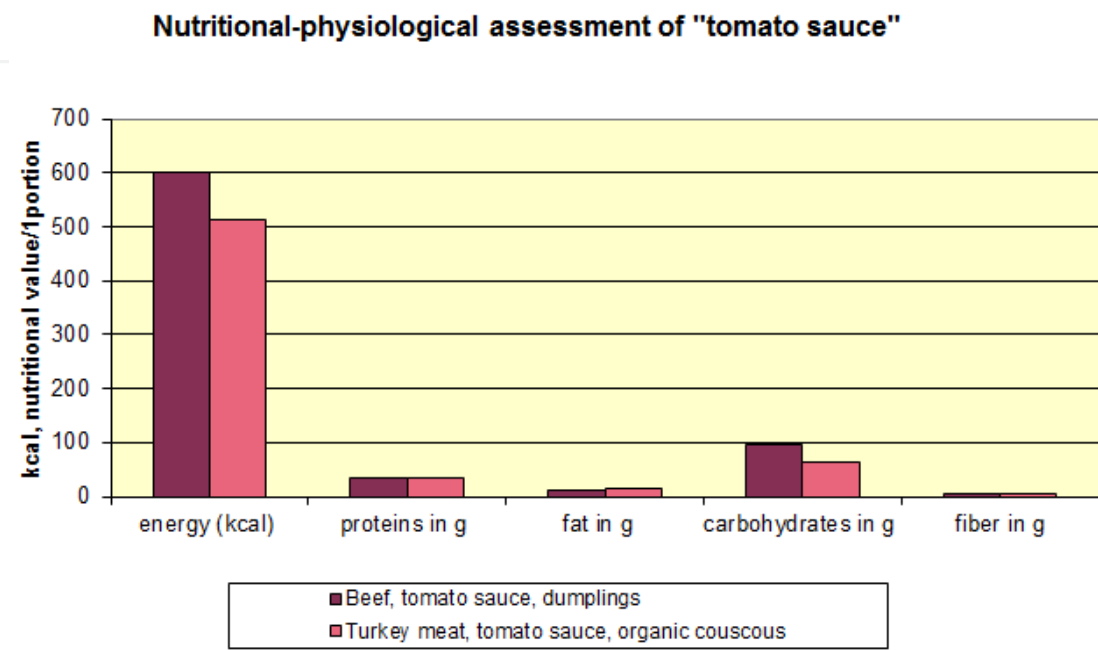
The analysis shows that the costs of optimized meal are by 17% higher. The price per serving is 0.2 EUR higher. More expensive are especially the costs of ingredients and personnel costs, it is due to a greater need for active involvement of staff. Conversely, operating costs are lower because simpler technological demands for preparation dominate.

##### 5.5.2. *Environmental assessment*

Ecological assessment shows about 69% smaller environmental burden when cooked optimized meals. The ingredients for the original and optimized meal in the total proportion of 99% were included into the assessment.

### 5.5.3. Nutritional–physiological assessment

One portion of the original dish contains 601 calories, 33 grams of protein, 11 grams of fat, 96 grams of carbohydrates and 4 grams of fibre. A portion of the optimized dish contains 513 calories, 35 grams of protein, 14 grams of fat, 63 grams of carbohydrates and 5 grams of fibre. The nutritional values were taken from nutritional tables. The percentage difference of indicators is shown in Figure 1.



**Figure 1.** Nutritional-physiological assessment of tomato sauce

### 5.5.4. Assessment according to the production method (organic, conventional)

100% of ingredients for the original dish were produced in conventional agriculture, whereas the proportional share of organic ingredients in the optimized meal is 23%.

### 5.5.5. Assessment according to the processing method (fresh, frozen or ready-to-cook)

Both the original and optimized dishes do not contain frozen ingredients and consist of fresh and ready-to-cook ingredients only. The proportional share of fresh ingredients is 44% in the original dish and 86% in the optimized dish.

### 5.5.6. Assessment of seasonality

Seasonality is assessed for vegetables and fruit, the original dish contains onion and the optimized dish contains onion and tomatoes. The original dish may be described as seasonal in the months of May, June, July, August and September. The optimized dish may be described as seasonal in the months of June, July, August, September and October.

