FOOD FORESTS,

A HEALHTY AND ATTRACTIVE DIET?

Project 2702

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Executive summary

This report starts with the academic consultancy advice on the potential of food from a food forest. Herein the research question: ''To what extent is it possible to create a healthy, varied and attractive diet from ingredients out of a food forest, and how can this be translated to stakeholders involved in a practical way?'' is answered. The overall conclusion is that eating from a food forest in a healthy and attractive way is definitely possible. However, some key challenges arise in meeting the daily recommendation of nutrients, as well as in creating dishes that offer sufficient variety. The academic consultancy advice provides suggestions for these issues as well as recommendations for future research. The report continues with an academic justification behind the advice, which is divided in three chapters, each representing one of the (sub)research questions.
In addition to the academic consultancy advice, a recipe booklet with ingredients from food forests and a masterclass 'cooking from a food forest' were created. The methods used for creating these are also described in this report.

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Academic Consultancy Advice

Introduction

Over the past years, research has been conducted on the ecological benefits of food forests as opposed to conventional agriculture to create a more sustainable food system. However, not much research has been done on the extent to which a food forest can contribute to a healthy, varied and attractive diet. Research on this matter is needed to see if we can optimally feed a population out of a food forest, just like conventional agriculture can do. Therefore, this report aims to offer advice, based on literature research and expert opinions, on the possible use of food forests in creating a healthy and attractive diet, and what research still needs to be done to further answer this question. Doing more research on this matter will help to increase the support base of food forests. The main research question of this project is thus: To what extent is it possible to create a healthy, varied and attractive diet from ingredients out of a food forest, and how can this be translated to stakeholders involved in a practical way?

General advice

Food forests can come in many forms and with many goals and purposes. We believe that producing food is one of the most important purposes of the food forest. In this project, we adhered to the Green Deal definition of a food forest, which is a forest ecosystem designed by humans consisting of a variety of perennial plants, mainly meant for human consumption (Green Deal Voedselbossen, n.d.-b). However, this research has found that perennial crops may not be sufficient to create a healthy and attractive diet out of food forest ingredients only. We advise including annual crops in a diet that mainly consists of ingredients from a food forest to solve the problem of the lack of variety in substance ingredients. From a health aspect, annual crops would also be helpful in increasing the energy-density of meals. Furthermore, in terms of attractiveness of a meal, the addition of annual crops will bring neutral middle note flavours to a dish, which for example are often represented by grains or starchy vegetables in conventional dishes, that currently lack in the overall produce of food forests. Lastly, annual crops are familiar to the public, thereby helping to simplify eating from food forests.

In terms of fitting the food forest in the Dutch conventional diets, we believe there are multiple possible phases, presented in figure 1. These phases consist of two extreme forms of diets; the first one being eating from a food forest only, and the other extreme is conventional diets only. In between, there are two phases which show possible variations between these two extremes. In our opinion, in order to secure a healthy diet, food forests should function as an addition to the conventional diet or should at least include additions from a conventional diet. We advise doing so because energy-dense foods and certain nutrients like vitamin B12 and calcium are lacking in the food forest. Furthermore, based on the recipes developed in this project, it is found that variety is also an issue when trying to create attractive dishes with food forest ingredients only. One would need to repeatedly use the same ingredients, like chestnut flour and nuts, to get a sufficient amount of energy while you would have a variety of ingredients to choose from in a conventional diet, such as grains and starchy vegetables. Therefore, additions from the conventional diet are necessary to create healthy and attractive dishes with food forest ingredients.

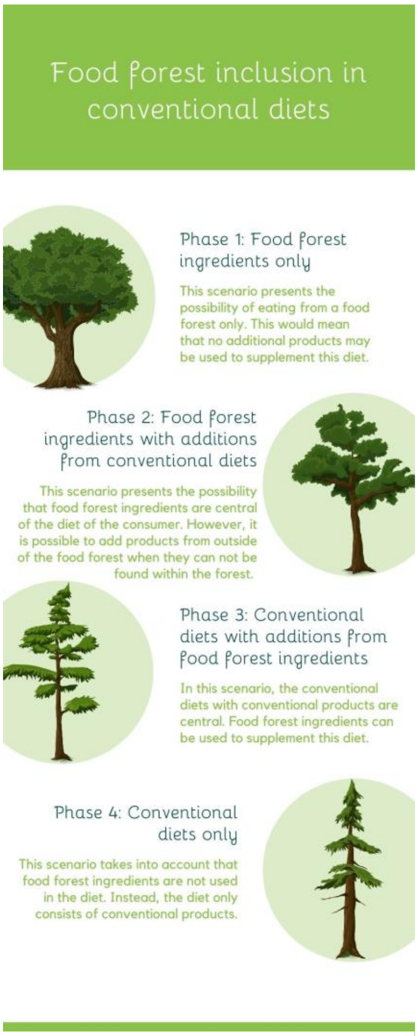


Figure 1: Food forest inclusion in conventional diets

Creating a healthy and varied diet

For the health analysis, several products from a food forest have been researched on their macro- and micronutrient composition. Results from this literature research can be found in Appendix 1. Based on this research, it seems that various micronutrients can easily be obtained from a food forest. Especially sodium, magnesium, iron, vitamin A, vitamin B1, vitamin C, vitamin E and vitamin K are present in sufficient amounts. Macronutrients such as proteins and fats are also easily found in nuts and seeds. Fruits and berries can also serve as a source of carbohydrates. However, it seems unrealistic to completely rely on a food forest for a person's nutrient needs in regard to both micro- and macronutrients, because there is a huge variety in what products food forests have to offer per season, and this also affects what and how many nutrients are present per season. For example, during spring and winter, there is a lack of energy-dense products with sufficient amounts of carbohydrates. Furthermore, there seems to be a lack of availability of proteins in most of the seasons. Only during autumn, there seems to be enough energy-dense products and foods containing sufficient amounts of proteins, fats and carbohydrates. Besides, even though many micronutrients seem to be sufficiently present in a food forest, calcium, selenium, zinc, iodine, and the vitamins B2, B6, folate, B12 and D are lacking. Taking all of this into consideration, we have therefore concluded that dining from a food forest is a good addition to the current diet of a person, but is not sufficient for a complete and healthy diet.

Even though completely relying on foods from a food forest is not advisable, it is also not impossible. We advise that the following steps need to happen to make an efficient transition to this diet:

1. If a person would solely be eating from a food forest, they should take supplements to compensate for the micronutrients that are lacking in plant-based foods.
2. Many products can also be preserved, so they can be consumed all year long instead of one season only. However, research is needed to see if this would affect the nutrient composition of products in the long-run, and what preservation techniques are the best suitable for this.
3. Combine perennial crops with annual crops in your kitchen. These annual crops are necessary since these are energy-dense and contain a sufficient amount of carbohydrates.

Making attractive dishes out of food forest products for consumers

From literature research it was found that, when looking at flavours, an attractive dish should consist of earthy, umami base notes, neutral middle notes that function as the substance of the dish, which could be vegetables, meat or grains, and top notes that transfer a volatile first scent. It can be argued that base notes and middle notes are quite difficult to find in a food forest, while there are plenty of top notes. These top notes are the food forest ingredients that are rich in attractive, new and unknown flavours. For people with a desire to explore new flavours, the food forest is the place to be. However, these new and unknown ingredients and flavours may very well be the greatest challenge for others to eat from a food forest. In general, people have an instinctive preference for flavours they are familiar with, which may hinder the choice to adopt a food forest diet. Our own experiences of creating and cooking recipes in order to create attractive dishes that are completely made from ingredients out of a food forest have shown that the main challenges are the lack of variation in substantial ingredients, such as starchy vegetables and other energy-dense products, the seasonality of certain food forest products and the lack of basic ingredients such as olive oil, sea salt and spices.

In order to overcome these challenges, the following solutions can be determined.

1. Include annual crops with perennial crops in the kitchen, because:
    a. Annual crops solve the problem of the lack of variety in substance ingredients, such as grains and potatoes.

b. Annual crops such as sweet potatoes are suitable middle note ingredients in terms of their flavour composition that currently lack in the overall produce of food forests.
c. Annual crops such as beetroot and sweet potato are more familiar to the public, they would thereby help to simplify eating meals with mainly ingredients from a food forest.

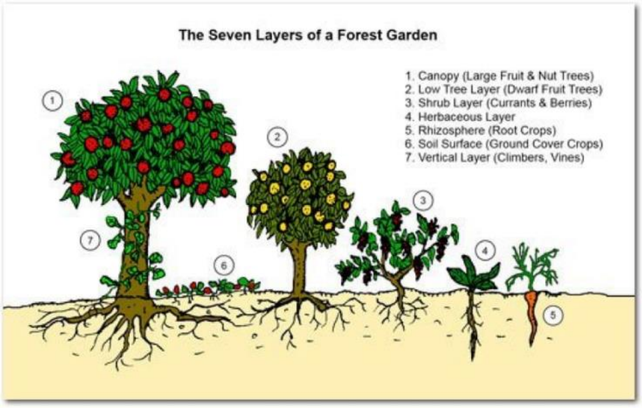
2. Unknown and unfamiliar ingredients can be used in familiar forms in order to make it easier to consume them. In other words, you can use a new ingredient to replace something alike from a familiar recipe. For example, instead of carpaccio with beef, you can also make a carpaccio using oyster mushrooms and figs. This will make it less of a challenge to consume food forest ingredients.
3. The challenge of seasonality can potentially be overcome using techniques that increase shelf life of food forest products. Such techniques include but are not limited to drying, fermentation and pickling. Further research should be conducted to see whether this is feasible for the consumer, and what this means for the flavours and ingredients that can be acquired from food forests.
4. Use a basic pantry when aiming to use only food forest ingredients in a meal. A basic pantry consists of ingredients that are commonly used in meals. Certain ingredients from this pantry such as olive oil, sea salt or spices are essential to the attractiveness of a dish and can therefore not be missed.

Communication strategy towards the consumer
During this project, a masterclass has been developed as a communication strategy to show how dining from a food forest can attractively be presented to consumers. The masterclass can visually show how various ingredients from a food forest can be incorporated in meals, while also giving some background information on the flavours of these ingredients and their health benefits. The availability of recipes in the masterclass makes it easier for the consumer to realize that it is possible to create a healthy and attractive meal from a food forest.
It is therefore advised that food forest owners and experts will take the same direction to promote food forests and their ingredients to the consumers. They could even present recipes in an attractive flyer to promote cooking from a food forest. Furthermore, there is limited knowledge available to the consumers about food forest ingredients. This accounts for nutritional aspects, as well as their flavours and applications. However, we believe that experts in the food forest sector together may hold a knowledge base that will simplify eating from a food forest. This consists of knowledge on food forest ingredients, related to nutritional aspects, flavour and culinary application, to themselves. We therefore advise experts to bundle this existing knowledge, and to make this available to the wider public. This way, eating out of a food forest is simplified.

Suggestions for future research
We advise conducting research on the following aspects:
1. The nutritional composition of all food forest products and possible difference in quality with conventional agriculture.
2. The importance of bioactive compounds in foods from a food forest.
3. Amino acid composition of protein containing food from a food forest.
4. Effect of different preservation and fermentation techniques on nutrient composition of food forest products.
5. Further experimentation with cooking with food forest produce and their flavours and applications.
6. Sensory consumer research on attractiveness and acceptance of eating from a food forest.

Introduction

Background
Food forests are up and coming in the Netherlands (Green Deal Voedselbossen, n.d.-a). In short, a food forest aims to produce food by using the natural ecosystem of a forest, resulting in a unique combination between agriculture and nature (De Groot & Veen, 2017). The definition, according to the Green Deal food forests, is "*a highly diverse ecosystem with the layered structure and diverse functions of a natural forest*" (Green Deal Voedselbossen, n.d.-b). In addition, a few characteristics are specified that qualify an ecosystem as a food forest. It should be a productive ecosystem, designed by humans, mimicking a natural forest, with a high diversity of perennial and/or woody species, of which parts like fruits, seeds or leaves, serve for human consumption. Additionally, there should be a canopy layer of large tree combined with a minimum of three other vegetation layers like lower trees, shrubs, herbs, ground cover, roots and creepers (see figure 2). This contrasts to conventional agriculture, which uses only one vegetation layer and one species per patch for food production. Moreover, soil life should be abundant, and the size should be significant, starting at 0.5 hectares (Green Deal Voedselbossen, n.d.-b).
Depending on the season, the harvest from these layered crops include fruits, nuts and seeds, roots and tubers, mushrooms, edible leaves and flowers, spices and honey (Stichting Voedselbosbouw Nederland, 2017).



Figuur 2 The seven layers of a forest garden (Eliades, 2011)

Regarding food production, conventional agriculture is considered to potentially contribute to problems such as biodiversity loss, soil degradation and (air) pollution. Food forests, however, appear to be sustainable alternatives to conventional agriculture, as they might have the potential to contribute to combating these problems (Stichting Voedselbosbouw Nederland, 2019). This is because food forests have been praised in academic research for their contribution to local biodiversity (Breidenbach et al., 2017). Current research aims to generate further insight on the impacts of food forests in terms of climate mitigation, soil quality and potential income (Green Deal Voedselbossen, n.d.-c). Furthermore, food forests can fulfil social and cultural functions, by potentially providing recreational space, opportunities for education and stimulating social cohesion (Green Deal Voedselbossen, 2020).

Different views on food forests
For proper contextualization of this project, we have visited two food forests in the Netherlands and conducted interviews with the owners/curators. We visited food forest Haarzuilens, also known as "Lekkerlandgoed" where we spoke to Jan Degenaar. Furthermore, we visited food forest Droevendaal, where we spoke to Kees van Veluw and Jordy van Eijk. From these visits we learned about different crops that are being grown in food forests, and the view of these people towards

agriculture, its future and food forest curation and exploitation. It is interesting to note that there are different approaches towards the management and exploitation of a food forest and the role it could play in our food systems. The most traditional and idealistic approach, strives to exclusively use perennial crops in its system. Such a system should be created well at the start, and after that, the only labour should be the harvesting; it should further be completely self-sustaining. Food forest 'Ketelbroek', and its curator Wouter van Eck are known for propagating this view. This is also in line with the definitions and principles of the Green Deal food forests. A more open view towards the inclusion of, or combination with, annual plants exists as well. Food forest Droevendaal is an example of this, where they consider planting sweet potatoes and beetroot, in order to increase the nutritional output of their forest.

Food forests and their curators can have different aims and goals. Jan Degenaar from food forest Haarzuilens mainly tends to select crops based on their interesting flavour. Parties that purchase products from Haarzuilens are mainly specialized restaurants and consumers with self-pick subscriptions. Some patches within their food forest are reserved for cultivation in rows for easier harvest, resulting in a lower diversity of crops, but higher harvest convenience on those spots. This also highlights the somewhat ''weaker spots'' of food forests, namely that harvesting is relatively difficult and labour-intensive compared to conventional agriculture. At food forest Droevendaal, they have a somewhat different view. They are more aimed towards turning a food forest into a business that is profitable and wherefrom people can live and generate income. Their food forest is still very young, so it does not yet generate a substantial output, but they have ambitious goals regarding efficiency of production. They want to generate an income of €40.000 and feed 10 people per year. Another challenge that surfaced from this interview, is that food forests need a lot of time to develop. From all food forest curators it can be concluded that until the first substantial production, it takes about 5-10 years and that the full potential is not reached until 30 years. However, when put into production, such a system delivers goods for a very long time, sustainably. This is useful information since a different view on the curation or different goals of a food forest can result in different outputs for each food forest individually.

Problem definition & research questions

Food forests Lekkerlandgoed and Droevendaal show that food forests in the Netherlands have the potential to generate interesting and efficient outputs in terms of food forest products. In addition to Lekkerlandgoed and Droevendaal, more and more food forests are appearing in the Netherlands and research into food forests and their environmental and economic benefits seems to be increasing as well. However, there is little attention for the 'food' part of the forest as opposed to the environmental and economic aspects. Furthermore, although food forests in the Netherlands go as far as growing over 400 different varieties, not much is known about what these varieties mean for the diet of the average Dutch consumer, especially when these varieties are rare and relatively unknown to the average Dutch consumer. Information about what food forests can mean for the diet of the average Dutch consumer is relevant to support further claims on the benefits of food forests relative to conventional agriculture. Jeroen Kruit (Researcher at Wageningen Environmental Research and Research Coordinator for Green Deal Voedselbossen) and his intern Melle van Schaijk, have therefore asked us, a group of seven master students from Wageningen University, to consult them on what food forests and their products can mean for the diet of the average Dutch consumer. Specifically: to what extent is it possible to create a healthy, varied and attractive diet from ingredients out of the food forest, and how can this be translated to stakeholders involved in a practical way?

We thus focus on two main points that determine what food forest ingredients mean for the diet of the average Dutch consumer. Firstly, we focus on the nutritional aspects of food forest ingredients and whether it is possible to create a healthy diet consuming only food forest ingredients based on their nutritional value. Secondly, we take into account the attractiveness of food forest ingredients and the dishes that can be made from them. Thirdly, this research aims to make a practical translation of our findings to the average Dutch consumer. In other words, our aim is to inform consumers about food forest ingredients and the dishes that can be made from them. This is done in the form of an online masterclass, where we show how to cook with food forest ingredients, while also educating the consumer about the nutritional value of the products, as well as the benefits of food forests in general.

The following research questions are central in this report:

Q. To what extent is it possible to create a healthy, varied and attractive diet from ingredients out of a food forest, and how can this be translated to stakeholders involved in a practical way?

Q1. To what extent is it possible to create a healthy and varied diet from ingredients out of a food forest during all seasons?

Q2. How can we make attractive dishes for consumers with ingredients out of a food forest?

Q3. With what communication strategy are we able to communicate the potential of food forest ingredients and dishes to the consumer, and what does this look like?

Methods

In order to answer our research questions, different methods have been used to enrich us with information to use in this report. These methods include visiting food forests, literature research, recipe development and the creation of a masterclass.

Visiting of food forests

In order to understand the context of what it means to grow and eat the food from a food forest, two visits to different food forests were planned: Haarzuilens and Droevendaal food forest (see figure 3). We tasted all kinds of plants and learned a lot about designing and maintaining the products in a food forest. Semi-structured interviews were done but have not been officially taken up in this report as they had as main aim to increase our own understanding of the functioning of a food forest. Information from those conversations has been taken up informally in the introduction.


Figure 3: Food forest Haarzuilens

Literature research

The review of literature has been used in multiple ways. First of all, to create a list of the products available in a food forest, categorical lists of food forest varieties created by Stichting Voedselbosbouw Nederland have been used and combined with varieties that we encountered during our food forest visits to make a final list (see variety list and justification of the list in Appendix 1). This gave us insight into the variety of ingredients a food forest produces. Our main literature research is based on creating a framework for what healthy and attractive dishes look like to be able to answer the question: to what extent is it possible to create a healthy and varied diet from ingredients out of a food forest during all seasons. Healthy nutrition has been analysed on different food groups and macro- and micronutrients. For the macro- and micronutrient framework, to decide what is a healthy intake of nutrients, the main sources were reports from the Dutch Health Council (Gezondheidsraad), WHO and the FAO. Furthermore, several meta-analyses, RCTs and cohort studies from Pubmed and Google Scholar were used to explain the benefits of some macro- and micronutrients. The composition of macro- and micronutrients from food forest products have mainly been researched through sources such as the Dutch nutrient document (NEVO), and the US FoodData Central. Food products that were not present in these two sources were looked up via Pubmed, WUR Library, and Google Scholar. In the case of attractive dishes, literature on sensory science, consumer behaviour and a sociological approach to food have been used to create a basis on what consumers find appealing in a dish. Pubmed, Google Scholar and WUR Library were used to find articles on these topics. This theory was then used to analyse and argue whether the food forest produce and our recipes are healthy and attractive.

Recipe development
To find out whether it is possible to make attractive dishes for consumers with ingredients out of a food forest, we started the process of recipe development. This was mainly done through personal culinary experience (three of us have worked as chefs) as well as using the theory of sensory science in building up the right flavour profiles. Different cookbooks (e.g. 'Wildpluk Kookboek', 'Bijbel van de Nederlandse Keuken') and blogs were used for inspiration for making trial recipes. Then, recipe testing was done through a few days of cooking, tasting and critiquing. It was difficult to find a place where these specific products could be purchased, since often food forests were too young to produce or did not sell without a subscription. Therefore, it was chosen to use available products that were present at the supermarket or speciality shops. A few items were foraged, like ramson leaves and linden leaves. The recipe layout and most of the food photography was done by us, Canva was used as a creative platform to make the designs.

Masterclass
A masterclass has been designed to answer the research question: with what communication strategy are we able to communicate the potential of food forest ingredients and dishes to the consumer, and what does this look like? The goal of this masterclass is to show the consumer what the culinary possibilities with ingredients from a food forest are, and to inspire them to start cooking with it themselves. The design of the masterclass was done through a group brainstorm session in which each person shared books, video's, documentaries, etc. on cooking/food education. Inspiration was taken from successful food writers, chefs and speakers to create a script for our masterclass. For example, YouTube content of Tasty, Jamie Oliver, AvantGarde Vegan, PickUpLimes, 24Kitchen and the cookbooks 'Wildpluk Kookboek' by ... and 'Flavour' by Ottolenghi. Furthermore, we attended an online workshop 'feast from a food forest' by Marly Bonten. The filming and producing of the masterclass was done with the help of Sikko Media.

A healthy and varied diet: the potential of food forests

Introduction

This chapter answers the first research sub-question of this research: 't*o what extent is it possible to create a healthy and varied diet from ingredients out of a food forest during all seasons?'.* The following quote from the World Health Organization explains why this is an important question to answer:

"A healthy diet helps to protect against malnutrition in all its forms, as well as diet-related non-communicable diseases, including diabetes, heart disease, stroke and cancer." (World Health Organization, 2019).

To answer the sub-question, the recommendations for macronutrients (carbohydrates, protein, and fats) will firstly be discussed. This is done to get an overview of the composition of a healthy diet and the importance of all the mentioned macronutrients. In addition, based on a list of common products from a food forest, the nutrient composition of food forest products will be analysed from the literature and discussed. The full list of common products in a food forest and their nutrient content can be found in Appendix 1. Because various products from the food forest are harvested during different periods throughout the year, this analysis will be made per season for the macronutrients. This will further be explained by taking a person as an example and discussing how many products she would need to consume from a food forest to meet her dietary needs. Next, the most important micronutrients, such as various vitamins and minerals, to meet a healthy and varied diet will be discussed one by one. The quantity of the different micronutrients that are available in a food forest will also be analysed according to the list of common products from a food forest and their nutrient values (Appendix 1).
Then, a conclusion can be made to what extent the products from a food forest can meet the recommendations for macro- and micronutrients. This conclusion can also be found in the overall advice of this report.

