

# Product Development on Goulash Sided by Parsley-Potatoes and Almond-Broccoli

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## Abstract

The team consisting of Mohammad Habibur Rahman, Nasim Marzban, Saiful Hasan, Caroline Nandwa, and Theresa Schmidl developed a traditional German Goulash half pork and half beef sided by parsley-potatoes and almond-broccoli. In the first stage of the project, product ideas were identified and product concept was developed. In three laboratory sessions, a prototype for the Goulash was created focusing on the needs of German seniors, >80 years, showing an early onset of dementia. Based on this prototype, the report was written considering important aspects to launch a product in a catering service in future: Product characteristics, marketing design specifications, product design specifications, quality and regulatory aspects. For this module, the project ended in the phase of the prototype.

The aim to provide a lunch for German seniors could be fulfilled as a successful prototype was developed. It is expected to be accepted by the German seniors as it reflects German traditions and seniors' childhood memories.

**Keywords:** Goulash; Product development; German seniors; Innovation; Healthy and nutritious

## Introduction

In this paper, a traditional German Goulash-half pork and half beef-sided by parsley potatoes and almond-broccoli is being developed in teamwork by Mohammad Habibur Rahman, Nasim Marzban, Saiful Hasan, Caroline Nandwa and Theresa Schmidl. The product's marketing name is: "Goulash sided by parsley-potatoes and almond-broccoli". The aim of the product is to fulfil the needs and demands of German seniors, >80 yrs., showing an early onset of dementia.

## Product Concept

In the following chapter, the product concept to the dish "Goulash sided by parsley-potatoes and almond-broccoli" is presented to the reader. The concept deals with the ingredients, the processing and serving recommendations, the nutritional aspects, the sensory and physical attributes, as well as the target group and the packaging, delivery and marketing.

## Ingredients, processing and serving recommendation

The aim of group E is to produce a tasty, healthy and fresh goulash sided by parsley-potatoes and almond-broccoli. Therefore, the following ingredients are needed: Lean pork and beef, onions, tomato paste, native sunflower seed oil, and spices (red pepper spice, chili, garlic powder, pepper and salt), potatoes, parsley, broccoli and almonds (Appendix 1).

For the preparation, the group needs to cut the meat into small pieces cutting off all possible fat and filaments. As well, the onions and the parsley need to be chopped. The lentils, set aside for swelling on the previous day, are heated and mashed. The potatoes are peeled and boiled in a microwave-stable Tupperware. For the Goulash: The meat is roasted in native sunflower seed oil using a pressure cooker. As soon as the meat is well done, the onions are roasted as well. Then the meat is put back into the cooker and the tomato paste as well as some water is added. The pressure cooker is now used for approx. 20-25 min. to reach the ideal tenderness of the meat before spicing the Goulash with the above-mentioned spices. For the side-dishes: The cooked potatoes are cut into adequate-sized squares and mixed with chopped parsley.

The cleaned and cooked broccoli is refined using thin slices of roasted almonds (according to an old family recipe).

The food is served in a metal plate with three sections—a bigger one for the Goulash and two smaller ones for the side-dishes. This allows the seniors to choose how to eat the Goulash, it keeps the heat easily and it is fast and hygienic to clean.

The big advantage of Goulash is that the consistence of the meat sauce is not tremendously altered when the dish is sitting aside waiting until lunch time. The potatoes and the broccoli can be served with adequate properties as well. The dish should be served warm to hot. It can be reheated in a microwave or oven, if the senior feels the heat not to be sufficient. The Goulash can be stored in the fridge for one to two days from the delivery day on.