5.5.7. Assessment of regionality

To assess the regionality, the origin of main ingredients of a meal was determined as a percentage, i.e. that the percentage of these ingredients constituted at least 80% of the meal. Regionality of ingredients may vary during the year, depending mainly on a purchase of seasonal ingredients. The original dish contains almost no seasonal products and the suppliers remain the same throughout the year and the proportional share of local ingredients is 35%. The optimized dish contains 37% of local ingredients in the months from June to September, whereas in other months it is 0%.

5.5.8. Qualitative assessment

Ten employees of catering facility answered in the carried survey that the original dish leads in the overall ranking, but also scores in the individual categories of taste, smell and appearance better than the ready-to-eat meal. The results are shown in Figure 2.

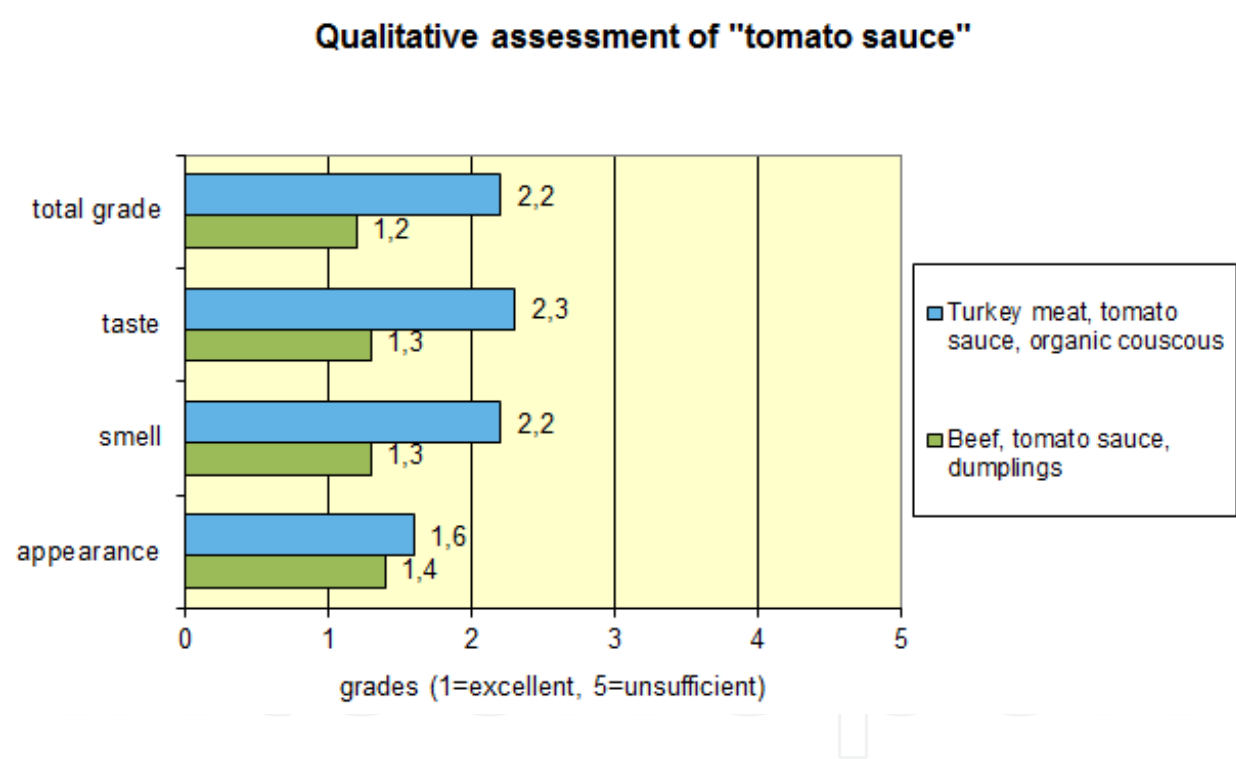


Figure 2. Qualitative assessment of tomato sauce

5.5.9. Results of other selected dishes

Table 1 shows the results of other selected experimental cooking. The results in each column are always related to the optimized meal. The costs column shows the difference between costs of the optimized meals per serving, the CO<sup>2</sup>eq column evaluates the environmental burden, i.e. the difference in the amount of produced greenhouse gases and the share-of-organic-ingredients column and the share-of-fresh-ingredients column display the difference in

proportion of organic and fresh ingredients. For the sake of clarity, the aspects identifying areas of improvement are marked in green, aspects that show deterioration are marked in red and aspects with no indication of a change are yellow.