Macronutrient recommendations

Carbohydrates

Carbohydrates play an important role in the body, since they are an important source of energy. Particularly, carbohydrates are important for supplying energy to the brain and red blood cells. The Health Council recommends that around 40 to 70% of our total energy intake should come from carbohydrates. Sources of carbohydrates are foods like fruits, vegetables, grains and fibres, potatoes, legumes, rice and milk (Voedingscentrum, n.d.-b).

Fruits and vegetables

Research shows convincing evidence that eating fruits and vegetables reduces the risk of non-communicable diseases (NCDs) such as cardiovascular diseases and diabetes. This is probably partly explained by the positive effect of the combination of fruits and vegetables on blood pressure. Furthermore, pectin, which occurs in fruit, seems to have a positive (lowering) effect on LDL cholesterol (Gezondheidsraad, 2015). In addition, there is substantial evidence of an association between high levels of fruit and vegetable consumption and a reduced risk of developing cancer. For example, multiple cohort studies found an association between a high intake of fruits and vegetables and a reduced risk of colon cancer. Moreover, an association was also found between eating green leafy vegetables and a lower risk of lung cancer, colon cancer and diabetes (Gezondheidsraad, 2015).

The current recommended daily intake for fruits and vegetables is 200 grams of fruit and 200 grams of vegetables, according to the Dutch Health Council. This is compliant with the recommended daily advice of 400 grams of fruit and vegetables in total from the WHO (Gezondheidsraad, 2015; WHO, 2019). These levels of consumption seem to have the same risk reducing effects on the above-mentioned diseases. Currently, the Dutch consume about 200-250 grams a day of fruits and vegetables together, which is well below the recommended daily intake (Gezondheidsraad, 2015).

Grains and dietary fibre
The consumption of whole grain products lowers the risk of cancer, cardiovascular disease and obesity (Reynolds et al., 2019). Whole grains are rich in dietary fibres: carbohydrate polymers that are not hydrolysed in the small intestine of humans (Kendall, Esfahani, & Jenkins, 2010). The consumption of fibres lowers the risk of stroke. Both whole grains and fibres are associated with a lower risk of diabetes and colon cancer. The Dutch Health Council, therefore, advises replacing refined grains with whole grains and to eat at least 90 grams of whole grain products daily. (Gezondheidsraad, 2015)

Protein
Proteins are very important for numerous life processes in the human body. A protein consists of a group of molecules which are, in turn, made up of amino acids. There are two types of amino acids: essential and non-essential. If an amino acid cannot be synthesized by the body, and must therefore be provided by nutrition, it is an essential amino acid. A non-essential amino acid can be synthesized by the body itself (Gezondheidsraad, 2021). Proteins in foods are broken down in the gastrointestinal tract into loose amino acids, which are then rebuilt in the body into body proteins that can be used for various life processes such as muscle building and as an energy source. Products that can provide us with the necessary proteins are meat, dairy, fish, grains, rice, legumes and nuts. The term protein quality refers to the extent to which all essential amino acids are present, in what quantity and to what extent it can be absorbed by the body (bioavailability) (Gezondheidsraad, 2021). In general, plant based protein sources have a less optimal amino acid distribution compared to animal based proteins (Mariotti & Gardner, 2019).
The overarching recommended daily intake is to consume about 0.8g/kg body weight of protein per day (Gezondheidsraad, 2015; Gezondheidsraad 2021). This advice is 20-30% higher for vegetarians and vegans. In general, in the Western world, people consume plenty of protein and their daily intake is often well above their requirements (Mariotti & Gardner, 2019). There is a growing shift in the advice to eat more plant based protein and less animal protein. This is not only for health reasons, but also for sustainability reasons (Gezondheidsraad, 2021).

Animal based proteins
Meat is a well-known source of protein. However, the Dutch Health Council mentioned in its 2015 report that there is an association between red meat consumption and a higher risk of stroke, diabetes, colon cancer and lung cancer. This association is stronger with high consumption of processed meat. In addition to meat, dairy products are also a source of protein. There are no Randomized Controlled Trials (RCTs) on the effect of dairy on chronic diseases (Gezondheidsraad 2021). However, the Dutch Health Council does conclude that it is plausible that the consumption of yoghurt is associated with a lower risk of diabetes and colon cancer. Eggs are also a source of protein. However, eggs, in addition to meat, fish and various snacks, are also a source of cholesterol. This can have negative health consequences (Luo, Yang, & Song, 2020).

Plant based proteins
Legumes are also a source of protein. Studies have shown that consumption of legumes could lead to various health benefits such as a reduction in LDL cholesterol, hypertension and bodyweight (Polak, et al., 2015). Multiple studies suggest that the effect on cholesterol could be explained by the peptides, (short) chains of amino acids, present in legumes (Kim, et al., 2012; Lammi, et al., 2014). An elevated LDL cholesterol is often a causal factor for the development of various non-communicable diseases. The advice of the Dutch Nutrition Council is therefore to eat legumes

weekly.
Various nuts are also a source of protein. Most nuts are also rich in fibre, unsaturated fat, phytosterols and low in saturated fat. It has been shown that the nutrient composition of nuts has many health benefits (Gezonheidsraad, 2015; Coates, et al., 208). It is thought that the fibre, phytosterol and unsaturated fat content in nuts have lowering effects on LDL cholesterol. In addition, the presence of polyphenols in nuts, an organic compound present in various plant based foods, have antioxidant properties which can lower cardiovascular disease risk factors in the body (Coates, et al., 2018). Therefore, the advice is also to eat 15 grams of nuts per day (Gezondheidsraad, 2015).

A vegetarian and vegan diet and protein
A vegetarian and vegan diet are commonly associated with a lower risk of various chronic diseases, such as diabetes and high blood pressure (Ciuris, et al., 2019). Despite these positive associations with a vegetarian and vegan diet, there are also several deficiencies that can occur when not consuming a thoughtful and varied diet. One pitfall is protein. Even though the protein quality and bioavailability of animal products is relatively higher, the protein required to maintain a healthy and varied diet can also be obtained from plant sources (Mariotti & Gardner, 2019). It is important to eat a varied diet and to consume protein from different plant sources such as soy, buckwheat, hemp seeds, different (whole) grains, chia seeds, legumes, and nuts (Voedingscentrum, n.d.-g). The advice for vegetarians and vegans is to eat 1-1.2 g/kg body weight per day from various plant based protein sources (Voedingscentrum, n.d.-g). Thus, when eating enough and a variety of plant based protein-rich products, there is no risk of a protein and amino acid deficiency in vegan or vegetarian diets (Mariotti & Gardner, 2019).

Fats
Fats are a good source of energy and also needed for various body processes such as cell building, energy storage and protection. In addition, there are multiple vitamins, such as vitamin A and D, which are lipid soluble and therefore enter the body exclusively through fat containing foods (Voedingscentrum, n.d.-d). There are saturated fatty acids, which are mainly found in butter and hard margarines. Furthermore, there are also unsaturated fatty acids, which can be found mainly in vegetable oils, nuts and, for example, fatty fish. There is sufficient evidence in studies to conclude that unsaturated fatty acids reduce the risk of various cardiovascular diseases (Gezondheidsraad, 2015; WHO, 2019). Saturated fatty acids can actually increase this risk. Therefore, the advice of the Dutch Health Council is to limit the intake of saturated fatty acids and to replace it with products rich in unsaturated fatty acids.

Consumption of fish can lower the risk of fatal coronary heart disease. Furthermore, having one portion of fish per week can lower the risk of a stroke (Gezondheidsraad, 2015). Therefore, the Dutch Health Council advises eating fish once a week, preferably fatty fish.
Omega-3 and omega-6, found in products high in unsaturated fatty acids, are essential for the human body. Essential fatty acids are polyunsaturated fatty acids that cannot be synthesized by the body. Therefore, they have to be consumed in the diet. The intake of essential fatty acids is positively correlated with the reduction of cardiovascular morbidity and mortality, infant development, cancer prevention and many other health benefits (Gezondheidsraad, 2015; Kaur, Chugh, & Gupta, 2014). Alpha-linolenic acid (ALA), eicosapentaenoic (EPA) acid and docosahexaenoic acid (DHA) are the most common examples of omega-3 fatty acids. ALA can be found in flax seeds and walnuts. EPA and DHA are both found in fish and fish oil. Omega-6 fatty acids are mostly found in various nuts, sunflower, corn, soybeans, meat, eggs and dairy (Kaur, Chugh, & Gupta, 2014).
The World Health Organization advises keeping the total fat intake below 30% of the total energy intake to make it easier to avoid unhealthy weight gain (WHO, 2019). The Dutch health council advises to keep the fat intake between 20-40% of the total energy intake, and not more than 35% if

you are overweight. It also advises to keep the intake of saturated fat under 10% of total energy intake (Voedingscentrum, n.d.-d).

Analysis of macronutrient composition of a food forest

For each of the food products in table 1, its nutrient composition has been researched. In the following paragraphs, it will be investigated if these products will be sufficient to fulfil the macronutrient needs of a person per season. This will be done based on the information given on macronutrients in the previous paragraphs. Furthermore, we will use a person, Barbara, as an example to show what she would have to eat per season to get her recommended daily intake. Figure 4 shows some characteristics of Barbara and her recommended daily intake (Voedingscentrum, n.d.-b; Voedingscentrum, n.d.-d). For the example of Barbara, annual crops will be excluded from the ingredients she can consume, since originally food forests do not consist of annual crops according to Green Deal Voedselbossen(Green Deal Voedselbossen, n.d.-b).

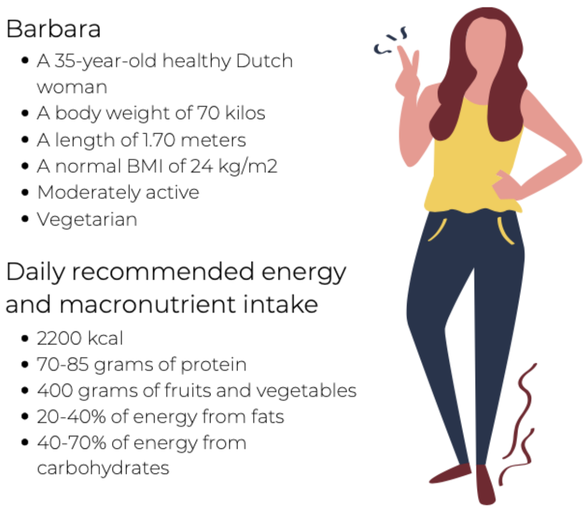


Figure 4: Barbara

Spring

In spring, a limited amount of food with a high energy density is harvested from a food forest. The products in spring are mostly leaves, herbs and berries. Calculated from Appendix 1, the products that can be harvested in spring would provide an average of 75 kcal, 4 grams of protein, 10 grams of carbohydrates and 1 gram of fat per 100 grams. It is practically impossible to maintain a healthy and varied diet with spring produce alone. There are shortages of all macronutrients to meet a healthy and varied diet. In addition, many of the products are also leaves, which is often consumed in small amounts.

Table 1: Energy-dense foods harvested during spring, their energy content and noteworthy remarks about some macronutrients.

Name	**Product type**	**Energy kcal/100 grams**	**Remarks**

Black locust	Flowers	448 kcal	The estimation of calories is based on a source which researches the whole plant. According to this study, black locust is also a source of protein, with 20 g per 100 grams. However, eating only the flowers might result in fewer calories. In addition, this is not a type of product which is usually eaten in large amounts.
Ground Ivy	Leaves	100 kcal	The part that is edible are the leaves, and these are mostly light and not eaten in large amounts.

Example of Barbara
Figure 5 shows what Barbara would need to eat to obtain her recommended energy-intake of 2200 kcal/day with only spring produce. This would deliver about 40 grams of protein, which is well under her recommended daily intake of (at least) 70 grams. The fat intake would be around an estimated 10 grams, which is also well under her recommended daily intake. To obtain a healthy and varied diet, she would have to complement her diet with conventional products or food forest products from other seasons.

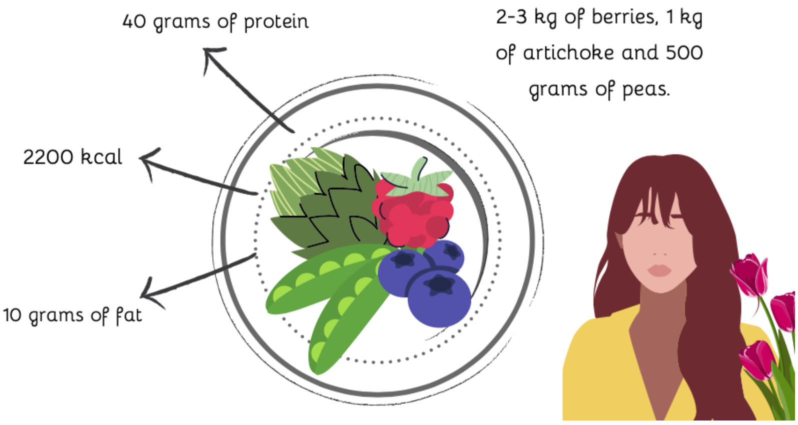


Figure 5: Barbara's diet in spring

Summer
In summer, the average energy density of the harvested food is almost the same as in spring. During this season, a lot of fruits, leaves and vegetables are harvested. In comparison with spring, the produce of summer contains more fruits and vegetables, which is easier to eat in larger amounts than leaves and herbs. In addition, when a food forest would choose to also plant annual plants, the energy density becomes higher compared to spring. Annual plants that can be harvested in the summer include buckwheat and sorghum. Calculated from Appendix 1, the plants, excluding annuals, would provide an average of 70 kcal, 2 grams of protein, 10 grams of carbohydrate and 1 gram of fat per 100 grams. The annual plants, such as buckwheat and sorghum, provide roughly about 350 kcal, 10 grams of protein, 75 grams of carbohydrates, and 2 grams of fat per 100 grams. With the annual plants included, the food forest still does not provide nearly enough fat in the summer months. The output of protein does improve when these plants are included, but is still not sufficient.

Table 2: Energy-dense foods harvested during summer, their energy content and noteworthy remarks about some macronutrients.

Name	**Product type**	**Energy kcal/100 grams**	**Noteworthy remarks**
Smooth Shadbush	Fruits (currants)	90 kcal	Mostly a source of carbohydrates.
Figs	Fruits	84 kcal	Mostly a source of carbohydrates
Black Locust	Flowers	448 kcal	See Appendix 1
Rowan Berries	Fruits	112 kcal	Mostly a source of carbohydrates
Buckwheat	Flour	353 kcal	Annual plant. Mostly a source of carbohydrates.
Sorghum	Flour	357 kcal	Annual plant. Mostly a source of carbohydrates.

Example of Barbara

Figure 6 shows what Barbara should consume to obtain her recommended energy-intake of 2200 kcal/day with only summer produce. This is an example with products from summer, which contain the most calories per 100 grams. This diet could already be a bit more diverse in comparison to the produce from spring, and would deliver an estimated 55 grams of protein, which is closer to her recommended daily intake. Fat intake would be around an estimated 21 grams, which is well below her recommended daily intake. Also for summer, Barbara would have to complement her diet with conventional products or food forest products from other seasons.

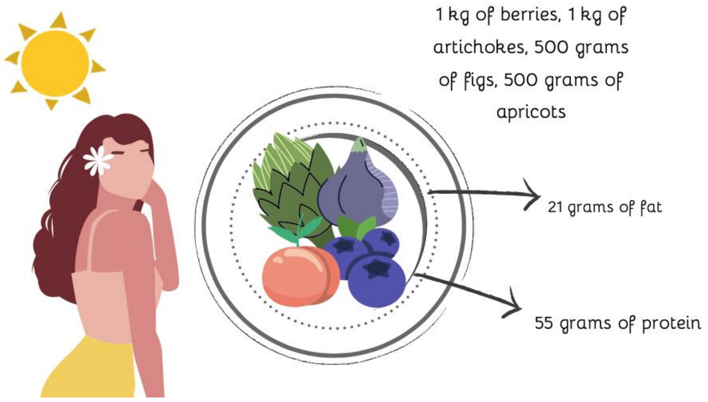


Figure 6: Barbara's diet in summer

Autumn

Most of the foods that are grown in the food forest are harvested during autumn. During this season several fruits, berries, nuts, mushrooms, leaves and herbs can be harvested and consumed. From all the seasons, the most energy-dense products can be found during autumn. On average, the energy-density of the harvested foods in this season, including annual crops, is 186 kcal per 100 grams, the average content of proteins, carbohydrates and fats are respectively 5.03, 16.9, and 9.64 grams per 100 grams. Excluding the annual crops the average energy would be 184 kcal/100 grams, and the average content of proteins, carbohydrates, and fats would respectively be 5, 14.5, and 10.44 grams per 100 grams. This means that including annual crops would not have a big influence on the macronutrient content of food forest products in this season.
The harvested products in autumn with a high energy-density especially consist of nuts such as pecans, sweet chestnut, hazelnuts, ginnan nuts and walnuts. But it also consists of berries such as juniper and rowan berries. Due to the amount of macronutrients some of these products contain, they can get a certain nutrition claim. Nutrition claims are used to shed positive light on a certain nutrient present in a food product. These claims are made and regulated by the European legislation and the Dutch Food and Drug Administration (Voedingscentrum, n.d.-f) Chestnut flour, for example, is rich in fibre since it contains more than 6 grams of fibre per 100 grams (NWVA, n.d.). Furthermore, some products, such as Korean nut pine, can be considered as rich in protein since more than 20% of their energetic value comes from proteins. A product is marked as a source of protein, for example hazelnuts, when a minimum of 12% of its energetic value comes from proteins(EUR-Lex NL, 2009). Table x shows energy-dense products that can be found during this season and some noteworthy remarks for each of the products.

Table 3: Energy-dense foods harvested during autumn, their energy content and noteworthy remarks about some macronutrients.

Name	Product type	Energy (kcal/100g)	Noteworthy remarks
Pecans	Nuts	721	Mainly consists of fats, contains 20.6 grams of omega-6 fatty acids per 100 grams.

Sweet chestnut	Nuts	189	Mainly consists of carbohydrates.
Chestnut flour	Flour from nuts	343	Rich in fibre, 14.2 g/100g.
Hazelnut	Nuts	670	Source of proteins, and rich in fibre (9.0 g/100 g). But mainly consists of fats, contains 13.8 g of omega-6 fatty acids.
Ginnan/Ginko nuts	Nuts	182	Mainly consists of carbohydrates.
Walnuts	Nuts	706	Source of proteins, but mainly consists of fats, including omega-3 fatty acids (7.2 g/100 g) and omega-6 fatty acids (36.8 g/100 g).
Dried juniper	Berries	216	Rich in fibre (45.1 g/100 g)
Korean pine nut	Nuts	611	Rich in proteins, mainly consists of fats, contains high amounts of omega-6 fatty acids (20.7 g/100 g).
Almonds	Nuts	622	Rich in proteins, mainly consists of fats, contains 13.8 g omega-6 fatty acids per 100 grams.
Apple rose fruit	Fruit	162	Mainly consists of carbohydrates, rich in fibre (24 g/100 g).
Rowan berry	Berries	112	Mainly consists of carbohydrates.
Chinese flowering chestnut	Nuts	753	Rich in proteins.
Buckwheat	Flour	353	Annual crop, mainly consists of carbohydrates.
Sorghum	Flour, refined	357	Annual crop, mainly consists of carbohydrates.

European bladdernut	Nuts	592	45% of fatty acids consists of linoleic acids, which is an omega-6 fatty acid.

Most of the harvested foods in autumn are low in energy. However, there are still some products that are rich in protein, such as sea buckthorn, mushrooms and snow peas. Foods such as mulberry, artichoke and beetroot (annual product) can also be considered sources of protein. Therefore, judging from all the available products and their macronutrient content during this season, it might be possible to maintain a healthy and varied diet from products from a food forest alone in autumn.

Example of Barbara

Barbara could easily obtain her recommended energy-intake of 2200 kcal/day by consuming energy-dense products (figure 7). Consuming these products in a day would give 63 grams of protein, which is almost sufficient, 315 grams of carbohydrates, which is sufficient, and 81.8 grams of fat. The amount of fat obtained from this diet would then be 34% of the total energy intake, which would also be sufficient.

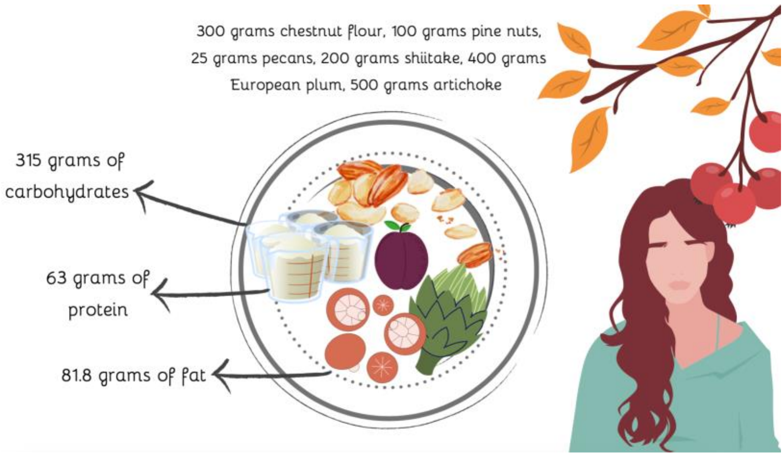


Figure 7: Barbara's diet in autumn

Winter

For winter, it will be difficult to get to the recommended amount of macronutrients solely from products from a food forest. The only energy-dense products which can be harvested during this period are sugar maple, and Korean nut pine (table 4).

Table 4: Energy-dense foods harvested during winter, their energy content and noteworthy remarks about some macronutrients.

Name	Product type	Energy (kcal/100g)	Noteworthy remarks
Sugar Maple	Juice for maple syrup	260	Consists mainly of carbohydrates

Korean pine nut	Nuts	611	Rich in proteins, mainly consists of fats, contains high amounts of omega-6 fatty acids (20.7 g/100 g).