## Nutritional aspects

The dish will contain between 400 kcal-600 kcal which is appropriate for a senior's main meal. It will also provide the seniors with many added nutritional values. As meat is one of the main ingredients, it provides a high content of protein with the full count of amino acids. Generally red meat is an important source of minerals, including iron, phosphorus, zinc, copper and vitamins such as vitamin A and B. Due to the high content of saturated fat and cholesterol in red meat, less fatty cuts are preferred for the dish from a nutritional point of view. Pork is a good source of thiamin converting carbohydrate into energy in the body. It is also a good source of zinc. Potatoes are a good source of energy, vitamin B<sub>6</sub>, vitamin C, and potassium. Almonds' calcium content is higher than the one of any other nut and they are

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an excellent source of iron, riboflavin, and vitamin E. Adding herbs such as parsley to the food is a good replacement for fat and salt and it provides a healthier diet. Broccoli is high in vitamin A (beta-carotene) and C. Additionally; it has anti-cancer properties due to various phytochemicals. Also onions contain phytochemicals with antioxidant capacity. It is recommended to serve a fruit yoghurt or quark dessert to the Goulash to provide the important calcium, as well as vitamin A, B, and D. It will also increase the number of the bacterial beneficial flora in the intestine. As the sense of taste declines when aging, spices will improve the appetite, though not adding much nutritional value [1].

### Sensory and physical attributes

Malnutrition in geriatrics is mostly attributed to the increased need of energy and the inadequate food intake, and often due to loss of appetite and alteration of taste and smell perceptions. Medical conditions, prescribed drugs, nutritional status, cognitive status, mood and feelings are also few factors that will affect the sensory and physical attachment to food intake [2]. Although these chemo-sensory deficits are generally not reversible, sensory and physical interventions including intensification of taste and odor can compensate for perceptual losses [3].

Amplification of flavor and taste can improve food palatability and acceptance, increase salivary flow and immunity, and reduce oral complaints in both sick and healthy elderly [3]. The flavors and spices must however be mildly use so that they do not irritate the mouth or stomach [4].

In the case of Goulash stew, the use of spices (red pepper, chili), herbs (garlic, parsley) and salt) will be used to enhance the olfactory as well as the gustatory perceptions. The wide array of the dish and the preparation method (boiling, pressure cooking and stewing), will also provide the right food texture suitable for geriatrics [4].

In order to enhance the physical attributes, plate size and food in the plate arrangement, color of the dish (potatoes being whitish, the goulash brown and the broccoli green) and use of almonds to garnish (including the nutritional benefits it supplies), is aimed to stimulate the appetite and willingness to take in the meal [3,4].

### Target group

The target group is German seniors, >80 yrs., showing an early onset of dementia. Most of these seniors are distressed from muscle function, anemia, oral health, reduced cognitive function, higher hospital and readmission rate, mortality or dementia. Often nutritional aspects such as malnutrition, BMI, dieting intake and dieting habits are responsible for biological and physiological changes [5].

The 80+ seniors in Germany need to take in carbohydrate (k/cal), protein (g/day), dietary fiber, calcium, folate, iron, minerals (K, Na), vitamin- A, E, C, D and B<sub>12</sub> [6]. Omega-3 fatty acids are also very essential for seniors showing an early onset dementia. Research shows that cold water fishes like mackerel, salmon, tuna etc. reduce the risk of increasing dementia/Alzheimer by over 50 percent [7].

Goulash can provide the seniors with all the essential energy compactness and macro-/micro-nutrients required at their life phase. As seniors often show dehydration, the juicy and slightly spicy Goulash can activate the water consumption. A limited sensory perception decreases the appetite of seniors. By creating a color-balanced dish the desire to eat should be animated. Often seniors only eat small portions for each meal, so the Goulash dish is kept in adequate dimensions. Lastly, seniors are mostly fighting problems with chewing and

swallowing. To decrease this problem, the meat, potato and broccoli pieces are kept in an easy-to-eat size. Though, it is important to not only serve mashes to the seniors. The pieces should be in a size which allows eating without prior cutting, as seniors often lose the capability to manage the hand/arm-coordination [8].

Other than that, the dish is kept lightly spicy by adding herbs and spices to enhance the flavor perception. Salt is only lightly used as it supports dehydration. As the product is intended for German seniors (80+ yrs., early onset of dementia) and is thought to provide them with a feeling of their early childhood as Goulash is a common German dish, especially in the Eastern parts of Germany and the former German regions of Poland and Czech Republic.