Original meal	Optimized meal	Costs	CO <sub>2</sub> eq	BIO-share	Share of fresh foods
Risotto with vegetables and pork	Couscous risotto with vegetables and chicken	+ 24%	+ 2%	+ 31%	−2%
Pork goulash with dumplings	Bean goulash with bread rolls	−3%	−41%	-	−66%
Fillet with potatoes	Carp with potatoes	+ 45%	−21%	+ 13%	+ 15%
Meat rolls with mashed potatoes	Meat rolls with spinach and tricolour rice	−7%	−35%	-	−13%
Meatball with mashed potatoes	Burger with broccoli and cheese and mashed potatoes	+ 24%	+ 47%	-	+ 2%
Stuffed cabbage leaf, potatoes	Cabbage leaves stuffed with buckwheat, potatoes	−7%	−18%	-	+ 180%
Fried meatballs	Buckwheat burgers	+ 16%	−65%	-	−26%
Bread pudding with cream cheese	Bulgur with fruit and raisins	+ 12%	−74%	-	−51 %

**Table 1.** Results of experimental cooking

#### 5.5.10. Discussion on meal optimization

There were a total of 32 experimental meal preparations, whose aim was to compare the original and optimized meals in several respects, had been performed. These general conclusions result from the assessment of each meals:

- Economic perspective: It always depends to what extent the original meal was modified, e.g. costs may be reduced when meat portion sizes reduced significantly, on the contrary, the increase of costs may be connected with the use of organic foods and some fresh and local foods (e.g. using fresh carp instead of frozen cod), the highest price increase was in our case by about 45%, the highest price reduction was by about 78%, the optimized meals are on average by 2% more expensive. Some conducted studies (e.g. results of the project “Organic food for schools”) show that consumers have an interest to pay more for quality.
- Environmental perspective: Most of modified meals result in decreased production of greenhouse gases and thus a positive environmental effect. The most significant reduction was by 88%, the greatest increase was by about 345%; however, this figure is completely beyond the average increase in emissions, which makes up approximately 20%. Putting this excessive result aside, emissions of the optimized meals decreased by 74% on an average.



- The proportion of organic ingredients: Regarding the share of organic foods in recipes, only a small proportion of experimental cooking included such foods. In particular, dry foods, alternative foods such as bulgur, then vegetables and in one case meat were used. However, the inclusion of organic foods, particularly meat, meant an increase in the price of meal. This fact is due to the current state of the organic food market, where their prices are still significantly higher than the prices of their conventional analogies.
- The proportion of fresh ingredients: The proportion of fresh foods had increased significantly at the expense of the ready-to-cook foods. The average increase reached 90%.

## 6. Conclusion

The diet structure of monitored school catering facilities shows that the normative indicator of the nutritional quality of food (consumer basket) is respected. Traditional meat dishes (62%) prevail, the trend of vegetarian diet is slow, but positive. Seemingly satisfactory representation of vegetables in a diet is given by traditionally high consumption of potatoes. Organic foods are almost absent in Czech school catering facilities. The reason is high price and low availability. Great variability in the consumption of local foods (17–86%) and seasonal foods (30–90%) indicates significant reserves for suppliers and catering facilities. Larger facilities tend to use ready-to-cook foods and ready-to-eat meals more. Their origin is mainly supraregional. Greater use of local, organic, seasonal and fresh foods is possible, thanks to the relationship between producers and food distributors in the region. Optimizing rarely improve all the required parameters, particularly difficult is to coordinate economic aspects with an ecological criterion, as well as use of fresh, local and organic foods. However, in many cases, improvements in the above mentioned parameters did not mean a noticeable increase in prices. Motivation of staff and consumers towards sustainable diet is a long process that requires continuous awareness of both parties. School meal plays an irreplaceable role in education in a healthy lifestyle.

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