However, this season does contain some products that are low in energy-density but are still rich in proteins, such as sea buckthorn, shiitake mushrooms, oyster mushrooms and Korean pine nuts. Furthermore, sources of protein can also be found in Babington's leek. This brings the average amount of protein from the winter harvest to 3.3 grams per 100 grams. The average amount of carbohydrates and fats is respectively 17 and 5.3 grams per 100 grams. Excluding Jerusalem artichoke, which is an annual crop, the average nutrient contents would be 3.4 grams for protein, 16.9 grams for carbohydrates and 5.9 grams fat per 100 grams. Because of the lack of products in this season, the chance is low that one can make a sufficient diet out of all the products harvested during this season, and this will be explained with the example of Barbara.

Example of Barbara

As mentioned before, it would be difficult for Barbara to get all her macronutrients from a food forest in this season. However, it is not impossible (figure 8). The products on Barbara's plate would consist of 71 grams of proteins, which is sufficient for her daily recommended intake, 254 grams of carbohydrates, which is also sufficient, and 106 grams of fat, which is 42% of the total energy intake, and therefore also sufficient.

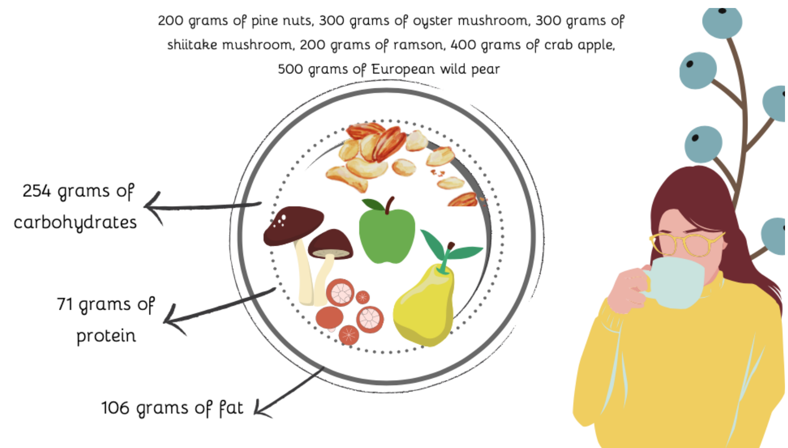


Figure 8: Barbara's diet in winter

Conclusion of macronutrient analysis per season

To meet a healthy and varied diet, products from the spring, summer, and winter months should be supplemented with either preserved produce from other months (nuts such as pecan, walnuts, almonds and chestnuts) or supplemented with produce from conventional agriculture. Nuts contain a lot of healthy fats, but could also be a source of protein. Storing these products for consumption during the spring, summer, and winter months can help compensate for the deficiencies for protein and fat during spring and summer produce. During autumn, this might not be necessary since the harvested products seem to be sufficient to fulfil the energy needs of a person, but for proteins this might be difficult because there is no major source of protein in a food forest. Furthermore, it is discussable if there will be enough variety for the consumer to be satisfied with this new diet.

Analysis of Micronutrients Composition in a Food Forest

The micronutrient composition of foods is also very important to take into account when assessing whether the food forest diet is healthy or not. Micronutrients which were included in this research were chosen based on the joint FAO and WHO report on human vitamin and mineral requirements (FAO, 2001). These compositions of food forest products can be found in Appendix 1. Furthermore, the recommended nutrient intake of the micronutrients mentioned in this chapter can also be found in Appendix 1. The different micronutrients are described below.

Sodium

Sodium is needed in the human body for the maintenance of the plasma volume, the acid-base homeostasis and the transmission of nerve impulses. It is ingested in the diet and excreted with the urine (World Health Organization, 2012). Sodium can mainly be found as part of regular table salt and in food products such as milk, meat and shellfish, and processed foods.

A high intake of sodium is associated with high blood pressure. Which, in turn, correlates with a higher risk of cardiovascular diseases and stroke. Therefore, it is important to limit the daily sodium intake (Calliope & Samman, 2020). The recommended maximum daily intake of sodium is 2 grams per day. This is comparable to 5 grams of salt per day (World Health Organization, 2012). However, the average person consumes way more than is recommended (18 g/day in some regions of the world) (Calliope & Samman, 2020).

As there is generally not much sodium to be found in vegetables, a problem of an excess sodium intake is not to be expected when eating from a food forest. As can be seen in Appendix 1, the products that have the highest sodium levels still don't reach the maximum recommended daily intake of sodium, even if you eat a lot of it. A diet from a food forest can therefore be a healthy alternative to a more processed, high sodium diet.

Calcium

Calcium is needed for a strong skeleton, and it plays a role in several metabolic processes. A calcium deficiency can cause osteoporosis and should be avoided at all times. Calcium can mainly be found in dairy products, but also in some cereals, vegetables (mostly kale, broccoli and watercress) and seeds and nuts (mostly almonds, sesame and chia) (Cormick & Belizán, 2019). The recommended dietary intake of calcium is 1000 mg per day (National Institutes of Health, 2021-a).

In spring, summer and autumn, there are enough calcium-rich products to be found in a food forest, as shown in Appendix 1. However, it could become difficult to have a sufficient calcium intake in winter when only eating from a food forest. It would be possible to consume nuts that are left from the autumn. It would also be possible to make jams and compotes out of the calcium-rich fruits and vegetables that are picked in the summer, like the apple rose and cardoon. Otherwise, supplementation with annual crops or products from outside a food forest might be a good option. This can be done with kale, broccoli and dairy.

Magnesium

Magnesium serves as a co-factor of enzymes that are involved in energy metabolism and in the maintenance of the electrical potential of nervous cells and membranes. Next to this, it is involved in protein RNA and DNA synthesis. Deficiencies occur very rarely and only when a patient has a very low magnesium intake together with excessive urinary magnesium excretion or diarrhea. The recommended daily intake of magnesium is 220 mg per day for women and 260 mg per day for men. It is present in green leafy vegetables, legumes, seeds, peas, beans, and nuts. (WHO, 1998)

As can be seen in Appendix 1, there is enough magnesium available in food forests to have a sufficient amount of it in the diet. The fact that magnesium is mainly found in leafy vegetables, legumes, seeds, peas, beans and nuts confirms this. There will be no problem with magnesium when eating from a food forest all year round.

Iron
The most important role of iron in the human body is the transportation of oxygen. Next to this, it is used for the transportation of electrons within tissues and as part of enzyme systems (WHO, 1998). Iron comes in two forms: non-haem iron and haem iron. Non-haem iron is mostly found in cereals, pulses, fruits and vegetables. Haem iron is mostly found in meat, poultry and fish (WHO, 1998).

The daily recommended nutrient intake (RNI) for iron is dependent on bioavailability. First, non-haem iron has a naturally lower bioavailability than haem iron (National Institutes of Health, 2021-b). Furthermore, bioavailability is influenced by multiple factors. Phytates that are mostly found in cereals have been shown to inhibit non-haem iron absorption. A high enough amount of ascorbic acids can counteract the inhibition. Tea, coffee, cocoa and green leafy vegetables contain polyphenols that strongly inhibit iron absorption as well. In addition, calcium also inhibits the absorption of haem- and non-haem iron. As said before, ascorbic acid works the best to enhance non-haem iron absorption. Meat, fish and seafood also enhance the absorption of non-haem iron. (WHO, 1998) The RNI of iron can be found in Appendix 1.
The current average intake of iron in the Netherlands is 11.9 mg/day for men and 9.9 mg/day for women (RIVM, 2016).

As can be seen in Appendix 1 there are plenty of iron-rich products in food forests all year round. Think of Chinese cedar, sage, sorrel, cardoon, smooth sumac and Korean nut pine. However, this is all non-haem iron, so the bioavailability is relatively low. The bioavailability of non-haem iron can be increased by a simultaneous intake of meat (National Institutes, 2021-b), but that is not a possibility with eating from a food forest. Simultaneous intake of ascorbic acid can also increase bioavailability. A food forest diet is generally high in ascorbic acid and therefore a beneficial way of enhancing the bioavailability of iron. There is expected to be a sufficient amount of iron in the food forest diet.

Selenium
Selenium is involved in the protection of the body tissues against oxidative stress. It also helps with the maintenance of the defences against infections, and it plays a role in the modulation of growth and development. Next to this, it is involved in the thyroid hormone metabolism pathway. Dietary selenium deficiencies are very uncommon, but can occur in people who are dependent on external feeding. The recommended daily intake of selenium is 26 micrograms for women and 34 micrograms for men. The presence of selenium is dependent on the environment and the amount of selenium in the soil. It is mainly present in products like fish, nuts, meat, whole wheat products and dairy products. (WHO, 1998)

As the main sources of selenium in an omnivorous diet are meat, eggs, fish and dairy, low intakes of selenium are of concern when having a fully plant-based diet. This suggests that people with plant-based diets might need fortified products or supplementation (Fallon & Dillon, 2020). In Appendix 1 it can be seen that there is not much literature found on the selenium content of the products in a food forest. This makes it difficult to analyse the food forest diet on its selenium content. However, plant-based products are often not selenium dense, therefore it is unlikely products from a food forest will contain high amounts of selenium.

Products in a food forest that do have a relatively high amount of selenium are walnuts, pecans, almonds. These nuts could be saved and eaten all year round. However, one would have to eat a lot of nuts to have a sufficient intake of selenium. As said before, the amount of selenium that is in the products from a food forest could differ from the amounts that are in Appendix 1. As it depends on the amount of selenium that is present in the soil. Research about the amount of selenium in the soil of Food Forests should be done in the future. To have a sufficient intake of selenium when eating from a food forest, it is advised to supplement with fish, meat, whole wheat or dairy.

Zinc
Zinc is needed for numerous enzymes that play an important role in the metabolism of nutrients. It contributes to the maintenance of cell and organ integrity, and it has a role in genetic expression. Next to this, zinc is needed for a healthy immune system. Zinc can be found in products like red meat, whole grain cereals, pulses and legumes and a little in leafy green vegetables, fruits, fish, roots and tubers. (WHO, 1998)

The recommended daily intake of zinc is, just like with iron, dependent on the bioavailability of the zinc that is present in the diet. With a high bioavailability, women need at least 3 mg per day and men need at least 4.2 mg per day. With a low bioavailability, these numbers increase to 9.8 mg and 14 mg per day, respectively. Mainly infants, children, adolescents and pregnant women are at risk for zinc deficiencies. (WHO, 1998)

Phytates can inhibit the absorption of zinc (Hambidge, Miller, Westcott, Sheng, & Krebs, 2010). Phytates occur in plant seeds, grains, roots, tubers, fruit, vegetables, nuts and pollen (Rukma Reddy, 2001). Therefore, there are phytates present in a food forest diet. This makes it even harder to have a sufficient intake of zinc and this means that it is best to use the recommended daily intake of 9,8 and 14 mg for women and men respectively.

Nuts have the highest amount of zinc of the products from a food forest (Appendix 1). However, just like with selenium, it would take a very large amount of nuts to come to the preferable intake of zinc. The average intake of people with a plant-based diet is 8.3 mg per day (Fallon & Dillon, 2020). This would be sufficient if the bioavailability of zinc was higher. This is, in all probability, not the case because of the high amounts of phytates in a food forest diet. Therefore, supplementation with products like meat, whole grains, pulses and legumes might be necessary. The absorption of zinc from supplements is the same as the absorption of zinc from the diet. This means that zinc supplements can also be a good way to increase zinc intake (Hambidge et al., 2010).

Iodine
The thyroid gland needs iodine to produce thyroid hormones. These hormones control metabolic processes in the body and play an important role in the growth and development of the body. Thyroid hormones are also involved in the development of the brain and nervous system. Iodine can mainly be found in seawater, and therefore, in seafood and seaweed. Meat, dairy and eggs are also a good source of iodine. The recommended daily intake for adults is 2 micrograms per kg of body weight. Children and pregnant women need more (3.5 micrograms per kg of body weight). Excess iodine intake (more than 30 micrograms per kg of body weight per day) can lead to iodine-induced hyperthyroidism (WHO, 1998). However, this is mainly seen in patients with underlying diseases and is not very common (Roti & Degli Uberti, 2001).

A plant-based diet generally has a lower iodine content than a vegetarian or omnivorous diet. The mean intake of iodine that was found in a study about the intake of micronutrients in women with vegan diets, was 24.4 micrograms (Fallon & Dillon, 2020). This is way below the recommended daily intake of 2 micrograms per kg of body weight. Our literature research about the micronutrients in products from a food forest confirms this, as can be seen in Appendix 1.

In the Netherlands, the government decided to add iodine to table salt and the salt that bakers use to reduce the iodine deficiencies in the population. These makes bread the main source of iodine in the diet of many Dutch people (Voedingscentrum, n.d.-a). When eating from a food forest, you won't eat pre-baked bread from the bakery or grocery store. This means that the main source of iodine is no longer present. Therefore, intake of iodine enriched salt, seafood, meat, dairy, eggs or supplements would be necessary to prevent iodine deficiencies.

Vitamin A

The human body needs vitamin A for the functioning of the visual system and growth and development. Furthermore, vitamin A is needed for the maintenance of epithelial cellular integrity, immune function and reproduction (WHO, 1998). It is present in two different forms: retinol and provitamin A (carotenoids). The body forms retinol itself from the carotenoids in the diet (During & Harrison, 2007). However, food products differ in the efficiency in which vitamin A can be absorbed in the body. Foods that contain pro-vitamin A carotenoid tend to be less biologically available. Except for animal products, in which they seem more affordable. Furthermore, absorption is also dependent on the fat content of a meal. Therefore, the FAO and WHO developed the concept Retinol Equivalent (RE) to express the vitamin A activity of carotenoids to account for the bioconversion of the carotenoids present in foods to active vitamin A (FAO, 2001). Appendix 1 will therefore mainly show the vitamin A content of food forest products in retinol equivalents. Retinol is present in animal products and provitamin A is found in leafy green vegetables, yellow vegetables and yellow and orange non-citrus fruits (WHO, 1998). The mean requirement of vitamin A in retinol equivalents is 270 µg for women and 300 µg for men (WHO, 1998).

The fact that vitamin A can be found in yellow vegetables is clearly seen in Appendix 1. The products from a food forest that contain the most vitamin A are dandelion, apricots and yellow horn. People that have a fully plant-based diet generally get enough vitamin A, and it is not expected that this would be different when eating from a food forest (Fallon & Dillon, 2020).

Vitamin B1

Vitamin B1, also known as thiamine, serves as a cofactor for enzymes that play a role in energy metabolism. These enzymes are needed for the production of neurotransmitters and oxidant stress-reducing substances (Fattal-Valevski, 2011). The recommended daily intake of vitamin B1 is 1.1 and 1.2 mg per day for women and men, respectively (WHO, 1998). Vitamin B1 is present in enriched bread and cereals, peas, beans, nuts, brown rice and meats. Anti-thiamine enzymes, that inhibit the absorption of thiamine, are present in raw fish, raw shellfish, blueberries, red currants, red beets, Brussel sprouts, red cabbage, betel nuts, coffee and tea (Fattal-Valevski, 2011).

There are enough products in a food forest that contain vitamin B1, as can be seen in Appendix 1. The intake of thiamine when fully eating from a food forest is high enough to reach the recommended daily intake.

Vitamin B2

Vitamin B2, also known as riboflavin, has a coenzyme function in some oxidation and reduction reactions (WHO, 1998). These enzymes play a major role in energy production (National Institutes of Health, 2021-c). The recommended daily intake of vitamin B2 is 1.1 and 1.3 mg for women and men, respectively. The major cause of vitamin B12 deficiency is a limited food supply or poor food storage. Deficiencies can also occur due to abnormal ingestion, for example with lactose intolerance or celiac disease (WHO, 1998).

Vitamin B2 is mainly found in eggs, organ meat, meat, milk, green vegetables and fortified grains and cereals. The main sources of vitamin B2 are milk (products) and bread (National Institutes of Health, 2021-c). These two food groups are both not available in a food forest. Smooth sumac, sugar maple, sorrel, sage and almonds are products from a food forest that do contain relatively high amounts of vitamin B2 (Appendix 1). However, these few foods might not be enough to reach the recommended daily intake of B2. Because of this, supplementation with eggs, organ meat, milk, grains or cereals might be necessary.

Vitamin B6
Vitamin B6 serves as a carbonyl-reactive coenzyme to various enzymes that are involved in the metabolism of amino acids. Vitamin B6 can mainly be found in meats, vegetables, fruits and whole grains (National Institutes of Health, 2021-d). The recommended daily intake of vitamin B6 is 1.3 mg for both women and men (WHO, 1998).

The main source of vitamin B6 of adults in the US is fortified cereals, beef, poultry, starchy vegetables and some fruits (National Institutes of Health, 2021-d). Most of these are not available in a food forest. As can be seen in Appendix 1, there are not many products from a food forest that contain a lot of vitamin B6. Smooth sumac is the main source of vitamin b6 from a food forest according to Appendix 1. Walnuts, hazelnuts, maidenhair trees and chestnuts are other products with a relatively high amount of vitamin B6. It is recommended to complement the food forest diet with some products that are vitamin 6 dense, or to add supplements to complete the diet.

Folate
Vitamin B9 or folic acid, previously known as vitamin B11, is needed to synthesize, repair and methylate DNA. It is also important during cell division and cell growth (WHO, 1998). This vitamin comes in two forms: folic acid and folate. Folic acid is a synthetic compound that is used in supplements and fortified foods. Folate is the natural form (Sobczyn & Harrington, 2018), and is less stable than folic acid. Folate can be found in dark leafy green vegetables, fruits, nuts, beans, peas, seafood, eggs, dairy, meat, poultry and grains (Folate - Health Professional Fact Sheet, 2021). The recommended daily intake of folate is 400 µg of food folate for both women and men. Pregnant women need a higher amount (Folate - Health Professional Fact Sheet, 2021).

Products from a food forest with the highest content of folate are Chinese pepper, asparagus, artichoke and Babington's leek as can be seen in Appendix 1. Especially the Chinese pepper contains a large amount. However, it is not realistic to consume substantial amounts of the pepper. The other folate sources from a food forest are not high enough to have a sufficient amount of folate, so supplementation with folate rich products like beans, peas, seafood, eggs, dairy, meat, poultry or grains, is recommended.

Vitamin B12
Vitamin B12, also known as cobalamin, is needed for the production of red blood cells, the function of the central nervous system and DNA synthesis (National Institutes of Health, 2021-e). Microorganisms synthesize vitamin B12 and are the only source of vitamin B12. The microorganisms often do this inside the gastrointestinal tract of animals. The vitamin is then absorbed into the meat (WHO, 1998). This is why the main sources of vitamin B12 are fish, meat, poultry, eggs and dairy. The recommended daily intake of vitamin B12 is 2,4 µg for both women and men (National Institutes of Health, 2021-e).

Consuming enough vitamin B12 is often a challenge with having a vegan diet. Half of the vegan population studied by Gilsing et al. had a vitamin B12 deficiency (Gilsing et al., 2010). As can be seen in Appendix 1, there are only two sources of vitamin B12 in the food forest diet: sea buckthorn and smooth sumac. These products both contain a substantial amount of the vitamin, so if they are preserved, and eaten the whole year round, it would be sufficient. Otherwise, consumption of fish, meat, poultry, eggs, dairy or supplements might be necessary.

Vitamin C
Vitamin C is needed in the body as an electron donor for several enzymes. It works as an antioxidant and promotes the absorption of non-heme iron. Vitamin C can be found in fruits and vegetables, mainly citrus fruits, cabbage, broccoli and peppers. The recommended daily intake of vitamin C is 98 mg and 101 for women and men, respectively (WHO, 1998). As can be seen in Appendix 1, there is

plenty of vitamin C rich products in a food forest. Having a sufficient vitamin C intake when eating from a food forest will not be a problem.

Vitamin D

Vitamin D is needed to maintain normal blood levels of calcium and phosphate in the body. It also plays a role in the production of proteins that are needed for cell development and division. Several populations can be at risk for vitamin D deficiency, such as infants, people with a dark skin colour and elderly(FAO/WHO, 2001).

Vitamin D is mostly made by our body due to UV-exposure from the sunlight. Vitamin D directly made from UV-rays is called vitamin D3(FAO/WHO, 2001). However, humans can also obtain dietary vitamin D (D2) from fatty fish, meat and eggs. In the Netherlands, vitamin D2 is often added to margarine and other products used for baking and frying, except oil (Voedingscentrum, n.d.-e). The recommended vitamin D intake for adults is 5 µg/day, for elderly, above 65 years, the recommended intake is 15 µg/day(FAO/WHO, 2001). Since dietary vitamin D is mainly present in animal products, it is difficult to obtain vitamin D2 from a food forest. This can also be seen in Appendix 1, where only Szechuan peppers contain a little amount of vitamin D2. People who solely rely on products from a food forest should therefore obtain their vitamin D from UV-rays or should take supplements.

Vitamin E

Vitamin E is a lipid-soluble vitamin that mainly functions as an antioxidant. It protects the cell membranes and LDL from oxidation by free radicals. Vitamin E seems to be adequately present in diets, except during ecological disasters and conflicts that can lead to food deprivation and famine. Therefore, there are no specific recommendations for vitamin E intake (FAO, 2001).

Vitamin E can be found in vegetable oils, animal fats, meat, nuts, and even some fruits and vegetables. Appendix 1 shows that vitamin E is present in various foods from food forests, such as snow pea, artichoke, mulberry, European plum, currants, chokeberries, hazelnuts, almonds, and Korean nut pine. Since vitamin E is present in a sufficient amount in food forests, it can therefore be concluded that consuming enough vitamin E will not be a problem.

Vitamin K

Vitamin K is needed in the body for the production of vitamin K-dependent proteins. These proteins are involved in the process of blood clotting. Vitamin K deficiency is rare, but can still be a risk for infants around the age of six months. This deficiency is known as haemorrhagic disease or as vitamin K deficiency bleeding. The recommended nutrient intake is around 65 µg for men and 55 µg for women per day. Dietary vitamin K (phylloquinone) is mostly found in green leafy vegetables and certain vegetable oils. Intestinal bacteria can also form vitamin K in the form of menaquinones (FAO, 2001). Appendix 1 shows that vitamin K is present in several products in a food forest, such as horseradish, Babington's leek, artichoke and asparagus. Therefore, having sufficient vitamin K from a food forest will not be a problem.