### Delivery, packaging and marketing

“Food packaging can retard product deterioration, retain the beneficial effects of processing, extend shelf-life, and maintain or increase the quality and safety of food [9]. The golupack consists of a metal bowl keeping the heat, a three-section metal plate and a hard plastic cover.

All parts are made out of hygienic and easily cleanable materials. The golupack keeps the Goulash dish hot for more than 90 minutes. It is a truly eco-friendly solution to hot food transport and storage. The golupack is suitable for the microwave so if the seniors want to reheat their food, they can do so later. The delivery system includes a thermal food carrier to store the golupacks during the delivery to the seniors’ homes keeping the dish hot (Figure 1).

As the package is the face of a product it is very important for a new product to be advertised by unique and innovative packaging concept. This helps to attract consumers and increases the sales [10]. The golupack is designed to increase the product performance and to give good product image. Nutritional value, ingredient declaration, net weight, manufacturer information, brand identification, and pricing are given on the product’s declaration. Additionally serving instructions may impact the consumer attraction and satisfaction.

The marketing of the Goulash is in a line with all the other dishes of the caterer “Gerichtbringer”. The description of the Goulash in the menu is as the following: “Homemade traditional Goulash (half/half) sided by parsley-potatoes and almond-broccoli, heartwarming dish for cold winter days”.



Figure 1: The golupack consists of a metal bowl keeping the heat, a three-section metal plate and a hard plastic cover Golupack (HEPP n.d.)

## Product Characteristics

### Sensory characteristics

When looking at the sensory characteristics provided by the Goulash, two different aspects shall be analysed: Taste and appearance [11]. The taste of the dish is described as following. The dish tastes as a traditional Goulash, but is only little salted in order to meet the nutritional requirements of seniors [12]. The onion and red pepper provide sweetness to the Goulash. Bitter and sour tastes cannot be found in the dish [11].

The parsley provides an herbal freshness as well as certain spiciness to the product underlining the potatoes in taste and color. Lastly, the chili and spicy paprika powder enhance the subtle spiciness of the dish. This will enhance the flavor perception (Trigeminus) of the seniors and by that, influences the food intake. Here it is important to not over-spice the dish not to irritate the taste buds and the food acceptance of the seniors [11].

For the appearance, next to the reddish-brown color of the Goulash and the yellowish-white potatoes, green broccoli was chosen. This should provide a feeling of freshness and remembering the earthiness of the vegetable. Additionally, the application of parsley and almonds further enhances the color experience when serving the dish [11,13].

### Nutritional characteristics

The nutritional characteristics are based on the ingredients found in Appendix 1. It is important to notice that the list of ingredients includes the dessert recommendation given in the product concept. The strawberries, the sugar and the low-fat yoghurt are blended together to a small dessert providing additional protein to the dish (Appendix 1).

For the calculation of the nutritional values with PRODI, a meal calculation program, the setting 'Mittagsverpflegung stat. Senioreneinrichtung (>65 Jahre PAL 1.2)' was chosen. This is a calculation suggestion for public senior institutions serving lunch to seniors older than 65 years with a low mobility. According to PRODI, the amount of fat in the dish is 26 percent, the carbohydrates are 35 percent and the protein is 35 percent. The amount of dietary fibers is 4.3% (Appendix 2).

When looking in Appendix 3 and 4, it can be found that the kilocalories are nearly ideal for a seniors' lunch. The protein content of the dish is relatively high (186%), while the fat content (90%) and the carbohydrates content (70%) are lower than the recommended serving. The dish is high in fibers (120%). The micro nutrients are very well provided by the Goulash. The vitamins B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, C, D and E are as well given in a satisfactory amount as vitamin B<sub>12</sub> which is important for seniors. Calcium is provided to 66% – including the dessert. Folic acids, important for senior nutrition, are sufficiently provided (114%).