Conclusion of micronutrient analysis

From the research on the micronutrient composition of food forest products, it can be concluded that there will be no problem with obtaining high enough amounts of sodium, magnesium, iron, vitamin A, vitamin B1, vitamin C, vitamin E and vitamin K. However, for calcium, selenium, zinc, iodine, and the vitamins B2, B6, folate, B12 and D, some supplementation with annual crops or food products from outside a food forest will need to be consumed to meet a sufficient intake.

Overall conclusion

Overall, based on the research done in this chapter, it seems that various micronutrients can easily be obtained from a food forest. Especially vitamins such as vitamin C and minerals like magnesium are present in sufficient amounts. Macronutrients such as proteins and fats are also easily found in nuts and seeds. Fruits and berries can also serve as a source of carbohydrates. However, it seems unrealistic to completely rely on a food forest for a person's nutrient needs in regard to both micro- and macronutrients, because there is a huge variety in what products food forests have to offer per season, and this also affects what and how many nutrients are present per season. For example, during spring and winter, there is a lack of energy-dense products with sufficient amounts of carbohydrates. Addition of annual crops in the diet would be needed besides ingredients from a food forest to compensate for the lack of energy-dense products. Furthermore, there seems to be a lack of availability of proteins in most of the seasons. Only during autumn, there seems to be enough energy-dense products and foods containing sufficient amounts of proteins, fats and carbohydrates. Besides, even though many micronutrients seem to be sufficiently present in a food forest, some micronutrients, such as vitamin B12, calcium, and zinc selenium, zinc and iodine are still lacking. Taking all of this into consideration, it can be concluded that dining from a food forest is a good addition to the current diet of a person, but is not sufficient for a complete and healthy diet.

Analysis of what makes a (food forest) meal attractive?

Introduction

This chapter will explore the research question of how we can make attractive dishes from a food forest through applying different theories. To evaluate what makes an attractive meal and if attractive meals can be made from food forest produce, different aspects of food should be covered. This analysis includes the social construction of taste, cultural aspects of food, the importance of variation and the sensory experience, comprising both flavour (defined as the combination of taste on the tongue and smell in the nose) and visual sensations. To find out what it takes to make attractive meals with food forest produce, we attempted to design dishes with products solely from food forests (see Appendix 2). When referring to our experience, we refer to making these dishes. In order to make an in depth analysis of the attractiveness of food forest meals, a Dutch frame will be applied; Dutch food culture and the wider social context of the Netherlands will be employed.

When it comes to comprehending what makes a meal attractive, science may not always suffice. Gastronomy, defined as "the practice or art of choosing, cooking, and eating good food" can be seen as an art or craft and is thus not a fully exact science. Nevertheless, we see use in employing research into taste and flavour and the human reaction because making attractive meals is not merely a hedonistic exercise. Gastronomy relates to big societal issues such as nourishing the elderly, the food children eat at school or environmental sustainability - concerns that are certainly not trivial and hardly hedonistic (Klosse, 2013).

Wider social context of attractive food

In order to look at the wider social context of food, it is necessary to dive into history and go back almost a century to gain insight into the changing zeitgeist. Since the second world war, the main approach to food has been productionist. The productionist approach, also called agro-industrial approach, means a top-down enforced focus on efficiency and production resulting in large-scale intensification of agriculture and industry (Lang et al., 2015). The main aim of agriculture is to produce as much as possible with the smallest amount of resources possible, and thus be profitable. This resulted in a modernization of agriculture that involves food production in large factories and global distribution; a geographical distancing of producers and consumers. There was no place associated with the food; the place being not just a location, but encompassing natural and human resources (FAO, 2009). This geographical distance is thus also paired with a social distancing of consumers and producers, which induced an increase in anonymity of food: food increasingly came from 'nowhere' (Wiskerke, 2009).

Around 1980, the very first agro-environmental movements arose as a reaction to the negative effects of the agri-industrial system, mainly concerned with animal welfare, attention to nature and transparency for food safety. More recently, since 2010, social food movements flourished. They brought a re-appreciation of local food, traditional knowledge, community, small-scale (short-chain) food production and emphasized the importance of nature and environment. This movement is also called the agro-ecological approach and provides a more holistic approach; a harmonious relationship between people, nature and food is the ultimate goal according to this approach. Locality and ecological implications of food are becoming more important in determining the quality of a product. There is a growing movement of people who want to be more in touch with (the origin of) their food and to eat in balance with the natural environment, and thus also consider the local and ecological quality of food. However, the agro-ecological movement remains a small movement and is still a niche in the current food production system, which is largely agro-industrial (Lang et al., 2015).

In a food forest
Food forests might be able to answer to and benefit from the growing movement of people who practice a more agro-ecological integrated view, for multiple reasons:

1. Food forests provide local food, decreasing the geographical distance between people and food. People can visit the place where their food is grown and in some cases even harvest their own food. In other words, people will be very close to the origin of their food.
2. Consumers from food forests are often acquainted with the food forest owner and/or curator because the food is currently mostly sold in small circles, thus closing the social distance to food.
3. The people who buy/eat from food forests may be able to get acquainted with each other and form a community more easily than those who buy/eat from the conventional supermarkets
4. The produce from food forests is often sold directly to the consumer, or sold in small stores with a short supply chain.
5. Food forests hold a much larger biodiversity than conventional agriculture, thereby answering the demand for more ecological food production and emphasizing the role of nature and the environment.

The social construction of attractive food
What people eat and find attractive can be seen as socially constructed. This is an important subject to explore in answering the research question of what makes an attractive dish from a food forest. Phenomena such as taste, quality and meal structure are all constructed and part of food culture (Carolan, 2016). Therefore, it is important to not only focus on the sensory aspects (flavour and visual) of attractive food, but also to explore what social aspects make food attractive. This will also help with the development of recipes through incorporating social or cultural aspects.

Taste and class distinction
Building on Bourdieu's famous work from 1984, Norbert Elias (2000) takes a very theoretical approach and describes how taste can be labelled as civil or uncivil and is thereby used to maintain (and expand) class distinction in society. Elias goes as far as saying the taste orders society, it organizes people into groups and is therefore vital to individual and group identities. Taste and quality can thus vary considerably based upon people's social networks and personal connections to food (Carolan, 2011). An example of this is how good, expensive wines, accompanied by jargon such as 'bouquet', are associated with the upper class (Bourdieu, 1984). It may be appropriate to mention that these ideas are quite extreme, and that distinction from taste in reality is more a probability than an actual truth.

Where Bourdieu and Elias are mainly concerned with the idea that upper class comes from having a distinctive taste, more recent ideas project that upper class taste is manifested in the idea of cultural omnivorousness. Cultural omnivorousness means that cultural consumption is not limited to a specific taste, but rather involves the consumption of a wide array of cultural activities (Kahma et al., 2016). In relation to food, this is manifested in the consumption of a wide array of food types, where the same person that consumes popular street food can also be educated on high quality wines. Inherent to cultural omnivorousness is a desire for exploration of new and exotic foods (Oleshuk, 2017), that can be used to show off status (Johnston & Baumann, 2014)

Within the analysis of the attractiveness of food forest meals, class distinction will not be applied because it is beyond the scope of this research. Any words on this would thus be highly subjective. However, it is important to recognize that food from food forests could also play a part in establishing class differences. For instance, due to possibly higher prices of food forest produce in relation to the supermarket, eating from a food forest could become an act of the higher class. On the other hand, it also may be interesting to notice that the rarity and unfamiliarity of food forest products may make them more popular among everyone, as the consumption of new and exotic foods are increasingly seen as images of popular food behaviour.

The omnivore's paradox

Related to the idea of cultural omnivorousness and the desire to explore new types of food is the omnivore’s paradox. What makes a meal attractive is not only the appreciation for exoticism, but is also linked to memories and nostalgia. People instinctively prefer the flavours they grew up with, an example of which was a blind taste test of home-made and commercial strawberry jam. The participants said to prefer home-made, but the taste test results showed preference for the commercial jam they grew up eating (Hayes-Conroy and Hayes-Conroy, 2008). Our eating behaviour is thus largely rooted in familiarity, habits and routines, which can provide a challenge for changing these behaviours according to these particular studies (Graçaa, Calheirosa, & Oliveira, 2015). This is also evident in the famous omnivore’s paradox; people are attracted by new foods, but at the same time they have a preference for foods of which they already know that they taste good (Pollan, 2009). Adding a familiar flavour principle to an unknown food may also help to bridge the cultural gap and increase the willingness to try the food (Stallberg-White & Pliner, 1999).

In a food forest

Although cultural omnivorousness and the increased desire to try new foods may have a positive impact on the consumption of rare and unfamiliar food forest ingredients, the omnivore’s paradox shows that familiarity is still highly valued. The familiarity that people instinctively prefer can be created by using the food forest products in known recipes, thereby increasing people's willingness to try and appreciation of the food as described above. However, many familiar dishes of Dutch food culture require building blocks such as grains (rice or pasta) or starchy vegetables (potatoes), all of which are currently only produced in conventional agriculture. Furthermore, dairy and meat are presently an important part of Dutch food. By using only food forest produce, none of these ingredients are present in the dishes. Familiar dishes can be created, but options are relatively limited when using only food forest produce. For example, a tagine without couscous is still a tagine, but making 'stamppot' (potatoes mashed with vegetables) without potatoes proves to be more difficult.

Not being able to create familiar dishes is one side of the omnivore's paradox. The other side can be employed to make the argument that food forest products are inherently attractive precisely because they are new and unknown, which is also argued by the theory of cultural omnivorousness.

Dutch food culture

Food is important in building national and regional identities, and this is shown in food culture (Carolan, 2016). To make the social context of food that will be applied in this report more tangible, we will zoom in on Dutch food culture. In "a brief history of the Dutch cuisine", Jacques Meerman (2015) starts by describing the historical Dutch preference for simplicity in their food. One specific habit of the Dutch is eating bread daily at breakfast and/or lunch. Furthermore, the Dutch diet is 25% animal-based and dairy, alcohol, snacks, sugar and fat intake is higher than in other European diets (RIVM, 2016). In addition, one research commissioned by Voedingscentrum (GfK, 2016) shows that in terms of variety, 45% of Dutch people try a new recipe every month. When choosing what to cook, 96% think taste is important, 89% variation and 85% think health is an important aspect. The cooking time of a meal is also culturally varied, an average Dutch consumer wants to spend a maximum of 30 minutes cooking during weekdays. On the weekend, this can be longer (Gfk, 2016).

Meerman (2015) further notes that the Dutch cuisine has always been a blend of unique Dutch recipes mixed with popular European and Arabic preparations. Many recipes that most Dutch people will see as uniquely Dutch, such as the 'bitterbal' or a 'stamppot’ are actually variations on foreign dishes. Moreover, in a recent cookbook publication 'the bible of the Dutch cuisine', esteemed Dutch food writer Janneke Vreugdenhil (2020) notes the ease with which the Dutch adopt new dishes and ingredients as their own. Eating traditional Dutch pea soup one day and couscous the next is perfectly normal. Dutch food culture can be seen as highly adaptive, which is also evident in the quick rise of vegetarian meat alternatives that are increasing steadily in number and in popularity. Which foods are considered attractive can thus change considerably. This provides a counter-argument to the preference towards familiar food as mentioned earlier, and thus an argument for swift adoption of new products.

In a food forest
As mentioned previously, people instinctively prefer familiar food, but can at the same time be curious about trying new food: the omnivore's paradox. This paradox is present in cultures around the world, and thus also in the Netherlands. However, as described above, the Dutch are notoriously good at adopting new dishes and products as their own. This open attitude could promote the embracing of food forest products in Dutch Food culture. Nevertheless, it will be a challenge to change the current eating patterns with 25% animal-based products. In addition, food forest ingredients are currently rare and quite unknown to the wider public. Cooking with these ingredients might thus be a challenge to the Dutch consumer, who appears to prefer simplicity to complexity of food.

Moreover, Dutch people value variation in their diet, which could provide a challenge. Food forest produce is mostly made up of fruits and vegetables, and the variety of energy-dense foods is low. To make a complete dinner, some energy-dense foods are required. Due to the low variety in these, an eating pattern fully composed of food forest foods will often build on the same base of energy-dense foods and is thus not very varied.

Sensory Modalities

Flavour
Different sensory modalities make a meal attractive to the consumer. In order of importance: taste, smell, visual appearance, tactual properties and sound. The human taste palette differentiates between sweet, salt, umami, sour and bitter, of which the last two may give our brain an indication of a possible harmful product. A study on sensory attributes show that the sweet taste has the most flavour impact on humans, followed by sour, salty and umami (Lease et al., 2016). Supplementing the five tastes we can distinguish on our tongue, are the thousands of smells that our nose can detect. Taste and smell together form the countless different flavours that can be found in our foods.
In general, attractive dishes offer complexity by the combination of different notes of flavour; usually consisting of base, middle and top notes. The base notes are usually the notes that add depth to the dish, through earthy or umami flavours. The middle notes account for the main substances in the dish, which could be vegetables, meat or grains. Lastly, the top note adds a ‘bright’ note: acidity in the form of citrus or fresh herbs. Often, the cooking of a meal starts with a flavour base. This could be a combination of aromatic vegetables, herbs and spices, think of an Italian sofrito or a French mirepoix. Such combinations can unite the base, middle and top notes. The addition of a sauce provides a harmonious combination of flavour as well as sensory properties (Schifferstein, Kudrowitz & Breuer, 2020).

In a food forest
Using the aforementioned framework for food aesthetics, we find several issues in producing attractive dishes with food forest produce. The base notes in a dish, the earthy, umami flavours, are harder to find in food forest produce due to the large share of fruits and vegetables which are often quite fresh in flavour. The only examples for base notes that are given in the food aesthetics frame that can be also found in the food forest are mushrooms, roasted flavours or fermented products.

However, not all products can be roasted; the wide variety of leaf vegetables a food forest produces, for example. Nonetheless, creating a roast flavour is a possibility. The same applies to fermentation, but this requires some dedication by the cook, as it can be a difficult job to get right. Mushrooms are a great ingredient to create an earthy base note, but using only mushrooms as a base may cause a lack in variety. Additionally, the onions that are often used in the base notes of a dish are not present in a food forest but can probably be replaced by other allium kinds such as ransom and babington leek and the surprisingly flavourful Chinese cedar.

The middle notes, or the substance of the dish, which is a combination of vegetables, grains and possibly meat or fish, should not specifically provide the bright/sour/sharp/herbal flavours nor the deep roasted/meaty/umami flavours. The myriad of vegetables and leaves that grow in a food forest are capable of fulfilling this job. However, the designers of the base-middle-top notes framework meant for the middle notes to also contain some more neutral flavours such as grains or starch vegetables. Food forests are not rich in such products, and there could therefore be a lack of neutral ingredients to use as middle notes.

Food forests are very rich in ingredients that can provide top notes in dishes. Top notes are the volatile first scents to be perceived, such as citrus or fresh herbs. Food forests are host to a large variety of aromatic herbs and plants, many of which are yet unknown to people. This aromatic richness contributes significantly to the attractiveness of food forest dishes.

Besides the base, middle and top notes, Schifferstein, Kudrowitz & Breuer (2020) also describe the ‘flavour base’ as used by the culinary world. The culinary flavour base is a combination of (regional) aromatic vegetables, herbs and spices that is used in a certain cuisine. Examples are Italian sofrito, French mirepoix, Indian or Thai curry paste and Indonesian bumbu. Of eleven examples of such culinary traditional flavour bases given, nine contain onion, and all of them are exclusively composed of annual vegetables. Some herbs and spices are perennial; for example bay leaves, thyme, sage, cinnamon, nutmeg and cloves, though not all could grow in food forests in the Netherlands. It could be a challenge to create some of the dishes that require these bases without the traditional ingredients.

Nevertheless, this is just one framework on making attractive food, there are many more ways to cook flavourful food. Not all dishes we know and love may be doable with just food forest ingredients, but the large variety of (new) flavours makes a food forest a culinary wonderland.

Visual
Besides the taste of a meal, the visual perception is also an important aspect to what makes a meal attractive. The visual aesthetics differ according to trends, the type of cuisine, the formality of the environment, etc. Recent plating trends include stacking food to make it look more impactful and dynamic, tapas style dishes, creating appealing food ‘art’ for social media and molecular spherification of sauces for example (Koh, 2015). In general, little research has been done on what the optimal way of presenting food is to make it more attractive. However, research shows that some general rules apply. For example, a white background is the best option in restaurants which serve different types of dishes. Furthermore, it matters how a plate is placed in front of the eater by having certain elements at a particular angle. Finally, centred dishes are generally preferred over one side arranged dishes (Schifferstein, Kudrowitz & Breuer, 2020).

Touch and auditory
Besides flavour and visual perception, touch and sound play an important role as well. Mouthfeel of food differs across cultures. Where Western cultures like a more chunky texture, Asian people prefer a smooth, puréed mixture of proteins and starches. The sound of food matters more than we might

be aware of; quality, freshness and pleasantness of food is often linked to auditory perception: how crunchy a chip is for example.

So, which rules do chefs use, to make sure that these sensory combinations above are pleasant? In general, science is unable to provide clear-cut rules as to what good, universally appreciated combinations there are in meals. It is and remains largely a creative terrain of artists and craftsmen. It is important to build up complexity in the different courses of a meal (Schifferstein, Kudrowitz & Breuer, 2020).

Conclusion

Based on the research done in this chapter, it can be concluded that it is absolutely possible to make attractive meals with food forest produce, but it does require commitment. The level of commitment depends on how much food forest products the meal consists of and how uncommon the ingredients are. Building up the flavour notes will take some practice and experimentation, as a wide variety of base and middle notes are lacking or need to be reinvented through applying different cooking techniques. However, with creativity and an open mind, a food forest is a culinary wonderland.

The social context and cultural appropriateness of using food forest ingredients for the consumer is an important aspect of attractiveness of the dishes. The omnivore's paradox is constantly present and must at times be overcome, for example by blending the new (and unfamiliar) food forest ingredients into culturally familiar recipes. This could be a challenge in a Dutch diet as many of our staple products (e.g. dairy, potatoes and grains) are missing.

Analysis of the developed recipes

This project has involved the creation of recipes to determine whether attractive dishes can be made from food forest ingredients (see figure 9 and Appendix 2). In this chapter, an analysis will be done on the healthiness and attractiveness of these recipes.

Figure 9: recipe development

Health

To analyse whether the designed food forest recipes can be considered as complete and nutritious meals as well, they have been compared to the Dutch guidelines on Healthy Nutrition. The Dutch guidelines have been made for the average Dutch healthy consumer, and is therefore not always applicable to the produce growing in a food forest. However, it gives a good indication of the important nutrients and ingredients that might be missing to form a complete and healthy meal (see figure 10).
A complete main dish meal, according to Voedingscentrum (2019), consists of:

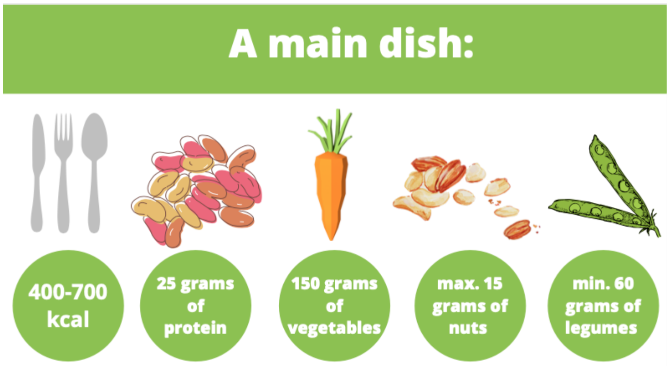


Figure 10: Guidelines for a main meal (Voedingscentrum, 2019)

When comparing these guidelines to the nutritional value of our recipes, all of our main courses adhere to the caloric recommendation. Unfortunately, the recipes do not meet the required 25 grams of protein and get stuck around the 10 gram mark. This is mainly due to the fact that there are no major sources of protein growing in the food forest. Nuts are an important source of protein and healthy fats, but the Dutch guideline advises no more than 15 grams in a main dish. This is due to the high caloric value and fat content of nuts. It can be argued, however, that in the case of eating from a food forest, these are important ingredients to attain those nutrients from and thus must generally exceed the 15 grams to meet a person's nutritional needs, like we have done in our dishes. Legumes are annual crops and therefore do not grow in food forests.
Meeting the 150 grams of vegetables per serving is not a problem for the recipes from food forests, usually there is more than the recommended amount and additional fruit included as well.

There are no specific guidelines for desserts, snacks or side dishes, and therefore we cannot make a scientific comparison. However, from a nutritionists' perspective, the whole foods being used in all the recipes with plenty of fruit, nuts and vegetables provides a variety of micro- and macronutrients. Once again, protein and carbohydrates content is relatively low due to a lack of staple crops and protein sources. However, one can meet their energy, fat and fibre requirements with recipes from a food forest.

Attractiveness

Our own experience with creating dishes (see attached recipe booklet) taught us that cooking with unknown food forest produce is not easy, mostly because we never encountered many of these products before. Partially also because the products from food forests are currently scarce, difficult to acquire and highly season bound. Even though it was very exciting to work with previously unknown ingredients, it was a demanding task. We therefore opted for making a basic list of pantry items available to be able to cook with. We expect it to be necessary to always have some essential items from the pantry at hand in order to make a tasty dish, such as: salt, pepper, spices, sugar, bouillon cubes, vinegar and (vegan) butter. These ingredients make it possible to create a deeper flavour and different types of dishes, a stew for example. Furthermore, throughout the process, we realized that the inclusion of some annual crops are necessary to be able to create an array of attractive dishes. The vegetables solely coming from a food forest lack substantial ingredients to have enough variety in a diet. The annual crops we used are potential crops that can grow alongside or in a food forest, based on conversations with food forest holders. For example, in a winter recipe we used Jerusalem artichoke in order to create an alternative to mashed potato and in an autumn recipe sweet potato and red beetroot have been included.

Creating an attractive dish with a new ingredient requires research and trial and error, for both of which time and resources were limited. Moreover, information on the internet or in cookbooks on many of the ingredients is scarce because they are currently so rare. At the moment, it will thus take curiosity, time and willingness for people to engage in cooking from a food forest and overcome the omnivore's paradox.

Discussion

During this project, several limitations of the research process were found. These limitations will be discussed in this chapter.

Recipe development

The process of developing attractive recipes with unknown ingredients is lengthy and requires a fair amount of trial and error, think of the chefs like Emile van der Staak that spend months trying to perfect a Chinese Mahogany broth for example. Time and resources were limited for this ACT project, with the consequence that some recipes have not been tested but have been developed hypothetically. This was also due to the fact that we were not able to acquire some ingredients, either due to seasonality or availability. The hypothetical recipes include: summer salad, autumn tray bake, winter mushroom stew and the spring salad.

Preservation techniques

The use of preservation techniques like fermentation or drying have not been researched or taken up into the recipe bundle, nor the health analysis. The reasons for this were a lack of knowledge on the effect of preservation on the nutrient values, limited time for experimenting in the kitchen with these techniques, and the assumption that fermentation is less accessible for the regular consumer. However, these are important practices when it comes to cooking from a food forest all year round and therefore should be taken into account in further research. From a health aspect, the effect of preservation could have a positive effect on the micronutrient values, further research needs to be conducted on this. Finally, the recipe development process has been done purely on the basis of personal culinary experience and literature theory on what makes a meal attractive. The conduction of sensory research with consumers would have given a more complete image of how attractive the dishes are thought to be.

Health aspects of a food forest diet

The designed list with a range of ingredients is a selection of food forest produce and therefore does not include all possible plants that grow in a food forest. Actual potential intake of a food forest could thus differ from our analysis. The table of nutrient values of food forest products is not complete due to the fact that the nutritional information was not available from every product or came from an unreliable source. Most of the nutrient values were taken from the NEVO table. However, in discussions with food forest holders we talked about the possibility that there is a difference in nutrient content between food forest products and conventional agricultural products due to the soil quality, and the presence of certain bacteria which could enhance nutritional value. This is an area that we did not go into further depth as it is beyond the scope of our expertise and requires further research. There are still knowledge gaps when it comes to the nutritional composition of certain plants, this has been a limitation in answering whether a healthy diet from a food forest is possible.

When zooming into the macronutrients, this report did not take into account protein quality, as the amino acid composition of the various products was not looked at. Again, this was due to lack of information and time. Thus, we cannot be sure that all the essential amino acids are met through a food forest diet. We expect there to be a shortage in amino acids from grains and legumes.
The composition of bioactive compounds such as (poly)phenols, flavonoids and tannins and their health benefits have not been taken into account in this project, but are an interesting field for further research to see to what extent these are present in a food forest.

Annual crops
A discussion point that keeps coming back throughout the report is whether annual plants can be part of a food forest or not. Expert opinions on this subject differ, and the Green Deal food forest definition only includes perennials. However, our conclusion shows that you need annual crops in order to have a fully healthy and attractive diet. So, it will be a discussion point for food forest holders in the future: should we cultivate annual crops, buy them from the (conventional) neighbour farm next door or solely grow perennials in the food forest?

Future research
The most important areas of further research on this topic include:

1. Nutrient composition, due to the fact that a lot of the food forest products lack information on their nutritional composition. In addition, it is suggested that the nutrient composition of foods in a food forest is different from products from conventional agriculture. This could be due to the difference in quality of the soil and what minerals and bacteria are present. Modelling tools can be used for the calculation of the compositions.
2. The importance of bioactive compounds in foods, since some of these compounds, such as antioxidants, can be beneficial for a person’s health, or can influence the absorption of other micronutrients in the body, e.g. tannins. Researching the presence of these compounds can therefore further explain the health-effects of products from a food forest.
3. Amino acid composition of products, this information is needed to be completely sure that a food forest can offer all the essential amino acids that a person needs in sufficient amounts.
4. Effect of different preservation techniques on nutrient composition of food forest products. This is to be sure that the nutrient composition of these foods can be maintained throughout other seasons, so consumers can optimally make use of these products to get all the macro and micronutrients they need.
5. Further experimentation on cooking with food forest ingredients is necessary to gain further insight into different flavours and applications and how this translates to an attractive dish for the consumer.
6. Consumer sensory research, via sensory research, the opinions of consumers on the attractiveness of several recipes that include food forest ingredients can be assessed. Performing sensory research will give extra confirmation that meals based on food forest ingredients are attractive for various consumers.

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Appendix 1: Variety and Nutrients List Food Forest

Justification of choice: variety list

For the list of varieties from food forests, we have built upon existing lists that are created by *Stichting Voedselbosbouw Nederland*. *Stichting Voedselbosbouw Nederland* has created four lists of varieties with specific themes to categorize the varieties found in food forests. These themes are volume production, gastronomy, experience and biodiversity. The varieties of the list of volume production are better known to the broader public and easy to produce on a bigger scale. In the gastronomy list, the chosen varieties are known for their extraordinary flavours. The varieties of the experience list have extra value due to their shape, growth, inflorescence, taste and ways they can be prepared. In the biodiversity list, varieties are included that provide food and habitat for organisms within the food forest. Because this project has a great focus on the food that comes out of a food forest, we have decided to combine the volume production list, the gastronomy list and the experience list into one main list that we will further use in this report. The varieties of our list are thus selected based on their potential to be meaningful for the creation of healthy and attractive meals out of a food forest.

In addition to the usage of these lists, we have added varieties that we came across in the food forest *Lekkerlandgoed* in Haarzuilens and *Voedselbos Droevendaal* in Wageningen. We believe this is a relevant addition to the lists by *Stichting Voedselbosbouw Nederland.*

Our lists exist of the scientific classification of the variety, its Dutch name and English name, the product type that it delivers, the season of harvest and the flavour profile.

Table 1: Recommended Nutrient Intake for minerals

	Calcium	Magnesium	Low-bioavailable iron (5%)	High-bioavailable iron (15%)	Selenium	Low-bioavailable zinc (15%)	Moderate bioavailable zinc (30%)	High-bioavailable zinc (50%)	Iodine
Male	19- 65 years: 1000 mg/day 65+ years: 1300 mg/day	19-65 years: 260 mg/day 65+ years: 224 mg/day	Adult: 27.4 mg/day	Adult: 9.1 mg/day	19-65 year: 34µg/day 65+ year: 33 µg/day	Adult: 14 mg/day	Adult: 7 mg/day	Adult: 4.2 mg/day	2 µg/kg/day Upper limit: 30µg/kg/day
Female	1000 mg/day	19-65 years: 220 mg/day 65+ years: 190 mg/day	Adult: 58.8 mg/day	Adult: 19.6 mg/day	19-65 year: 26 µg/day 65+ year: 25 µg/day	Adult: 9.8 mg/day	Adult: 4.9 mg/day	Adult: 3.0 mg/day	2 µg/kg/day Upper limit: 30µg/kg/day
Pregnant	last trimester: 1200 mg/day				2nd trimester: 28 µg/day 3rd trimester: 30µg/day	11-20 mg/day	5.5-10 mg/day	3.4-6 mg/day	3.5 µg/kg/day Upper limit: 40µg/kg/day
Lactating	1000 mg/day		30 mg/day	10 mg/day	0-6 months: 35 µg/day 7-12 months: 42 µg/day	14-19 mg/day	7.2-9.5 mg/day	4.3-5.8 mg/day	3.5 µg/kg/day Upper limit: 40µg/kg/day

Post-menopause	1300 mg/day		22.6 mg/day	7.5 mg/day					

Table 2: Recommended Nutrient Intake for vitamins

	Vitamin A*	**Vitamin B1 (thiamin)**	**Vitamin B2 (riboflavin)**	**Vitamin B6**	**Vitamin B9/B11 (folate/folic acid)**	**Vitamin B12**	**Vitamin C****	**Vitamin D*****	**Vitamin E**	**Vitamin K**
Male	Adult: 300 µg RE*/day	1.1 mg/day	1.6 mg/day	1.8 mg/day	400 µg/day	2.4 µg/day	Adults: 45 mg/day	19-50 year: 5µg/day	14.6 mg/day	65 µg/day
Female	Adult: 270 µg RE**/day	0.9 mg/day	1.3 mg/day	1.5 mg/day		2.4 µg/day	Adults: 45 mg/day	51-65 year: 10 µg/day	11.6 mg/day	55 µg/day
Pregnant	800 µg/day				600 µg/day	2.6 µg/day	55 mg/day	65+: 15 µg/day		
Lactating	850 µg/day				500 µg/day	2.8 µg/day	70 g/day			

*Estimated mean requirement of vitamin A
**RE = Retinol-equivalents
**Upper limit: 1g/day
*** goes for both male and female

Table 3: Variety list from a food forest

Latin name	Dutch name	English name	Harvest/season	Edible part of plant
Spring				
Aralia elata	Duivelswandelstok	Japanese Angelica Tree	Spring	Berries
Larix decidua	Larix	Larch	Spring	Shoots
Robinia pseudo-acacia	Valse Acacia	Black Locust	Spring/Summer	Flowers
Sassafras albidum	Sassafras	Sassafras	Spring/Summer	Young leaves
Toona sinensis	Franse Uiensoepboom	Chinese Cedar	Spring/Summer	Leaves
Vitex agnus-castus	Monnikspeper/Kuisheidsboom	Monk'S Pepper/Chaste Tree	Spring/Summer/ Autumn	Fruits
Salvia officinalis	Salie	Sage	Spring/Summer/ Autumn/Winter	Leaves
Armoracia rusticana	Mierikswortel	Horseradish	Spring	Roots, leaves
Glechoma hederacea	Hondsdraf	Ground Ivy	Spring	Leaves
Aquilegia vulgaris	Akelei	Columbine	Spring/Summer/ Autumn	Flowers
Mentha spicata 'strawberry'	Aardbeienmunt	Strawberry Mint	Spring/Summer/ Autumn	Leaves
Blitum bonus-henricus	Brave Hendrik	Good-King Henry	Spring/Summer/ Autumn/Winter	Leaves, stem
Tilia	Linde	Linden	Spring/Summer/ Autumn	Leaves
Myrrhis odorata	Roomse Kervel	Sweet Cicely	Spring/Summer/ Autumn	Seeds
Mentha suaveolens	Witte Munt	Apple Mint	Spring/Summer/ Autumn	Leaves
Mentha spicata 'Maroccan'	Marokkaanse Munt	Maroccan Mint	Spring/Summer/ Autumn	Leaves
Mentha spicata 'Russian'	Russische Munt	Russian Mint	Spring/Summer/ Autumn	Leaves
Pisum sativum var. saccharatum	Peulen	Snow Pea	Spring/Summer/ Autumn	Peas
Rumex acetosa	Veldzuring	Sorrel	Spring/Summer/ Autumn	Leaves
Anethum graveolens	Dille	Dill	Spring/Summer/ Autumn	Leaves
Allium ampeloprasum babingtonii	Wilde Prei, Akkerknoflook	Babington'S Leek	Winter/Spring	Leaves, stem
Cynara cardunculus var. scolymus	Artisjok	Artichoke	Spring/Summer/ Autumn	Artichoke

Cynara cardunculus	Kardoen	Cardoon	Spring/Summer/ Autumn	Flower buds, stems
Petasites japonicus	Japans Hoefblad	Japanese Butterbur	Spring	Flower buds
Allium ursinum	Daslook	Ramsons	Winter/Spring/Summer	Leaves, seeds
Annual plants in spring				
Heracleum sphondylium	Berenklauw	Cow Parsnip	Spring/Summer	Stem, leaves, flower buds, seeds
Taraxacum officinale	Paardenbloem	Dandelion	Spring/Summer	Whole
Rheum rhabarbarum	Rabarber	Rhubarb	Spring/Summer	Stem
Asparagus officinalis	Asperges	Asparagus	Spring/Summer	
Symphytum officinale	Smeerwortel	Symphytum	Spring/Summer	Leaves, stem, shoots
Summer				
Amelanchier laevis	Krentenboompje	Smooth Shadbush	Summer	Fruits
Chaenomeles spp.	Chinese Kwee	Flowering Quince	Summer/Autumn	Fruits
Cornus mas	Gele Kornoelje	Cornelian Cherry /Dogwood	Summer/Autumn	Fruits
Ficus carica	Vijg	Fig	Summer/Autumn	Fruits
Gaultheria shallon	Bergthee, Appeltjesblad	Salal	Summer	Berries
Halesia carolina	Sneeuwklokjesboom	Silver-Bell Tree	Summer	Fruits
Hibiscus rosa-sinensis	Hibiscus	Chinese Hibiscus	Summer/Autumn	Flowers, leaves
Hippophae rhamnoides	Duindoorn	Sea Buckthorn	Summer/Autumn /Winter	Berries
Lonicera caerulea	Honingbes	Blue Honeysuckle	Summer	Berries
Morus spp.	Moerbei	Mulberry	Summer/Autumn	Berries
Prunus armeniaca	Abrikoos	Apricot	Summer/Autumn	Fruits
Prunus avium	Zoete Kers	Sweet Cherry	Summer/Autumn	Fruits
Prunus domestica	Mirabel/Kroosjes pruim	European Plum	Summer/Autumn	Fruits
Prunus serotina	Amerikaanse Vogelkers	Black Cherry	Summer/Autumn	Fruits
Prunus tomentosa	Struikkers	Nanking Cherry	Summer	Fruits
Pseudotsuga menziesii	Douglasspar	Douglas Fir	Summer	Shoots, needles
Pyrus communis	Wilde Peer	European Wild Pear	Summer/Autumn /Winter	Fruits

Rhus glabra	Fluweelboom	Smooth Sumac	Summer/Autumn	Berries
Ribes spp.	Bessen	Currants	Summer/Autumn	Berries
Robinia pseudo-acacia	Valse Acacia	Black Locust	Spring/Summer	Flowers
Rubus fruticosus	Braam	Blackberry	Summer/Autumn	Berries
Rubus idaeus	Framboos	Raspberry	Summer/Autumn	Berries
Sassafras albidum	Sassafras	Sassafras	Spring/Summer	Young leaves
Sorbus aucuparia	Lijsterbes	Rowan	Summer/Autumn	Berries
Toona sinensis	Franse Uiensoepboom	Chinese Cedar	Spring/Summer	Leaves
Vaccinium corymbosum	Blauwe Bes	Blueberry	Summer/Autumn	Berries
Vitex agnus-castus	Monnikspeper/Kuisheidsboom	Monk'S Pepper/Chaste Tree	Spring/Summer/Autumn	Fruits
Salvia officinalis	Salie	Sage	Spring/Summer/Autumn/Winter	Leaves
Aquilegia vulgaris	Akelei	Columbine	Spring/Summer/Autumn	Flowers
Mentha spicata 'strawberry'	Aardbeienmunt	Strawberry Mint	Spring/Summer/Autumn	Leaves
Blitum bonus-henricus	Brave Hendrik	Good-King Henry	Spring/Summer/Autumn/Winter	Leaves, stem
Tilia	Linde	Linden	Spring/Summer/Autumn	Leaves
Myrrhis odorata	Roomse Kervel	Sweet Cicely	Spring/Summer/Autumn	Seeds
Ribes nigrum	Zwarte Bes	Blackcurrant	Summer/Autumn	Berries, leaves
Rosaceae	Roos Bloem	Rose	Summer	Fruits, flowers
Mentha suaveolens	Witte Munt	Apple Mint	Spring/Summer/Autumn	Leaves
Mentha spicata 'Maroccan'	Marokkaanse Munt	Maroccan Mint	Spring/Summer/Autumn	Leaves
Mentha spicata 'Russian'	Russische Munt	Russian Mint	Spring/Summer/Autumn	Leaves
Sambucus nigra	Vlier	Elderberry	Summer/Autumn	Berries
Sambucus canadensis	Canadese Vlier	American/Canadian Elderberry	Summer/Autumn	Berries
Pisum sativum var. saccharatum	Peulen	Snow Pea	Spring/Summer/Autumn	Peas
Rumex acetosa	Veldzuring	Sorrel	Spring/Summer/Autumn	Leaves
Anethum graveolens	Dille	Dill	Spring/Summer/Autumn	Leaves
Rubus phoenicolasius	Japanse Wijnbes	Wineberry	Summer	Berries

Cynara cardunculus var. scolymus	Artisjok	Artichoke	Spring/Summer/ Autumn	Artichoke
Cynara cardunculus	Kardoen	Cardoon	Spring/Summer/ Autumn	Flower buds, stems
Allium ursinum	Daslook	Ramsons	Winter/Spring/Summer	Leaves, seeds
Annual plants in summer				
	Boekweit meel	Buckwheat flour	Summer/Autumn	
	Sorghum meel	Sorghum (flour, refined)	Summer/Autumn	
Heracleum sphondylium	Berenklauw	Cow Parsnip	Spring/Summer	Stem, leaves, flower buds, seeds
Anthriscus sylvestris	Fluitenkruid	Cow Parsley	Summer	Flowers, leaves, stems
Taraxacum officinale	Paardenbloem	Dandelion	Spring/Summer	Whole
Rheum rhabarbarum	Rabarber	Rhubarb	Spring/Summer	Stem
Asparagus officinalis	Asperges	Asparagus	Spring/Summer	
Symphytum officinale	Smeerwortel	Symphytum	Spring/Summer	Leaves, stem, shoots
Beta vulgaris subsp. vulgaris var. ruba	Rode Biet	Beetroot	Summer/Autumn	Root
Autumn				
Akebia quinata	Schijnaugurk	Chocolate Vine	Autumn	Fruits
Arbutus unedo	Aardbeiboom	Strawberry Tree	Autumn/Winter	Fruits
Aronia melanocarpa/prunifolia	Appelbes	Chokeberry	Autumn	Berries
Asimina triloba	Pawpaw	Pawpaw	Autumn	Fruits
Carya illinoinensis	Pecan	Pecan	Autumn	Nuts
Castanea sativa	Tamme Kastanje	Sweet Chestnut	Autumn	Nuts
Castanea sativa	Kastanjemeel	Ground Chestnut	Autumn	Nutmeal
Chaenomeles spp.	Chinese Kwee	Flowering Quince	Summer/Autumn	Fruits
Cornus capitata	Wintergroene Kornoelje	Bentham'S Cornel	Autumn/Winter	Fruits
Cornus kousa	Japanse Kornoelje	Chinese Dogwood	Autumn	Fruits
Cornus mas	Gele Kornoelje	Cornelian Cherry /Dogwood	Summer/Autumn	Fruits
Corylus avellana	Gewone Hazelaar	Hazelnut	Autumn	Nuts
Crataegus spp.	Meidoorn	Hawthorn	Autumn	Fruits

Cydonia oblonga	Kweepeer	Quince	Autumn	Fruits
Elaeagnus umbellata	Olijfwilg	Autumn Olive	Autumn	Berries
Ficus carica	Vijg	Fig	Summer/Autumn	Fruits
Ginkgo biloba	Japanse Notenboom	Maidenhair Tree	Autumn	Nuts (ginnan)
Gleditsia triacanthos	Valse Christusdoorn	Honey Locust	Autumn	Fruits
Hibiscus rosa-sinensis	Hibiscus	Chinese Hibiscus	Summer/Autumn	Flowers, leaves
Hippophae rhamnoides	Duindoorn	Sea Buckthorn	Summer/Autumn /Winter	Berries
Juglans regia	Walnoot	Walnut	Autumn	Nuts
Juniperus communis	Jeneverbes	Common Juniper	Autumn	Berries
Malus spp.	Wilde Appel	Crab Apple	Autumn/Winter	Fruits
Mespilus germanica	Wilde Mispel	Medlar	Autumn	Fruits
Morella caroliniensis	Wasgagel	Small Bayberry	Autumn	Berries
Morus spp.	Moerbei	Mulberry	Summer/Autumn	Berries
Pinus koraiensis	Koreaanse Pijnboom	Korean Nut Pine	Autumn/Winter	Nuts
Prunus armeniaca	Abrikoos	Apricot	Summer/Autumn	Fruits
Prunus avium	Zoete Kers	Sweet Cherry	Summer/Autumn	Fruits
Prunus domestica	Mirabel/Kroosjes pruim	European Plum	Summer/Autumn	Fruits
Prunus dulcis	Amandel	Almond	Autumn	Nuts
Prunus serotina	Amerikaanse Vogelkers	Black Cherry	Summer/Autumn	Fruits
Pyrus communis	Wilde Peer	European Wild Pear	Summer/Autumn /Winter	Fruits
Quercus ilex	Steeneik	Holly Oak	Autumn	
Quercus ilex ballota	Steeneik	Holm Oak	Autumn	
Rhus glabra	Fluweelboom	Smooth Sumac	Summer/Autumn	Berries
Ribes spp.	Bessen	Currants	Summer/Autumn	Berries
Rosa rugosa	Rimpelroos	Apple Rose	Autumn	Fruits
Rubus fruticosus	Braam	Blackberry	Summer/Autumn	Berries
Rubus idaeus	Framboos	Raspberry	Summer/Autumn	Berries
Schisandra chinensis	Vijfsmakenbes/P eperbes	Magnolia Berry	Autumn	Berries
Sorbopyrus auricularis (shipova)	Peerlijsterbes	Shipova, Bollwyller Pear	Autumn	Fruits
Sorbus aucuparia	Lijsterbes	Rowan	Summer/Autumn	Berries

Vaccinium corymbosum	Blauwe Bes	Blueberry	Summer/Autumn	Berries
Viburnum setigerum	Thee Virburnum, Sneeuwbal	Tea Viburnum	Autumn	Berries
Vitex agnus-castus	Monnikspeper/Kuisheidsboom	Monk'S Pepper/Chaste Tree	Spring/Summer/ Autumn	Fruits
Vitis vinifera	Druif	Grapevine	Autumn	Fruits
Xanthoceras sorbifolium	Chinese Kastanje	Chinese Flowering Chestnut/Yellow horn	Autumn	Nuts
Zanthoxylum simulans	Szechuan Peperboom	Chinese Peper	Autumn	Fruits, shoots, leaves
Salvia officinalis	Salie	Sage	Spring/Summer/ Autumn/Winter	Leaves
Aquilegia vulgaris	Akelei	Columbine	Spring/Summer/ Autumn	Flowers
Mentha spicata 'strawberry'	Aardbeienmunt	Strawberry Mint	Spring/Summer/ Autumn	Leaves
Blitum bonus-henricus	Brave Hendrik	Good-King Henry	Spring/Summer/ Autumn/Winter	Leaves, stem
Tilia	Linde	Linden	Spring/Summer/ Autumn	Leaves
Juglans ailantifolia	Hartnoten	Japanese Walnut, Heartnut	Autumn	Nuts
Myrrhis odorata	Roomse Kervel	Sweet Cicely	Spring/Summer/ Autumn	Seeds
Ribes nigrum	Zwarte Bes	Blackcurrant	Summer/Autumn	Berries, leaves
	Rozenbottel		Autumn	
Staphylea pinnata	Pimpernoot	European Bladdernut	Autumn	Nuts & flower buds
Mentha suaveolens	Witte Munt	Apple Mint	Spring/Summer/ Autumn	Leaves
Mentha spicata 'Maroccan'	Marokkaanse Munt	Maroccan Mint	Spring/Summer/ Autumn	Leaves
Mentha spicata 'Russian'	Russische Munt	Russian Mint	Spring/Summer/ Autumn	Leaves
Sambucus nigra	Vlier	Elderberry	Summer/Autumn	Berries
Sambucus canadensis	Canadese Vlier	American/Canadian Elderberry	Summer/Autumn	Berries
Pisum sativum var. saccharatum	Peulen	Snow Pea	Spring/Summer/ Autumn	Peas
Rumex acetosa	Veldzuring	Sorrel	Spring/Summer/ Autumn	Leaves
Anethum graveolens	Dille	Dill	Spring/Summer/ Autumn	Leaves
Cynara cardunculus var. scolymus	Artisjok	Artichoke	Spring/Summer/ Autumn	Artichoke