### Physical characteristics

Several physical characteristics of the dish can be identified. The texture of the Goulash is soft and juicy, as the vegetables and meats are pressure-cooked forming a soft consistency. The red pepper and the onions do not only provide nutritional value and certain sweetness to the product but also form a juicy basis for the Goulash. The broccoli is cooked to a point where a distinct crispness is sensed in the eating experience. The potatoes offer a creamy component to the dish, which makes it more pleasant to consume.

In general, the texture of a dish can influence its taste, aromas and the mouth-feel. Other components such as almonds provide a crunchy,

nutty, roasted taste to the dish enhancing the appetite of the elderly [11].

### Chemical characteristics

The chemical characteristics of the Goulash are changed during the warm-storage between the delivery and the consumption of the meal. Here, the structure of the molecules in the food is easily changed. Vitamin losses can be a result. The main chemical effects on the Goulash could be caused by non-enzymatic browning or enzymatic browning, for example affecting the broccoli. Also the physical characteristics, such as the texture are affected by the change in the chemical characteristics [14].

### Microbiological characteristics

The Goulash could potentially be affected by several microbes. Mycotoxines might be found in the Goulash. Especially the almonds processed in the dish could be infected with aflatoxin. According to the food law, only certain amounts of aflatoxins are allowed in products for human consumption. Almonds should only be purchased in small amounts allowing quick turn-over and they should be stored in a dry and cool place [15].

*Clostridium perfringens*, a anaerobic bacterium, could affect consumers when deficient hygiene was practiced during the dish's preparation phase. Especially meals containing meat which were kept warm are affected. This risk can be minimized by storing the food at more than 70°C. If this is not possible, the food should be stored in an environment colder than 5°C and it should be reheated just before the consumption [15].

Salmonella could affect the Goulash through cross-contamination in the processing area or by keeping food warm at a temperature between 20°C and 45°C. In order to reduce the risk of salmonellosis, the food products should at least be cooked at 80°C core temperature for ten minutes. Additionally, all highly perishable ingredients need to be stored in a refrigerator. Cutlery and crockery should be cleaned properly after processing meat products and other risky ingredients such as eggs [15].

*Staphylococcus aureus* is a bacterium which could also affect the Goulash. Through deficient personal hygiene or cross-contamination in the preparation phase as well as incorrect storage of ingredients, an outbreak of *staphylococcus aureus* could be fostered. The bacterium can be killed by heat application, though its toxins are highly heat-resistant. Cooking processes of 90 minutes at 100°C are needed to destroy the toxins [15].

### Processing

The processing of the 'Goulash sided by parsley-potatoes and almond-broccoli' can be seen as three parallel preparation parts which stem from an old family recipe.

Firstly the parsley-potatoes are prepared by rinsing the parsley to get rid of the soil attached to the leafy greens. After cutting off the stems of the parsley, the leaves are finely chopped. The potatoes are washed, peeled and cut into small squares of approximately two times two centimeters. The potatoes are cooked in preheated water for approx. 20 minutes depending on the potato variety. When they are tender, the cooked potatoes are given into a bowl. They are sprinkled with small butter flakes. A little salt and the chopped parsley are added. All the ingredients are mixed and filled into a small section of the serving plate.

For preparing the almond-broccoli, the almonds are roasted until

they have a fine brown tan. The broccoli is cut into small flowers in a size adequate for eating without prior cutting. The broccoli is washed carefully and the flowers are steamed in a sieve over a pot with boiling water. This requires approx. nine minutes. After the steaming, the broccoli is mixed together with the rest of the butter, a little salt and the roasted almonds. This part of the dish is also filled into a small section of the serving plate.

The third preparation part is the Goulash. Here, the meat is washed, dried and fat is cut off. Then, the meat pieces are cut into convenient to eat two times two centimeters pieces. The onions are cleaned and chopped. The red pepper is washed and sliced into thin (0.5 cm) and short (3 cm) cuts. The garlic is cleaned and finely chopped. Extra native oil is added into a pre-heated pressure cooker first browning the onions, followed by the meat which is seared. When the meat is well done, garlic, red pepper and water are added for the cooking process. In the pressure cooker, the dish cooks on medium heat with a medium pressure for 24 minutes. After this cooking process, tomato mark and spices (pepper [2 g], salt [0.5 g], paprika powder sweet [3 g], paprika powder spicy [1 g] and chili powder [2.5 g]) are added to the mixture. After letting the Goulash sit for two minutes, it can be served in the largest section of the plate (According to the family recipe).

### Packaging

The Goulash is served on a three-section plate which is closed with a lit on top. This serving crockery is placed inside heater boxes which can restore the product's heat until being consumed. On top of the plates lit, the nutrition facts and product specifications can be presented to the customer.

### Storage

The Goulash can be stored in the heated box until it is consumed. If it is not eaten on the day of the production and delivery, the Goulash should be stored in the fridge for maximum one day. It can be reheated on low heat in any oven or microwave. The dish can be frozen as well. In this case, the microwave's defrosting component should be used to get a wishful state of the dish. Plate and lit of the crockery are both microwavable [16].

### Marketing Design Specifications

The following attributes should be promoted. Promotion is one of the marketing's four Ps (Price, product, promotion and place). According to Perreault and Carthy [17], promotion is sharing information between seller and buyer. Its main objective is to tell the consumer about product, price and place. According to Kotler and Armstrong, promotional activities have five tools: Advertising, personal selling, sales promotion, public relations and direct marketing [18].

Advertising is the paid presentation and promotion of goods, ideas or services by an identified sponsor. The following media is attempted to influence the Goulash's consumers: Television, newspapers, magazines and radio. The personal selling is an oral communication with the consumer with the purpose of selling products and building relationships. The sales promotion is providing short-term incentives to consumers and the distribution channels encourage the purchase or sale of a product [18].

The public relations are communicating with the target audience directly or indirectly through the media aiming to create and maintain a positive image and create a strong relationship with the audience. Examples are press releases, newsletters and public appearances. Direct marketing communicates with targeted consumers directly to

get immediate responses for a product by using e-mail, telephone and other tools [18].

For the previously selected target customer group (German seniors, >80 yrs., showing an early onset of dementia) advertisement, personal selling and direct marketing could be possible options for the Goulash's marketing and promotion.

According to Kotler and Armstrong [18] the "Distribution channel is a set of interdependent organization involved in the process of making a product or service available of use or consumption by the consumer and service sector". The distribution method depends on the individual product. The Goulash's distribution is complex as the target consumers are German seniors. This is why a very crucial distribution channel is needed which supports the customer's demand and the product flow. According to Shepherd [19] there are some possible distribution channels:

- a. Direct to consumers (Suitable option for covering small areas)
- b. Retailers (If interested to sell the product)
- c. Supermarkets (If product acceptable and sufficient quantities can be delivered)
- d. Wholesalers (Suitable for larger processors and large consumer demand)
- e. Institutions and the catering trade

The direct distribution to the target group is here the favored alternative for the Goulash dish [19].

### Product Design Specifications

Product design specifications: The product design and process includes integration, creativity, systematic planning and monitoring. The product design is one of the most important parts of the product development work. As the project progresses, the product is more clearly Defined and the study of the variables of the process becomes more important allowing achieving the optimal product [20].

### Product formulation

The raw materials for the Goulash sided by parsley-potatoes and almond-broccoli can be found in Appendix 1.

The utensils applied during the processing are listed in Table 1. The process flow chart can be found in Appendix 5.

### Marketing package design

Golupack is served in a three sectional metal bowl with a plastic cover. The logo of the catering service "Gerichtbringer" is broadly designed on the packaging to coin the caterer with high quality, fresh, healthy and good tasting food. The description of the Goulash in the menu is as the following: "Homemade traditional Goulash (half/half) sided by parsley-potatoes and almond-broccoli, Heartwarming dish for cold winter days". The following information will be printed with attractive coloring on the package's wrapping paper as declaration for the consumers (Table 2).