Cynara cardunculus	Kardoen	Cardoon	Spring/Summer/ Autumn	Flower buds, stems
Pyrus pyrifolia	Aziatische Peer	Asian Pear, Nashi	Autumn	Fruits
Ulmus	Iep	Elm	Autumn	Seeds
Pleurotus ostreatus	Oesterzwammen	Oyster Mushroom	Autumn/Winter	Mushroom
Lentinula edodes	Shiitake	Shiitake	Autumn/Winter	Mushroom
Annual plants in Autumn				
	Zoete aardappel	Sweet potato	Autumn	
	Boekweit meel	Buckwheat flour	Summer/Autumn	
		Sorghum (flour, refined)	Summer/Autumn	
Beta vulgaris subsp. vulgaris var. ruba	Rode Biet	Beetroot	Summer/Autumn	Root
Winter				
Acer saccharum	Suikeresdoorn	Sugar Maple	Winter	Juice for maple syrup
Arbutus unedo	Aardbeiboom	Strawberry Tree	Autumn/Winter	Fruits
Cornus capitata	Wintergroene Kornoelje	Bentham'S Cornel	Autumn/Winter	Fruits
Hippophae rhamnoides	Duindoorn	Sea Buckthorn	Summer/Autumn /Winter	Berries
Malus spp.	Wilde Appel	Crab Apple	Autumn/Winter	Fruits
Pinus koraiensis	Koreaanse Pijnboom	Korean Nut Pine	Autumn/Winter	Nuts
Pyrus communis	Wilde Peer	European Wild Pear	Summer/Autumn /Winter	Fruits
Salvia officinalis	Salie	Sage	Spring/Summer/ Autumn/Winter	Leaves
Blitum bonus-henricus	Brave Hendrik	Good-King Henry	Spring/Summer/ Autumn/Winter	Leaves, stem
Allium ampeloprasum babingtonii	Wilde Prei, Akkerknoflook	Babington'S Leek	Winter/Spring	Leaves, stem
Pleurotus ostreatus	Oesterzwammen	Oyster Mushroom	Autumn/Winter	Mushroom
Lentinula edodes	Shiitake	Shiitake	Autumn/Winter	Mushroom
Allium ursinum	Daslook	Ramsons	Winter/Spring/Summer	Leaves, seeds
Annual plants in winter				
	Aardpeer	Jerusalem artichoke	Winter	Roots

Table 4: Spring produce: macronutrients

English name	Source	Energy (kcal)	Protein (g)	Carbohydrates (g)	Fat (g)	Saturated fatty acids total	Total trans fats	MUFA	PUFA	n-3 PUFA	n-6 PUFA	Fibre (g)
Japanese Angelica Tree												
Larch												
Black Locust	(Horton & Christensen, 1981)	448	20									13.5
Sassafras	("SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews," n.d.)											
Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)		9.8									
Monk'S Pepper/Chaste Tree												
Sage	("Eetmeter - Mijn Voedingscentrum," n.d.)	64	1.5	8.3	1.5	1						5.5
Horseradish	("NEVO-online," 2019)	80	4.5	11	0.3	0.1	0	0.2	0			7.5
Ground Ivy	(Pereira et al., 2020)	100	1.3	21	1.18							
Columbine												
Strawberry Mint												
Good-King Henry												
Linden												

Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)											
Apple Mint												
Maroccan Mint	(Pereira et al., 2020)		1.75	10.39	2.2							2.1
Russian Mint												
Snow Pea	(“NEVO-online,” 2019)	33	2	5	0	0	0	0	0	0	0	2.5
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	48	3.1	5.1	0.8	0.1						3.9
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	62	4	8	1	0						2.3
Babington'S Leek	(“NEVO-online,” 2019)	28	1.5	3.5	0.2							3
Artichoke	(“NEVO-online,” 2019)	49	2	9.5	0	0	0	0	0	0	0	1.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	72.4	3.03	13.76	0.59	0.51		0.03	0.05			
Japanese Butterbur	(Hiemori-Kondo & Nii, 2020)											
Ramsons	(Petkova et al., 2019)(Jenkins, 2020)	19	0.9	5.1	0.3							2.59
Annual crops												
Cow Parsnip	(Kuhnlein, 1986)	20	0.4	3.8	0.24							
Dandelion	(“NEVO-online,” 2019)	55	3	8	1	0.2			0.5	0.3	0.2	1.2
Rhubarb	(“NEVO-online,” 2019)	23	1.0	2.0	0.0							1.8
Asparagus	(“NEVO-online,” 2019)	19	1.0	3.0	0.0							1.7

Symphytum												

Table 5: Spring produce: minerals

English name	Source	Sodium (mg)	Calcium (mg)	magnesium (mg)	Iron total (mg)	Iron (haem) (mg)	Iron (non-haem) (mg)	Selenium (ug)	Zinc (mg)	Iodine (ug)
Japanese Angelica Tree										
Larch										
Black Locust	(Horton & Christensen, 1981)								42.9	
Sassafras	("SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews," n.d.)									
Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)		519		7.1					
Monk'S Pepper/Chaste Tree										
Sage	("Eetmeter - Mijn Voedingscentrum," n.d.)	0	250	11	5.5			0	0.7	0
Horseradish	("NEVO-online," 2019)	8	120	36	2	0	2	0	1.4	0.9
Ground Ivy	(Pereira et al., 2020)									
Columbine										
Strawberry Mint										
Good-King Henry										
Linden										
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)	5.15	1.34	0.45						

Apple Mint										
Maroccan Mint	(Pereira et al., 2020)									
Russian Mint										
Snow Pea	(“NEVO-online,” 2019)	5	40	0.5	0.5	0	0.5	1	0.5	
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	9	250	11	5.5			0	0.7	0
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	3	167	32	1.3			0	0	0
Babington'S Leek	(“NEVO-online,” 2019)	4	39	11	0.4	0	0.4	1	0.4	2.5
Artichoke	(“NEVO-online,” 2019)	47	53	22	1.5	0	1.5	1	0.5	0.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	240	1199	389	5.5				1.17	
Japanese Butterbur	(Hiemori-Kondo & Nii, 2020)									
Ramsons	(Petkova et al., 2019)(Jenkins, 2020)		76	22	2.9				0.3	
Annual crops										
Cow Parsnip	(Kuhnlein, 1986)	0.54	27.7	11.7	0.3		0.3		0.38	
Dandelion	(“NEVO-online,” 2019)	76	150	36	3.1		3.1		1.2	
Rhubarb	(“NEVO-online,” 2019)	5	40	14	0.5		0.5	0	0.1	1.0
Asparagus	(“NEVO-online,” 2019)	1	20	20	1.0		1.0	1	0.5	0.2
Symphytum										

Table 6: Spring produce: vitamins

English name	Source	Vit A (in RE or RAE. ug)	Vit B1 (mg)	Vit B2 (mg)	Vit B6 (mg)	Folate (ug)	Vit B12 (ug)	Vit C (mg)	Vit D (ug)	Vit E (mg)	Vit K (ug)
Japanese Angelica Tree											
Larch											
Black Locust	(Horton & Christensen, 1981)										
Sassafras	("SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews," n.d.)										
Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)	3.4						10		10	
Monk'S Pepper/Chaste Tree											
Sage	("Eetmeter - Mijn Voedingscentrum," n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Horseradish	("NEVO-online," 2019)	0	0.05	0.03	0.15		0	120	0		1.3
Ground Ivy	(Pereira et al., 2020)										
Columbine											
Strawberry Mint											
Good-King Henry											
Linden											
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)										

Apple Mint											
Maroccan Mint	(Pereira et al., 2020)										
Russian Mint											
Snow Pea	(“NEVO-online,” 2019)	15	0.15	0.06	0.09	10	0	35	0	0.4	15
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.14	0.15	0	0	0	47	0	0	
Babington'S Leek	(“NEVO-online,” 2019)	55	0.04	0.05	0.18	66.4	0	7	0	0.4	10.1
Artichoke	(“NEVO-online,” 2019)	8	0.14	0.01	0.03	68	0	8	0	0.2	14.8
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)										
Japanese Butterbur	(Hiemori-Kondo & Nii, 2020)										
Ramsons	(Petkova et al., 2019)(Jenkins, 2020)		0.13	0.06		0	0	150		0.25	
Annual crops											
Cow Parsnip	(Kuhnlein, 1986)	7.5						3.5			
Dandelion	(“NEVO-online,” 2019)	139	0.19	0.14	0.25	28.4	0.0	40	0.0	3.4	129
Rhubarb	(“NEVO-online,” 2019)	10	0.05	0.02	0.03	7	0.0	6	0.0	0.2	29.3
Asparagus	(“NEVO-online,” 2019)	1	0.1	0.07	0.03	175	0.0	30	0.0	1.2	41.6
Symphytum											

Table 7: Summer produce: macronutrients

English name	Source	Energy (kcal)	Protein (g)	Carbohydrates (g)	Fat (g)	Saturated fatty acids total	Total trans fats	MUFA	PUFA	n-3 PUFA	n-6 PUFA	Fibre (g)
Smooth Shadbush	(Kuhnlein, 1989)	90	0.7	21.4	1.2							6.4
Flowering Quince	(Watychowicz, Janda, Jakubczyk, & Wolska, 2017)		0.25	2.27	0.8							1.53
Cornelian Cherry /Dogwood	(Lietava et al., 2019)		0.4	21.7	0.3							0.5
Fig	("NEVO-online," 2019)	84	1.0	19.0	0	0	0	0	0	0	0	2.0
Salal	McDougall et al, 2016											
Silver-Bell Tree												
Chinese Hibiscus												
Sea Buckthorn	(Chandra, Zafar, Dwivedi, Shinde, & Prita, 2018)		34.6	6.29								
Blue Honeysuckle	(Gołba, Sokół-Łetowska, & Kucharska, 2020)											
Mulberry	("NEVO-online," 2019)	45	1.4	8.1	0.4	0	0	0	0.2	0	0.2	1.7

Apricot	(“NEVO-online,” 2019)	44	0.9	8	0.1	0	0	0	0	0	0	1.7
Sweet Cherry	(“NEVO-online,” 2019)	57	0.9	11.5	0.4	0.1	0	0.1	0.1	0.1	0.1	0.9
European Plum	(“NEVO-online,” 2019)	40	0.8	7.3	0	0	0	0	0	0	0	2.2
Black Cherry	(“NEVO-online,” 2019)	57	0.9	11.5	0.4	0.1	0	0.1	0.1	0.1	0.1	0.9
Nanking Cherry	(“The Earth of India: All About Nanking Cherry,” 2013)	63	1.2	16	0	0	0	0	0	0	0	2.1
Douglas Fir												
European Wild Pear	(“NEVO-online,” 2019)	55	0.2	11.7	0.3	0.1	0	0	0.2	0	0.1	2.2
Smooth Sumac	(Kossah et al., 2009)		4.31		11.6							
Currants	(“NEVO-online,” 2019)	30	0.6	6	0	0	0	0	0	0	0	1.8
Black Locust	(Horton & Christensen, 1981)	448	20									13.5
Blackberry	(“NEVO-online,” 2019)	37	0.9	5.1	0.2	0	0	0	0.1	0.1	0.1	3.1
Raspberry	(“NEVO-online,” 2019)	37	1.4	4.5	0.3	0	0	0	0.2	0.1	0.1	2.5
Sassafras	(“SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews,” n.d.)											

Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)	112	2.3	23.9	2							6.2
Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)		9.8									
Blueberry	(“NEVO-online,” 2019)	52	0.7	11	0	0	0	0	0	0	0	2.4
Monk'S Pepper/Chaste Tree												
Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	64	1.5	8.3	1.5	1						5.5
Columbine												
Strawberry Mint												
Good-King Henry												
Linden												
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)											
Blackcurrant	(“NEVO-online,” 2019)	53	0.9	8	0	0	0	0	0	0	0	3.6
Rose	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	30	1	6	0	0						1.2
Apple Mint												
Maroccan Mint	(Pereira et al., 2020)		1.75	10.39	2.2							2.1
Russian Mint												
Elderberry												

American/Canadian Elderberry												
Snow Pea	(“NEVO-online,” 2019)	33	2	5	0	0	0	0	0	0	0	2.5
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	48	3.1	5.1	0.8	0.1						3.9
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	62	4	8	1	0						2.3
Wineberry												
Artichoke	(“NEVO-online,” 2019)	49	2	9.5	0	0	0	0	0	0	0	1.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	72.4	3.03	13.76	0.59	0.51		0.03	0.05			
Ramsons	(Petkova et al., 2019), thesis	19	0.9	5.1	0.3							2.59
Annual crops												
Buckwheat flour	(“NEVO-online,” 2019)	353	9.0	72	2.0	0.4		0.6	0.6		0.58	5.6
Sorghum flour	(“FoodData Central,” n.d.)	357	9.53	76.8	1.24	0.30		0.39	0.48			1.9
Cow Parsnip	(Kuhnlein, 1986)	20	0.4	3.8	0.24							
Cow Parsley												
Dandelion	(“NEVO-online,” 2019)	55	3	8	1	0.2			0.5	0.3	0.2	1.2
Rhubarb	(“NEVO-online,” 2019)	23	1.0	2.0	0.0							1.8

Asparagus	("NEVO-online," 2019)	19	1.0	3.0	0.0							1.7
Symphytum												
Beetroot	("NEVO-online," 2019)	38	1.7	6.0	0.1							2.9

Table 8 Summer produce: minerals

English name	**Source**	**Sodium (mg)**	**Calcium (mg)**	**magnesium (mg)**	**Iron total (mg)**	**Iron (haem) (mg)**	**Iron (non-haem) (mg)**	**Selenium (ug)**	**Zinc (mg)**	**Iodine (ug)**
Smooth Shadbush	(Kuhnlein, 1989)	0.6	69	26	0.5				0.4	
Flowering Quince	(Watychowicz, Janda, Jakubczyk, & Wolska, 2017)	13.7	26.5	11.6	0.64				0.25	
Cornelian Cherry /Dogwood	(Lietava et al., 2019)	32.42	32.34		0.05				0.05	
Fig	("NEVO-online," 2019)	1	54	15	0.6	0.0	0.6	0	0.3	
Salal	McDougall et al, 2016									
Silver-Bell Tree										
Chinese Hibiscus										
Sea Buckthorn	(Chandra, Zafar, Dwivedi, Shinde, & Prita, 2018)	4.13	38.3	4.77	1.17				0.09	
Blue Honeysuckle	(Gołba, Sokół-Łetowska, & Kucharska, 2020)	1.4	44.2	16.3						
Mulberry	("NEVO-online," 2019)	10	26	18	1.9	0	1.9	1	0.12	

Apricot	(“NEVO-online,” 2019)	0	20	11	0.8	0	0.8	0	0.1	
Sweet Cherry	(“NEVO-online,” 2019)	1	20	21	0.5	0	0.5	0	0.06	
European Plum	(“NEVO-online,” 2019)	0	8	7	0.3	0	0.3	0	0.9	
Black Cherry	(“NEVO-online,” 2019)	1	20	21	0.5	0	0.5	0	0.06	
Nanking Cherry	(“The Earth of India: All About Nanking Cherry,” 2013)	1	13	11	0.4	0	0.4	0	0.06	
Douglas Fir										
European Wild Pear	(“NEVO-online,” 2019)	1	6	7	0.2	0	0.2	0	0.17	2.5
Smooth Sumac	(Kossah et al., 2009)	18.3	30.1	87.1	18		18		1.7	
Currants	(“NEVO-online,” 2019)	1	20	10	0.5	0	0.5	0	0.06	
Black Locust	(Horton & Christensen, 1981)								42.9	
Blackberry	(“NEVO-online,” 2019)	2	41	23	1	0	1	0	0.2	
Raspberry	(“NEVO-online,” 2019)	3	15	19	1.5	0	1.5	0	0.3	
Sassafras	(“SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews,” n.d.)									
Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)		15	32	2.2		2.2		0.4	

Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)		519		7.1					
Blueberry	("NEVO-online," 2019)	1	5	5	0.3	0	0.3	0	0.2	
Monk'S Pepper/Chaste Tree										
Sage	("Eetmeter - Mijn Voedingscentrum," n.d.)	0	250	11	5.5			0	0.7	0
Columbine										
Strawberry Mint										
Good-King Henry										
Linden										
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)	5.15	1.34	0.45						
Blackcurrant	("NEVO-online," 2019)	2	30	17	1	0	1	1	0.3	
Rose	("Eetmeter - Mijn Voedingscentrum," n.d.)	3	25	11	0.8			0	0.2	0
Apple Mint										
Maroccan Mint	(Pereira et al., 2020)									
Russian Mint										
Elderberry										
American/Canadian Elderberry										
Snow Pea	("NEVO-online," 2019)	5	40	0.5	0.5	0	0.5	1	0.5	

Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	9	250	11	5.5			0	0.7	0
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	3	167	32	1.3			0	0	0
Wineberry										
Artichoke	(“NEVO-online,” 2019)	47	53	22	1.5	0	1.5	1	0.5	0.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	240	1199	389	5.5				1.17	
Ramsons	(Petkova et al., 2019), thesis		76	22	2.9				0.3	
Annual crops										
Buckwheat flour	(“NEVO-online,” 2019)	2	15	117	2.0		2.0	9	2	1.9
Sorghum flour	(“FoodData Central,” n.d.)	1	6	31	0.97				0.47	
Cow Parsnip	(Kuhnlein, 1986)	0.54	27.7	11.7	0.3		0.3		0.38	
Cow Parsley										
Dandelion	(“NEVO-online,” 2019)	76	150	36	3.1		3.1		1.2	
Rhubarb	(“NEVO-online,” 2019)	5	40	14	0.5		0.5	0	0.1	1.0
Asparagus	(“NEVO-online,” 2019)	1	20	20	1.0		1.0	1	0.5	0.2
Symphytum										
Beetroot	(“NEVO-online,” 2019)	70	10	14	0.4		0.4	0	0.4	0.5

Table 9: Summer produce: vitamins

English name	Source	Vit A (in RE or RAE. ug)	Vit B1 (mg)	Vit B2 (mg)	Vit B6 (mg)	Folate (ug)	Vit B12 (ug)	Vit C (mg)	Vit D (ug)	Vit E (mg)	Vit K (ug)
Smooth Shadbush	(Kuhnlein, 1989)	0.5		0.001				10.9			
Flowering Quince	(Watychowicz, Janda, Jakubczyk, & Wolska, 2017)							1593			
Cornelian Cherry /Dogwood	(Lietava et al., 2019)							38.87			
Fig	(“NEVO-online,” 2019)	25	0.06	0.05	0.11	8	0.0	3	0.0	0.1	4.7
Salal	McDougall et al, 2016							4.87			
Silver-Bell Tree											
Chinese Hibiscus											
Sea Buckthorn	(Chandra, Zafar, Dwivedi, Shinde, & Prita, 2018)	7.4					37	1302.5			
Blue Honeysuckle	(Gołba, Sokół-Ł etowska, & Kucharska, 2020)							186			
Mulberry	(“NEVO-online,” 2019)	3	0.03	0.1	0.05	0	0	36	0	0.9	
Apricot	(“NEVO-online,” 2019)	209	0.06	0.05	0.06	0	0	5	0	0.5	
Sweet Cherry	(“NEVO-online,” 2019)	12	0.02	0.02	0.04	0	0	10	0	0.1	
European Plum	(“NEVO-online,” 2019)	61	0.02	0.03	0.1	0	0	5	0	0.7	7.5

Black Cherry	(“NEVO-online,” 2019)	12	0.02	0.02	0.04	0	0	10	0	0.1	
Nanking Cherry	(“The Earth of India: All About Nanking Cherry,” 2013)	12	0.02	0.02	0.04	0	0	7	0	0.1	
Douglas Fir											
European Wild Pear	(“NEVO-online,” 2019)	5	0.01	0.02	0.02	0	0	3	0	0.2	3.6
Smooth Sumac	(Kossah et al., 2009)		2.4	2.4	2		3.5	1			
Currants	(“NEVO-online,” 2019)	2	0.01	0.02	0.04	0	0	10	0	1.9	
Black Locust	(Horton & Christensen, 1981)										
Blackberry	(“NEVO-online,” 2019)										
Raspberry	(“NEVO-online,” 2019)	4	0.09	0.06	0.06	0	0	32	0	0.5	
Sassafras	(“SASSAFRAS: Overview, Uses, Side Effects, Precautions, Interactions, Dosing and Reviews,” n.d.)										
Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)							25.8		1.89	
Chinese Cedar	(Lin, Hsiao, & Kuo, 2009)	3.4						10		10	
Blueberry	(“NEVO-online,” 2019)	7	0.02	0.03	0.05	0	0	10	0	0.6	
Monk'S Pepper/Chaste Tree											

Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Columbine											
Strawberry Mint											
Good-King Henry											
Linden											
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)										
Blackcurrant	(“NEVO-online,” 2019)	15	0.08	0.04	0.07	8	0	150	0	1	
Rose	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.04	0.04	0.09	18	0	3	0	0	
Apple Mint											
Maroccan Mint	(Pereira et al., 2020)										
Russian Mint											
Elderberry											
American/Canadian Elderberry											
Snow Pea	(“NEVO-online,” 2019)	15	0.15	0.06	0.09	10	0	35	0	0.4	15
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.14	0.15	0	0	0	47	0	0	
Wineberry											