### Regulatory Aspects

To successfully introduce a new food product or ingredient, it is important to consider the regulatory environment and aspects applicable to its markets, especially at the early stage of the product development [21]. The General European Union Food Law Regulation (EC) 178/2002 aims at ensuring high levels of protection of human life

Utensils
➤ Pressure cooker
➤ Pots
➤ Kitchen towels
➤ Jars or containers
➤ Stove
➤ Spoons and knives
➤ Cutting board
➤ Steam cooker
Source: Own design

Table 1: Processing utensils.

Product sheet	
Article description	Goulash sided by parsley-potatoes and almond-broccoli
Manufacturer information	Gerichtebringer GmbH, Examplestraße 1, 12345 Example
Pricing	?
Net weight	400 g for the main meal + 50 g for the recommended dessert
Nutritional value	Caloric value 408.26 kcal Protein 35.43% Carbohydrates 34.25% Sugar 0% Fat 26.04% Fiber 4.28%
Raw material requirements	All ingredients must be impeccable with a high quality and freshness
Ingredients declaration	Lean pork, beef, onions, tomato paste, native sunflower seed oil, red pepper spice, chilli, garlic powder, pepper, salt, potatoes, parsley, broccoli, almonds
Instructions for reheating	Oven: 180°C for 5 minutes; Microwave: high for 1.5 minutes
Recycling information	

Table 2: Wrapping paper as declaration for the consumers.

and health, both at national and EU level, and established the rights of consumers to safe food and accurate and honest information (EU Food Law). That is, “food must not be injurious to health and must be fit for consumption” (EU REGULATION 178/2002). In the EU, a set of regulations, directives, scientific opinions and guidance documents have been established which assist producers and manufactures during the development of products [21]. This regulatory framework covers a wide array of issues. However, for the purposes of this paper, the Goulash dish, the applicable regulatory frameworks to it shall be considered.

## Food hygiene

Food hygiene results from the implementation of prerequisite requirements and procedures by food businesses based on the HACCP principles [22]. In line with this, the implementation of certain provisions of Regulation (EC) 852/2004 on the hygiene of food stuffs, some prerequisite requirements to be observed include: The safe handling of food, food waste handling, sanitation procedures and personal hygiene.

## Labelling

The EU Regulation 1169/2011, on the provision of food information to consumers, (Also Directive 2000/13/EC on labelling, presentation and advertising of foodstuffs and Directive 90/496/EEC on nutritional

labelling for foodstuffs), states that consumers must not be misled by inadequate labelling on weight, constituents and additives, shelf life, nutritive value and the production method of products. Food labelling is thus also seen as a food safety measure, since information on allergens, the proper handling of the dish (Refrigeration, shelf life, cooking) and any food intolerance is provided (EU Food Law). In Germany, in line with this Regulation, the “Lebensmittel-und Futtermittelgesetzbuch” and the “Lebensmittelkennzeichnungs-Verordnung” also provide information on how food must be labelled. For the Goulash dish, the following labelling information shall be included: The name of the food, the list of ingredients, allergens (In this case almonds), quantity of certain ingredients, net quantity of the dish, the date of minimum durability, storage conditions (Refrigeration), and the instructions of use.

## Nutritional and health claims

According to EU Regulation (EC) 1924/2006 foreseeing implementing measures to ensure that claims made on food labels are clear and based on evidence. Low fat, not more than 3 g fat per 100 g solids, and low salt, 0.12 g per 100 g, as stated in the regulation were considered in labelling the Goulash “low in fat and salt”. For this case, low fat ingredients (Lean beef, lean pork and a small quantity of sunflower seed oil), and small amount of iodized Dead Sea salt was used. No health claim is intended to be used on this product.

## Allergens

The EU Regulation 1169/2011 lists nuts and almonds as allergen-commodity examples listed in the Regulation Annex II. The Goulash dish is garnished with roasted almonds. Therefore it must be clearly labelled for individuals who cannot tolerate them or who may have allergic reactions.

## Food for particular nutritional uses

The Goulash dish is ideal for seniors over the age 65 (geriatric nutrition). Therefore, all the nutritional and sensory aspects have been put in consideration in its preparation.

## Genetically modified ingredients

Based on the Regulation (EC) 1829/2003 on GMO`s, and in order to surpass this risk, all the ingredients used are natural ingredients, grown/produced organically and ecologically.

## Food additives/flavorings/enzymes

As stated in the annex list of food additives, flavorings and enzymes in the Regulation (EC) 1333/2008; no synthetic flavorings, additives and enzymes were used in the preparation of the Goulash. All-natural flavors from garlic and red bell pepper were used to enhance the flavors.

## Food packaging

The EU Directive 2000/13 on “presentation of food stuffs” aims to also provide information to consumers, through labelling, in a better legible text including minimum size of text. The material of the packaging was considered to prevent cross-contamination of substances from the packaging into the food.

## Food waste

The EU states its goal to reduce food waste by at least 30 percent by 2025 (EU Food Law). This targets sectors including manufacturing, retail, food service/hospitality and households. One of the ways in achieving this is avoiding food surpluses. The preparation and the

serving of the Goulash dish, aims to attain this through using the exact amount of ingredients and correct portioning of the meal. This attempts to ensure that almost all the dish is consumed by an individual with minimal waste.

### Quality aspects

Quality is the combined knowledge of how to use good hygiene practices (General and specific hygiene requirements) and hazard analysis as well as critical control points (HACCP) principles [23]. To get and sustain quality standards for Goulash, the focus lies on all production activities and responsibilities such as purchasing (Fresh lean meat, organic ingredients etc.), personal hygiene, food preparation, food processing, sensory tests and packaging which need to be kept up to a desired level. With the concern on quality aspects of the Goulash, basic hygiene practices were followed in all stages of the processing. This allows serving the dish with little food hazards, less product failure and high product nutrient value [24-27]. There are no chemical preservatives added during the preparation of the Goulash. The time-temperature combination during stewing and cooking was focused upon.

Packaging also a very important part of the food quality aspects. It can play a vital role in the food processing industries or food catering services. It makes food more suitable, convenient and gives the food safety assurance from microorganisms and biological, chemical and physical changes. Sometimes also taste depends on packaging [9]. The packaging keeps the Goulash dish hot for more than 90 minutes and extends the shelf life. The storage of the cooked Goulash after its packaging is an important critical control point (CCP). All microorganisms need to be killed in this stage to extend the product's shelf life.

As the product is intended for German seniors (>80 yrs., early onset of dementia) thought to provide them with a feeling of their early childhood, the researchers tried to maintain all the quality procedures during the Goulash preparation. The end product had the benefit that it did not contain artificial additives, chemicals or genetically modified organisms (GMO).

### Conclusion

When reflecting on the project process, it was found that the teamwork, especially in the laboratory was very good as many preparation steps needed to be undertaken. Also the idea and the recipe of the Goulash were quickly found and the product concept was developed within the group. In general, when problems or difficulties occurred during the processing stage, immediate actions were taken to correct or stabilize individual processes.

On the other hand, several setbacks were experienced as the initially planned use of the microwave for steaming the potatoes did not work out. Also one of the pressure cookers was not fully functioning (Not allowing closing lid properly). These limitations were due to technical problems in the kitchen which could not be solved. Solved limitations were the steaming of the broccoli which was first too long altering its color and the buttering of the potatoes to make them lustrous as well as to make the parsley adhere to the surface of the potatoes.

Other improvements such as time and temperature, which could be carried out in the future are the following. The beef could be firstly roasted in order to get a softer consistence compared to the pork. Additionally, simmering instead of boiling the Goulash for a relatively long time under low heat might optimize the taste and texture of the

dish. Lastly, the Goulash could be thickened with cornstarch or flour if a short processing time does not allow the dish to boil down.

Concluding, the project's aim to provide a lunch for German seniors, >80 years, showing an early onset of dementia, could be fulfilled as a promising prototype was developed (Appendix 6-8). It is expected to be accepted by the German seniors as it reflects the German traditions and with it the seniors' childhood memories.

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