Artichoke	(“NEVO-online,” 2019)	8	0.14	0.01	0.03	68	0	8	0	0.2	14.8
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)										
Ramsons	(Petkova et al., 2019), thesis		0.13	0.06		0	0	150		0.25	
Annual crops											
Buckwheat flour	(“NEVO-online,” 2019)	0	0.2	0.05	0.4	54	0.0	0	0	0.3	7.0
Sorghum flour	(“FoodData Central,” n.d.)		0.09	0.01	0.07			0.6			
Cow Parsnip	(Kuhnlein, 1986)	7.5						3.5			
Cow Parsley											
Dandelion	(“NEVO-online,” 2019)	139	0.19	0.14	0.25	28.4	0.0	40	0.0	3.4	129
Rhubarb	(“NEVO-online,” 2019)	10	0.05	0.02	0.03	7	0.0	6	0.0	0.2	29.3
Asparagus	(“NEVO-online,” 2019)	1	0.1	0.07	0.03	175	0.0	30	0.0	1.2	41.6
Symphytum											
Beetroot	(“NEVO-online,” 2019)	2	0.05	0.05	0.05	19	0.0	2	0.0	0.1	0.2

Table 10: Autumn produce: macronutrients

English name	Source	Energy (kcal)	Protein (g)	Carbohydrates (g)	Fat (g)	Saturated fatty acids total	Total trans fats	MUFA	PUFA	n-3 PUFA	n-6 PUFA	Fibre (g)
Chocolate Vine	(Li, Yao, Zhong, Chen, & Huang, 2010)											
Strawberry Tree	(Alarcão-E-Silva, Leitão, Azinheira, & Leitão, 2001)			41.98								
Chokeberry	(Kulling & Rawel, 2008)		0.7	17.6	0.14							5.62
Pawpaw	(Kentucky State University, n.d.)	80	1.2	18.8	1.2							2.6
Pecan	("NEVO-online," 2019)	721	9.2	4.4	72.0	6.2	0.0	40.7	21.5	1.0	20.6	9.6
Sweet Chestnut	("NEVO-online," 2019)	189	4.0	35.0	2.7	0.5	0.0	1.0	1.1	0.1	1.0	4.1
Ground Chestnut	(Atasay & Altingoz, 2012)	343	6.1	63.3	3.7							14.2
Flowering Quince	(Chen et al., 2014)		0.25	2.27	0.8							1.53
Bentham'S Cornel												
Chinese Dogwood												
Cornelian Cherry /Dogwood	(Lietava et al., 2019)		0.4	21.7	0.3							0.5
Hazelnut	("NEVO-online," 2019)	670	16.4	4.8	63.0	4.6	0	47.1	8.2	0.1	8.1	9.0
Hawthorn	(Kuhnlein, 1989)	52	0.3	14.9	1.4							2.6
Quince	("FoodData Central," n.d.)	57	0.4	15.3	0.1	0.01	0	36	0.05	0	0	1.9
Autumn Olive	(Parmar & Kaushal, 1982)		4.47	8.34								
Fig	("NEVO-online," 2019)	84	1.0	19.0	0	0	0	0	0	0	0	2.0
Maidenhair Tree	("FoodData Central," n.d.)	182	4.32	37.6	1.68	0.32		0.62	0.62	0.0	0.0	

Honey Locust												
Chinese Hibiscus												
Sea Buckthorn	(Chandra et al., 2018)		34.6	6.29								
Walnut	(“NEVO-online,” 2019)	706	15.9	5.1	68.1	6.8	0	12.8	44.1	7.2	36.8	4.6
Common Juniper	(Dried, Wolfe, Weber, Arviso, 1985)	216	3.9	42.7	3.3							45.1
Crab Apple	(“FoodData Central,” n.d.)	76	0.4	20	0.3	0.05	0	0.01	0.09			
Medlar	(“FoodData Central,” n.d.)	88	0.5	24	0.1							1.3
Small Bayberry												
Mulberry	(“NEVO-online,” 2019)	45	1.4	8.1	0.4	0	0	0	0.2	0	0.2	1.7
Korean Nut Pine	(“NEVO-online,” 2019)	611	24	14.2	50.7	5.3	0	19.1	21.4	0.7	20.7	0.8
Apricot	(“NEVO-online,” 2019)	44	0.9	8	0.1	0	0	0	0	0	0	1.7
Sweet Cherry	(“NEVO-online,” 2019)	57	0.9	11.5	0.4	0.1	0	0.1	0.1	0.1	0.1	0.9
European Plum	(“NEVO-online,” 2019)	40	0.8	7.3	0	0	0	0	0	0	0	2.2
Almond	(“NEVO-online,” 2019)	622	25.4	5	53.4	3.6	0	33.3	13.9	0.1	13.8	10.2
Black Cherry	(“NEVO-online,” 2019)	57	0.9	11.5	0.4	0.1	0	0.1	0.1	0.1	0.1	0.9
European Wild Pear	(“NEVO-online,” 2019)	55	0.2	11.7	0.3	0.1	0	0	0.2	0	0.1	2.2
Holly Oak												
Holm Oak												
Smooth Sumac	(Kossah et al., 2009)		4.31		11.6							
Currants	(“NEVO-online,” 2019)	30	0.6	6	0	0	0	0	0	0	0	1.8
Apple Rose	(“FoodData Central,” n.d.)	162	1.6	38	0.3							24
Blackberry	(“NEVO-online,” 2019)	37	0.9	5.1	0.2	0	0	0	0.1	0.1	0.1	3.1
Raspberry	(“NEVO-online,” 2019)	37	1.4	4.5	0.3	0	0	0	0.2	0.1	0.1	2.5
Magnolia Berry												
Shipova, Bollwyller Pear												

Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)	112	2.3	23.9	2							6.2
Blueberry	(“NEVO-online,” 2019)	52	0.7	11	0	0	0	0	0	0	0	2.4
Tea Viburnum												
Monk'S Pepper/Chaste Tree												
Grapevine	(“NEVO-online,” 2019)	78	0.6	16.8		0.1	0	0	0.1	0	0.1	1.8
Chinese Flowering Chestnut/Yellowhorn	(Liang et al., 2021)		26.2		54.8	478.95		29.37	20.66			
Chinese Peper	(Lim, 2012)		8.73	2.11	0.84							
Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	64	1.5	8.3	1.5	1						5.5
Columbine												
Strawberry Mint												
Good-King Henry												
Linden												
Japanese Walnut, Heartnut	(L. Li, Tsao, Yang, Kramer, & Hernandez, 2007)				49	1.8	0.13	0.88	39.68			
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)											
Blackcurrant	(“NEVO-online,” 2019)	53	0.9	8	0	0	0	0	0	0	0	3.6
European Bladdernut												
Apple Mint												
Maroccan Mint	(Pereira et al., 2020)		1.75	10.39	2.2							2.1
Russian Mint												
Elderberry												
American/Canadian Elderberry												
Snow Pea	(“NEVO-online,” 2019)	33	2	5	0	0	0	0	0	0	0	2.5

Sorrel	("Eetmeter - Mijn Voedingscentrum," n.d.)	48	3.1	5.1	0.8	0.1						3.9
Dill	("Eetmeter - Mijn Voedingscentrum," n.d.)	62	4	8	1	0						2.3
Artichoke	("NEVO-online," 2019)	49	2	9.5	0	0	0	0	0	0	0	1.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	72.4	3.03	13.76	0.59	0.51		0.03	0.05			
Asian Pear, Nashi	("Eetmeter - Mijn Voedingscentrum," n.d.)	55	0.2	11.7	0.3	0.1						2.2
Elm	(Osborne, 1983)		44.9									6.8
Oyster Mushroom	("FoodData Central," n.d.)	41	2.9	6.94	0.19							
Shiitake	("FoodData Central," n.d.)	44	2.41	8.17	0.2							
Annual crops												
Sweet potato	("NEVO-online," 2019)	98	1.2	21.3	0.3	0.1			0.2		0.1	2.4
Buckwheat flour	("NEVO-online," 2019)	353	9.0	72	2.0	0.4		0.6	0.6		0.58	5.6
Sorghum flour	("FoodData Central," n.d.)	357	9.53	76.8	1.24	0.30		0.39	0.48			1.9
Beetroot	("NEVO-online," 2019)	38	1.7	6.0	0.1							2.9

Table 11: Autumn produce: minerals

English name	**Source**	**Sodium (mg)**	**Calcium (mg)**	**magnesium (mg)**	**Iron total (mg)**	**Iron (haem) (mg)**	**Iron (non-haem) (mg)**	**Selenium (ug)**	**Zinc (mg)**	**Iodine (ug)**
Chocolate Vine	(Li, Yao, Zhong, Chen, & Huang, 2010)		49.7	100.7	3.2				2.1	
Strawberry Tree	(Alarcão-E-Silva, Leitão, Azinheira, & Leitão, 2001)									
Chokeberry	(Kulling & Rawel, 2008)	2.6	32.2	16.2	0.93				0.147	
Pawpaw	(Kentucky State University, n.d.)		63	113	7				0.9	

Pecan	(“NEVO-online,” 2019)	0	70	121	2.5	0.0	2.5	4	4.53	2.0
Sweet Chestnut	(“NEVO-online,” 2019)	5	40	45	1.0	0.0	1.0		0.5	0.1
Ground Chestnut	(Atasay & Altingoz, 2012)									
Flowering Quince	(Chen et al., 2014)	13.7	26.5	11.6	0.64				0.25	
Bentham'S Cornel										
Chinese Dogwood										
Cornelian Cherry /Dogwood	(Lietava et al., 2019)	32.42	32.34		0.05				0.05	
Hazelnut	(“NEVO-online,” 2019)	1	160	160	3.6	0.0	3.6	2	2.2	5.6
Hawthorn	(Kuhnlein, 1989)	6.9	31	12	0.5				0.2	
Quince	(“FoodData Central,” n.d.)	4	11	8	0.7			0.6	0.04	
Autumn Olive	(Parmar & Kaushal, 1982)		0.05	0.03	0.01					
Fig	(“NEVO-online,” 2019)	1	54	15	0.6	0.0	0.6	0	0.3	
Maidenhair Tree	(“FoodData Central,” n.d.)	7	2	27	1				0.34	
Honey Locust										
Chinese Hibiscus										
Sea Buckthorn	(Chandra et al., 2018)	4.13	38.3	4.77	1.168				0.09	
Walnut	(“NEVO-online,” 2019)	0	117	196	3.4	0.0	3.4	12	3.4	2.5
Common Juniper	(Dried, Wolfe, Weber, Arviso, 1985)	130	404	62	3.3				1.1	
Crab Apple	(“FoodData Central,” n.d.)	1	18	7	0.36					
Medlar	(“FoodData Central,” n.d.)		41		1.2	0	1.2			
Small Bayberry										
Mulberry	(“NEVO-online,” 2019)	10	26	18	1.9	0	1.9	1	0.12	
Korean Nut Pine	(“NEVO-online,” 2019)	4	26	233	5.5	0	5.5	2	4.25	0.2
Apricot	(“NEVO-online,” 2019)	0	20	11	0.8	0	0.8	0	0.1	
Sweet Cherry	(“NEVO-online,” 2019)	1	20	21	0.5	0	0.5	0	0.06	
European Plum	(“NEVO-online,” 2019)	0	8	7	0.3	0	0.3	0	0.9	
Almond	(“NEVO-online,” 2019)	2	248	232	3	0	3	4	3.85	5.7
Black Cherry	(“NEVO-online,” 2019)	1	20	21	0.5	0	0.5	0	0.06	

European Wild Pear	(“NEVO-online,” 2019)	1	6	7	0.2	0	0.2	0	0.17	2.5
Holly Oak										
Holm Oak										
Smooth Sumac	(Kossah et al., 2009)	18.3	30.1	87.1	18		18		1.7	
Currants	(“NEVO-online,” 2019)	1	20	10	0.5	0	0.5	0	0.06	
Apple Rose	(“FoodData Central,” n.d.)		169	69	1.1		1.1			
Blackberry	(“NEVO-online,” 2019)	2	41	23	1	0	1	0	0.2	
Raspberry	(“NEVO-online,” 2019)	3	15	19	1.5	0	1.5	0	0.3	
Magnolia Berry										
Shipova, Bollwyller Pear										
Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)		15	32	2.2		2.2		0.4	
Blueberry	(“NEVO-online,” 2019)	1	5	5	0.3	0	0.3	0	0.2	
Tea Viburnum										
Monk'S Pepper/Chaste Tree										
Grapevine	(“NEVO-online,” 2019)	3	17	9	0.2	0	0.2	0	0.21	2.5
Chinese Flowering Chestnut/Yellowhorn	(Liang et al., 2021)									
Chinese Peper	(Lim, 2012)		93.3		7.3					
Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	250	11	5.5			0	0.7	0
Columbine										
Strawberry Mint										
Good-King Henry										
Linden										
Japanese Walnut, Heartnut	(L. Li, Tsao, Yang, Kramer, & Hernandez, 2007)									
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)	5.15	1.34	0.45						
Blackcurrant	(“NEVO-online,” 2019)	2	30	17	1	0	1	1	0.3	

European Bladdernut										
Apple Mint										
Maroccan Mint	(Pereira et al., 2020)									
Russian Mint										
Elderberry										
American/Canadian Elderberry										
Snow Pea	(“NEVO-online,” 2019)	5	40	0.5	0.5	0	0.5	1	0.5	
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	9	250	11	5.5			0	0.7	0
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	3	167	32	1.3			0	0	0
Artichoke	(“NEVO-online,” 2019)	47	53	22	1.5	0	1.5	1	0.5	0.5
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)	240	1199	389	5.5				1.17	
Asian Pear, Nashi	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	1	6	7	0.2			0	0.2	3
Elm	(Osborne, 1983)									
Oyster Mushroom	(“FoodData Central,” n.d.)	1	2.5	13.9	0.7			1.4	0.68	
Shiitake	(“FoodData Central,” n.d.)	1	1	14.1	0.14			1.2	0.76	
Annual crops										
Sweet potato	(“NEVO-online,” 2019)	40	24	18	0.7		0.7	1	0.30	2.0
Buckwheat flour	(“NEVO-online,” 2019)	2	15	117	2.0		2.0	9	2	1.9
Sorghum flour	(“FoodData Central,” n.d.)	1	6	31	0.97				0.47	
Beetroot	(“NEVO-online,” 2019)	70	10	14	0.4		0.4	0	0.4	0.5

Table 12: Autumn produce: vitamins

English name	Source	Vit A (in RE or RAE. ug)	Vit B1 (mg)	Vit B2 (mg)	Vit B6 (mg)	Folate (ug)	Vit B12 (ug)	Vit C (mg)	Vit D (ug)	Vit E (mg)	Vit K (ug)
Chocolate Vine	(Li, Yao, Zhong, Chen, & Huang, 2010)										
Strawberry Tree	(Alarcão-E-Silva, Leitão, Azinheira, & Leitão, 2001)	70.9						346			
Chokeberry	(Kulling & Rawel, 2008)		18	20	28	20		13.7		1.71	24.2
Pawpaw	(Kentucky State University, n.d.)	8.6	0.01	0.09				18.3			
Pecan	("NEVO-online," 2019)	6	0.66	0.13	0.21	22.0	0.0	1	0.0	4.0	3.5
Sweet Chestnut	("NEVO-online," 2019)	0	0.3	0.05	0.3	58	0.0	0	0.0	1.2	
Ground Chestnut	(Atasay & Altingoz, 2012)										
Flowering Quince	(Chen et al., 2014)							1593			
Bentham'S Cornel											
Chinese Dogwood											
Cornelian Cherry /Dogwood	(Lietava et al., 2019)							38.87			
Hazelnut	("NEVO-online," 2019)	2	0.38	0.11	0.34	121.0	0.0	4	0.0	15.2	14.2
Hawthorn	(Kuhnlein, 1989)	8.1						9.5			
Quince	("FoodData Central," n.d.)	2	0.02	0.03	0.04	3	0	15			
Autumn Olive	(Parmar & Kaushal, 1982)							12.04			
Fig	("NEVO-online," 2019)	25	0.06	0.05	0.11	8	0.0	3	0.0	0.1	4.7
Maidenhair Tree	("FoodData Central," n.d.)	28	0.22	0.09	0.33	54	0	15	0		
Honey Locust											
Chinese Hibiscus											
Sea Buckthorn	(Chandra et al., 2018)	7.4					47	1302.5			
Walnut	("NEVO-online," 2019)	4	0.37	0.11	0.42	62.1	0.0	0	0.0	3.1	

Common Juniper	(Dried, Wolfe, Weber, Arviso, 1985)										
Crab Apple	(“FoodData Central,” n.d.)	2	0.03	0.02			0	8			
Medlar	(“FoodData Central,” n.d.)	12	0.06	0.03							
Small Bayberry											
Mulberry	(“NEVO-online,” 2019)	3	0.03	0.1	0.05	0	0	36	0	0.9	
Korean Nut Pine	(“NEVO-online,” 2019)	3	0.81	0.19	0.11	0	0	2	0	24	
Apricot	(“NEVO-online,” 2019)	209	0.06	0.05	0.06	0	0	5	0	0.5	
Sweet Cherry	(“NEVO-online,” 2019)	12	0.02	0.02	0.04	0	0	10	0	0.1	
European Plum	(“NEVO-online,” 2019)	61	0.02	0.03	0.1	0	0	5	0	0.7	7.5
Almond	(“NEVO-online,” 2019)	0	0.18	0.91	0.11	0	0	0	0	25.8	
Black Cherry	(“NEVO-online,” 2019)	12	0.02	0.02	0.04	0	0	10	0	0.1	
European Wild Pear	(“NEVO-online,” 2019)	5	0.01	0.02	0.02	0	0	3	0	0.2	3.6
Holly Oak											
Holm Oak											
Smooth Sumac	(Kossah et al., 2009)		2.4	2.4	2		3.5	1			
Currants	(“NEVO-online,” 2019)	2	0.01	0.02	0.04	0	0	10	0	1.9	
Apple Rose	(“FoodData Central,” n.d.)	4.3			0.1			426			
Blackberry	(“NEVO-online,” 2019)										
Raspberry	(“NEVO-online,” 2019)	4	0.09	0.06	0.06	0	0	32	0	0.5	
Magnolia Berry											
Shipova, Bollwyller Pear											
Rowan	(“De voedingswaarde van lijsterbessen - aHealthylife.nl,” n.d.)							25.8		1.89	
Blueberry	(“NEVO-online,” 2019)	7	0.02	0.03	0.05	0	0	10	0	0.6	
Tea Viburnum											
Monk'S Pepper/Chaste Tree											
Grapevine	(“NEVO-online,” 2019)	4	0.04	0.01	0.05	0	0	2	0	0.3	
Chinese Flowering Chestnut/Yellowhorn	(Liang et al., 2021)	133									
Chinese Peper	(Lim, 2012)					1123		0.28	34.67		

Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Columbine											
Strawberry Mint											
Good-King Henry											
Linden											
Japanese Walnut, Heartnut	(L. Li, Tsao, Yang, Kramer, & Hernandez, 2007)										
Sweet Cicely	(Thompson, Parkinson, Band, & Spencer, 1997)										
Blackcurrant	(“NEVO-online,” 2019)	15	0.08	0.04	0.07	8	0	150	0	1	
European Bladdernut											
Apple Mint											
Maroccan Mint	(Pereira et al., 2020)										
Russian Mint											
Elderberry											
American/Canadian Elderberry											
Snow Pea	(“NEVO-online,” 2019)	15	0.15	0.06	0.09	10	0	35	0	0.4	15
Sorrel	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Dill	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.14	0.15	0	0	0	47	0	0	
Artichoke	(“NEVO-online,” 2019)	8	0.14	0.01	0.03	68	0	8	0	0.2	14.8
Cardoon	(Petropoulos, Pereira, Tzortzakis, Barros, & Ferreira, 2018)										
Asian Pear, Nashi	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	3	0.01	0.02	0.02	4	0	3	0	0.2	
Elm	(Osborne, 1983)										
Oyster Mushroom	(“FoodData Central,” n.d.)		0.07		0.10	63					
Shiitake	(“FoodData Central,” n.d.)		0.00		0.16	32					
Annual crops											
Sweet potato	(“NEVO-online,” 2019)	1440	0.17		0.06	17	0.00	23	0.0	0.3	

Buckwheat flour	(“NEVO-online,” 2019)	0	0.2	0.05	0.4	54	0.0	0	0	0.3	7.0
Sorghum flour	(“FoodData Central,” n.d.)		0.09	0.01	0.07			0.6			
Beetroot	(“NEVO-online,” 2019)	2	0.05	0.05	0.05	19	0.0	2	0.0	0.1	0.2

Table 13: Winter produce: macronutrients

English name	**Source**	**Energy (kcal)**	**Protein (g)**	**Carbohydrates (g)**	**Fat (g)**	**Saturated fatty acids total**	**Total trans fats**	**MUFA**	**PUFA**	**n-3 PUFA**	**n-6 PUFA**	**Fibre (g)**
Sugar Maple	(“FoodData Central,” n.d.)	260	0.04	67	0.06	0.01		0.01	0.02	0		0
Strawberry Tree	(Alarcão-E-Silva et al., 2001)			41.98								
Bentham'S Cornel												
Sea Buckthorn	(Chandra et al., 2018)		34.6	6.29								
Crab Apple	(“FoodData Central,” n.d.)	76	0.4	20	0.3	0.05	0	0.01	0.09			
Korean Nut Pine	(“NEVO-online,” 2019)	611	24	14.2	50.7	5.3	0	19.1	21.4	0.7	20.7	0.8
European Wild Pear	(“NEVO-online,” 2019)	55	0.2	11.7	0.3	0.1	0	0	0.2	0	0.1	2.2
Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	64	1.5	8.3	1.5	1						5.5
Good-King Henry												
Babington'S Leek	(“NEVO-online,” 2019)	28	1.5	3.5	0.2							3
Oyster Mushroom	(“FoodData Central,” n.d.)	41	2.9	6.94	0.19							
Shiitake	(“FoodData Central,” n.d.)	44	2.41	8.17	0.2							

Ramsons	(Petkova et al., 2019), thesis	19	0.9	5.1	0.3							2.59
Annual crops												
Jerusalem artichoke	("FoodData Central," n.d.)	37	2	17.4	0.01			0.01	0.00			1.6

Table 14: Winter produce: minerals

English name	**Source**	**Sodium (mg)**	**Calcium (mg)**	**magnesium (mg)**	**Iron total (mg)**	**Iron (haem) (mg)**	**Iron (non-haem) (mg)**	**Selenium (ug)**	**Zinc (mg)**	**Iodine (ug)**
Sugar Maple	("FoodData Central," n.d.)	12	102	21	0.11			0.6	1.47	
Strawberry Tree	(Alarcão-E-Silva et al., 2001)									
Bentham'S Cornel										
Sea Buckthorn	(Chandra et al., 2018)	4.13	38.3	4.77	1.17				0.09	
Crab Apple	("FoodData Central," n.d.)	1	18	7	0.36					
Korean Nut Pine	("NEVO-online," 2019)	4	26	233	5.5	0	5.5	2	4.25	0.2
European Wild Pear	("NEVO-online," 2019)	1	6	7	0.2	0	0.2	0	0.17	2.5
Sage	("Eetmeter - Mijn Voedingscentrum," n.d.)	0	250	11	5.5			0	0.7	0
Good-King Henry										
Babington'S Leek	("NEVO-online," 2019)	4	39	11	0.4	0	0.4	1	0.4	2.5
Oyster Mushroom	("FoodData Central," n.d.)	1	2.5	13.9	0.7			1.4	0.68	
Shiitake	("FoodData Central," n.d.)	1	1	14.1	0.14			1.2	0.76	
Ramsons	(Petkova et al., 2019), thesis		76	22	2.9				0.3	
Annual crops										

Jerusalem artichoke	(“FoodData Central,” n.d.)	4	14	17	3.4			0.7	0.12	

Table 15: Winter produce: vitamins

English name	**Source**	**Vit A (in RE or RAE. ug)**	**Vit B1 (mg)**	**Vit B2 (mg)**	**Vit B6 (mg)**	**Folate (ug)**	**Vit B12 (ug)**	**Vit C (mg)**	**Vit D (ug)**	**Vit E (mg)**	**Vit K (ug)**
Sugar Maple	(“FoodData Central,” n.d.)	0	0.07	1.27	0.00	0	0	0	0	0	0
Strawberry Tree	(Alarcão-E-Silva et al., 2001)	70.9						346			
Bentham'S Cornel											
Sea Buckthorn	(Chandra et al., 2018)	7.4					37	1302.5			
Crab Apple	(“FoodData Central,” n.d.)	2	0.03	0.02			0	8			
Korean Nut Pine	(“NEVO-online,” 2019)	3	0.81	0.19	0.11	0	0	2	0	24	
European Wild Pear	(“NEVO-online,” 2019)	5	0.01	0.02	0.02	0	0	3	0	0.2	3.6
Sage	(“Eetmeter - Mijn Voedingscentrum,” n.d.)	0	0.08	0.31	0	0	0	26	0	0	
Good-King Henry											
Babington'S Leek	(“NEVO-online,” 2019)	55	0.04	0.05	0.18	66.4	0	7	0	0.4	10.1
Oyster Mushroom	(“FoodData Central,” n.d.)		0.07		0.10	63					
Shiitake	(“FoodData Central,” n.d.)		0.00		0.16	32					
Ramsons	(Petkova et al., 2019), thesis		0.13	0.06		0	0	150		0.25	
Annual crops											
Jerusalem artichoke	(“FoodData Central,” n.d.)	1	0.2	0.06	0.08	13	0.0	4	0.0	0.19	0.1

Appendix 2: Food Forest Recipes

See below.

FOOD FOREST RECIPES

A bundle of seasonal recipes with ingredients from a food forest.
Happy cooking!

Developed by:
Aiza Oorthuizen
Femke Meulman
Ghazala Arain
Gijs Dam
Jana Pols
Kim Medema
Rosan van de Nobelen

SUMMER SALAD
FOOD FOREST FEAST

A summer salad for warm days. The caramelised grilled fig and pickled beet bring out the freshness of this season. Serve it as a lunch, side dish or even a light dinner!

30 MIN SERVES 2

SALAD

Ingredients

- 200 grams of Linden leaves
- Columbine
- Chopped sorrel
- 5 Figs
- 1 beetroot
- 50 grams of almonds
- 50 grams of walnuts
- 7 Saffras leaves
- Handful of mint

Pantry ingredients

- 100 ml olive oil
- 100 ml Balsamic vinegar
- Sugar

Method

1. Wash all the vegetables and fruits
2. Cut the figs in half and sprinkle with pinch of salt and sugar. Heat a grill pan to high heat and grill them for a minute on each side.
3. In a different pan, roast the almonds and walnuts dry for a few minutes
4. Thinly slice the beetroot and add it to a bath of 50 ml water, 50 ml balsamic vinegar and a tablespoon of sugar. Let it sit for 10 minutes.
5. Make the dressing: in a jar add 50 ml of balsamic vinegar to 100 ml of olive oil, a tablespoon of sugar and a pinch of salt. Shake until fully combined.
6. Roughly chop the linden leaves, sorrel, saffras and mint. Toss leaves in a balsamic dressing.
7. Assemble salad with all ingredients

Nutritional Information

PER SERVING

Kcal: 540 | Fat: 40,8 gram | Carbs: 27,5 gram | Fibre: 7,3 gram | Protein: 12,2 gram

SUMMER CHESTNUT BERRY CRUMBLE

A warming berry crumble that can be made from any type of berry coming out of your food forest. The chestnut combined with almonds provides a sweet and nutty crumble - a perfect combination with the tartness of the berries.

35 MIN SERVES 4

DESSERT

Ingredients

- 200 grams of any berries, black currants, blue berries, raspberries, rowan
- 70 grams of ground almonds
- 70 grams of chestnut flour (see recipe page 11)

Pantry ingredients

- 70 grams of butter (cold and diced)
- 70 grams of sugar
- Pinch of salt

Method

1. Preheat the oven to 180 degrees Celsius
2. Place the berries in an oven proof dish and set aside
3. Mix together the sugar, ground almonds, chestnut flower and butter until it resembles breadcrumbs
4. Sprinkle the crumb mixture over the berries and bake for 20 minutes, or until golden brown

Nutritional Information

PER SERVING

Kcal: 553 | Fat: 30,5 gram | Carbs: 53,8 gram | Fibre: 8 gram | Protein: 11,7 gram

SUMMER ARTICHOKE & APRICOT TAGINE

Warming, tangy, sweet and ultimate comfort food. Take a chestnut naan to dip into this food forest tagine. The creamy and soft notes from the artichoke compliment really well with the sweet and acidity from the apricots.

90 MIN SERVES 4

MAIN COURSE

Ingredients

- 3 Szechuan pepper corns (crushed)
- 2 Ramson leaves, thinly sliced
- 5 Chinese toon leaves, thinly sliced
- 6 artichokes
- 10 apricots
- 140 grams of almonds
- 140 grams of hazelnut
- Handful of mint

Pantry ingredients

- 1 tablespoon of olive oil
- 1 tablespoon of cumin, ginger, coriander & cinnamon
- 1 bouillon cube (this can also be made fresh with toon stems and leaves)
- Salt

Method

1. Heat a tablespoon of olive oil and braise the spices, toon leaves, Szechuan pepper corns and salt for 3 minutes on low heat. Keep stirring and make sure they do not burn.
2. Prepare the artichoke: tear off leaves until reaching pale green inner leaves. Cut off the top and remove the fibers from the heart with a spoon. With a chef's knife, cut off the stem and leaves that attach to the base. Rub with lemon juice all over to avoid oxidizing. Cut artichokes in 4 pieces and add to the pan.
3. Add chopped up apricots and fine diced preserved lemon
4. Add 500 ml of bouillon and let simmer for 60 minutes, in the meantime finely chop up the nuts
5. When the artichoke is tender, finish off dish with fresh cut mint and chopped nuts

Chestnut Naan

- 3 tablespoons of Greek Yoghurt (or vegan yoghurt when eating plant based)
- 100 grams of chestnut flour
- 5 grams of salt

Knead the yoghurt and chestnut flour together, make into small flatbreads and grill at high temperature 2 minutes on each side

Nutritional Information PER SERVING

Kcal: 520 | Fat: 32,9 gram | Carbs: 36,6 gram | Fibre: 10,8 gram | Protein: 13,3 gram

AUTUMN TRAYBAKE WITH SWEET POTATO, BEETROOT, CHESTNUTS & SHIITAKES

This traybake is perfect for a sunday roast in autumn. It is easy to make and ingredients can easily be added or swapped. The flavours of sweet potato, beetroot, chestnut and shiitake beautifully show the taste of autumn.

45 MIN SERVES 4-5

MAIN COURSE

Ingredients

- 3 large sweet potatoes
- 3 red beetroots
- 400 gr chestnuts (with husks)
- 400 gr shiitake mushrooms
- Sea buckthorn vinegar
- Szechuan peppercorns (crushed)
- Twigs of fresh thyme
- Twigs of fresh rosemary

Pantry ingredients

- Olive oil
- Sea salt

Method

1. Preheat oven at 200c
2. Cut the sweet potato and beetroots into cubes roughly the same size
3. Place them on a baking tray and sprinkle with olive oil, szechuan pepper and sea salt. Add twigs of thyme and rosemary.
4. Bake the sweet potato and beetroot for about 20 minutes..
5. Score the chestnuts on top with a sharp knife by cutting a cross into them. The deeper you cut them, the easier it is to remove the husk later.
6. Cut the shiitake mushrooms
7. Pull the baking tray out of the ove and toss the beetroot and sweet potato
8. Add the chestnuts and shiitake mushrooms to the tray and bake them for another 20-25 minutes.
9. Take the tray out of the oven. Remove the husks from the chestnuts
10. Mix all ingredients together. Finish off with some sea salt, szechuan pepper, fresh thyme, fresh rosemary, olive oil and some sea buckthorn vinegar.

Nutritional Information

PER SERVING

Kcal: 428 | Fat: 17,2 gram | Carbs: 53,9 gram | Fibre: 11,1 gram | Protein: 8,7 gram

AUTUMN GRILLED OYSTER MUSHROOM AND FRESH FIG CARPACCIO

This entree has all it takes to start of a great autumn dinner. The earthy oystermushrooms, sweet fresh figs and crunchy nuts make the dish into a delight to eat. And a big plus: the carpaccio is easy and quick to make!

20 MIN SERVES 4-5

ENTREE

Ingredients

- 600 gr oyster mushroom
- 4 fresh figs
- A couple of linden leaves
- Sea buckthorn vinegar*
- Szechuan peppercorns (crushed)
- Tops of sweet cicely
- 100 gr of mixed nuts (for example walnuts, almonds, hazelnuts)

Pantry ingredients

- Olive oil
- Sea salt

Method

1. Cut the oyster mushroom into slices.
2. Pour olive oil into a hot preheated pan and grill the oyster mushroom for about 8 minutes until they are golden brown. Press them together by putting a heavy pan on top of them.
3. Get the mushrooms out of the pan and let them cool.
4. Slice the figs into thin slices.
5. Chop the nuts
6. Put the slices of oystermushroom and figs on the plate. Sprinkle them with some olive oil and add szechuan pepper and salt to your likings.
7. Add a couple of linden leaves to each plate and add the nuts
8. Finish off with sprinkling tops of sweet cicely and the sea buckthorn vinegar over the carpaccio.

Nutritional Information

PER SERVING

Kcal: 264 | Fat: 19,9 gram | Carbs: 11,2 gram | Fibre: 5,6 gram | Protein: 7,2 gram

*Sea buckthorn vinegar

- Fill half a bottle with sea buckthorn
- Fill the bottle with white wine vinegar
- Rest for a month

WINTER HEARTY HERBY MUSHROOM STEW WITH JERUSALEM ARTICHOKE PUREE

A warming stew with hearty winter flavours on a soft. Does well on a cold weeknight, but can also shine at a fancy (Christmas) dinner. You could even fancy it up by topping the stew with fried sage leaves.

60 MIN SERVES 4-5

MAIN COURSE

Ingredients

- 1 kg jerusalem artichokes, cleaned but skin on and chopped into 3 cm chunks
- 900 g mushrooms of any kind. Cut or torn in to 1 cm thick pieces
- Large handful of ramson leaves, thinly sliced
- 2 small babbington leeks, thinly sliced
- 6 twigs of thyme
- 2 twigs of rosemary
- 2 bay leaves
- Small handful of Chinese cedar leaves, sliced
- 5 sage leaves, sliced

Pantry ingredients

- 100 g + 1 tbsp (vegetable) butter
- 250 mL dry red wine
- 2 tbsp flour
- Salt
- Pepper

Method

1. Add 2 tablespoons butter or oil to a large Dutch oven or pot and set it over medium heat. When the fat is hot, stir in half the mushrooms. (If it doesn't all fit in the pot in one layer, you might have to do this in three batches, rather than two.) Without stirring too much, cook the mushrooms until they are brown on one side, about 3 minutes. Stir and let them brown on the other side, 2 to 3 minutes more. Use a slotted spoon to transfer mushrooms to a large bowl or plate and sprinkle with salt and pepper. Repeat with another 2 tablespoons butter and the remaining mushrooms seasoning them as you go.
2. Reduce the heat to medium-low, add the remaining butter and cook the ransom leaves and Babbington leek until soft, about 5 minutes.
3. Stir in the herbs and leaves and cook for a minute. Add the flour and stir for another minute before adding the wine.
4. Bring the sauce to a simmer and add the browned mushrooms. Simmer on low heat for 30-40 minutes while you prepare the jerusalem artichoke puree.
5. Cover the artichokes with boiling water and boil until tender. Check after 10 minutes and give them 5 more if not tender yet.
6. Drain the artichokes and add salt, pepper and butter to taste, then mash into a coarse or smooth puree of your liking. Serve the stew on a bed of puree.

Nutritional Information

PER SERVING

Kcal: 497 | Fat: 24,6 gram | Carbs: 49,3 gram | Fibre: 7,7 gram | Protein: 10,2 gram

WINTER BERRY SAUCE

Goes well with hearty dishes, but can serve as a fruity complement to your breakfast too. Sassafras leaves are also good in this sauce, but would have to be preserved during spring or summer.

20 MIN FOR 500 ML

SIDE DISH

Ingredients

- 350 gram cleaned mixed berries (such as strawberry tree, Bentham's cornel, sea buckthorn, or frozen berries from the summer season). Halve the larger fruits.
- 1 or 2 wild apples or quinces, cut into small pieces

Pantry ingredients

- 150-200 grams of sugar
- 1 cinnamon stick, broken into 2 or 3 pieces
- 1 star anise
- 2 cloves

Method

1. Add all fruit, spices and 150 grams of sugar to a pot and bring to a simmer. Add a couple of tablespoons of water if the fruit is dry.
2. Simmer for about 5 minutes, then taste for sweetness and add more sugar if necessary.
3. Store the sauce in the fridge. Leave the spices in if you like a strong flavour or take them out if you like it milder.

Nutritional Information

PER SERVING

Kcal: 48 | Fat: 0 gram | Carbs: 10,9 gram | Fibre: 1 gram | Protein: 0,2 gram

GREEN SPRING STEW

Cheerful green vegetable stew, which suits a sunny spring evening, but provides a warm and delightful feeling on a rainy day as well. Easy & quick to make. You could pair it with some (chestnut) bread on the side.

30 MIN SERVES 4

LUNCH

Ingredients

- Small handful of Chinese cedar leaves
- 10 gram fresh mint leaves (chopped)
- 150 gram good king henry leaves
- Handful of Sorrel
- 1 or 2 Babington leek leaves (chopped fine)
- 300 gram artichoke hearts
- Large handful of Ramson leaves (chopped fine)

Pantry ingredients

- 200 ml water
- 100 ml white wine
- 1 tbsp Olive oil
- 500 g Peas
- 500 g Broad beans/snow peas
- 1 broth tablet (this can also be made fresh with Chinese cedar stems)
- Salt & pepper

Method

1. Add the olive oil in a stew pot and put the fire medium high. Add the Chinese cedar leaves, the babington leek leaves and half of the ramson leaves and simmer it for a few minutes.
2. Add the artichoke hearts, the peas and the broad/snow peas and add (perfume with) the white wine, the broth tablet and the water. Let simmer for about 10 minutes.
3. Meanwhile, chop the mint leaves and the sorrel. After 10 minutes of simmering, add these chopped leaves, the second half of the ramson leaves and the good king henry leaves and stir gently. Add pepper & salt to taste.

Nutritional Information

PER SERVING

Kcal: 269 | Fat: 5,8 gram | Carbs: 28,9 gram | Fibre: 5,6 gram | Protein: 14,1 gram

SPRING LINDEN LEAVE SALAD WITH ASPARAGUS

Green spring salad with different leaves and interesting flavours. The bits of somewhat fierce flavours of all the different leaves nicely balance with the softness of the asparagus and the linden leaves.

15 MIN SERVES 2

SALAD

Ingredients

- 200 gram lime (linde) leaves
- 50 gram Horseradish leaves
- 50 gram Hazelnut (chopped)
- 200 gram green asparagus
- Small handful of ground ivy (chopped)
- A few dill leaves (chopped)
- A few Sorrel leaves (chopped)

Pantry ingredients (dressing)

- Tbsp of olive oil
- Tbsp of Vinegar
- teaspoon of mustard
- Teaspoon of sugar or honey
- Pinch of salt and pepper

Method

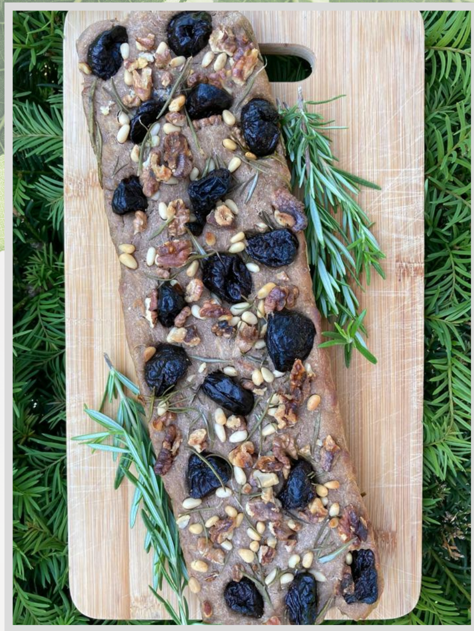
1. Cook water in a cooking pan, with a pinch of salt
2. In the meanwhile, break the lowest 3 cm off the asparagus and add them to the water when it is cooking. Cook them for about 5 minutes (or 2 minutes and then grill them shortly). When they are done cooking, chop them in pieces of about 4 to 5 cm.
3. In the meanwhile mix all ingredients for the salad
4. Spread the asparagus pieces over the salad
5. Mix the ingredients for the dressing and pour over the salad

Nutritional Information

PER SERVING

Kcal: 391 | Fat: 33 gram | Carbs: 13,7 gram | Fibre: 4,9 gram | Protein: 7 gram

SPRING CASTAGNACCIO: TUSCAN CHESTNUT CAKE WITH RHUBARB



Interesting cake which can be eaten as dessert or as a snack. The nutty flavour of the chestnut flower and other nuts nicely balance with the acdity of the rhubarb.

60 MIN SERVES 10

DESSERT OR SNACK

Ingredients

- 200 gr chestnut flour (see recipe page 11)
- 60 gr dried plums
- 20 gr walnuts
- 15 gr pine nuts
- 1 twig of fresh rosemary, leaves picked
- 500 gr rhubarb
- 40 gr hazelnut

Pantry ingredients

- 30 gr sugar
- a pinch of salt
- 250 ml cold water
- 2 tablespoons of olive oil

Method

1. Preheat the oven at 180 C.
2. Clean the rhubarb and chop in pieces of 3 cm. Put the rhubarb in an oven dish, with 3 teaspoons of sugar and a dash of water and heat it for 15 minutes.
3. In the meanwhile, chop the hazelnut and set aside.
4. Sieve the chestnut flour into a bowl and add the sugar and salt. Add the water bit by bit and stir to avoid lumps.
5. When smooth, add 1 tablespoon olive oil to the batter and let rest for about 30 minutes.
6. After 15 minutes, take the rhubarb out of the oven (leave the oven turned on), and let it cool down a bit for a few minutes.
7. Make a mousse of the rhubarb with a blender or food processor.
8. Put the rhubarb mousse into a sieve and push the moisture out with a spoon. Let it leak for about 10 minutes (collect this moisture and when it is cooled down, you can make delicious drinks/lemonade out of this by diluting it with sparkling water for example).
9. Mix the rhubarb mousse and chopped hazelnuts with the batter and pour the batter into a small baking dish covered with parchment paper (greased with a bit of olive oil).
10. Evenly scatter over the dried plums, walnuts, and pine nuts and finish with rosemary and the rest of the olive oil.
11. Bake for about 30 minutes or until you begin to see little cracks appear all over the top. Do not overbake or it will become very dry. Let it cool in the pan, slice and serve

Nutritional Information

PER SLICE

Kcal: 173 | Fat: 7,3 gram | Carbs: 19,8 gram | Fibre: 5,2 gram | Protein: 3,2 gram

CHESTNUT FLOWER

How to make your own chestnut flower?

Ingredients

For 200 grams of chestnut flour, you need 600 grams of chestnuts (with husk)

Kitchen utensils

- Oven
- Food processor

Method

1. Preheat the oven at 200c
2. Score the sweet chestnuts on top with a sharp knife by cutting a cross into them. The deeper you cut them, the easier it is to remove the husk later.
3. Put the chestnuts on a baking tray and roast them in the oven for about 10 minutes, or until they are all open.
4. Lower the oven temperature to 50c.
5. Remove the husk from the chestnuts as fast as possible. The warmer they still are, the easier this will be.
6. Break the chestnuts in small pieces and put them back on the baking tray.
7. Put the tray in the oven for 1,5 / 2 hours
8. Get the chestnuts out of the oven and let them cool off
9. Grind the chestnuts in a food processor until it is as fine as possible
10. Put the flour back in the oven and cook until it is dry enough.
11. Cool the flour and put it in an airtight jar.

Nutritional Information

PER 100 GRAMS

Kcal: 343 | Fat: 3,7 gram | Carbs: 63,6 gram | Fibre: 14,2 gram | Protein: 6,1 gram