GUIDE TO SUSTAINABLE MENUS

VISIT OUR WEBSITE · VISIT OUR WEBSITE ·

A guide to sustainable menus

A step by step approach to sustainablility

NOURISH
The future of food in health care.

November 2019

Written by:

Annie Marquez, RD, Manager of Food Services, CIUSSS Centre-Sud-de-l'Île-de-Montréal, Quebec
Allison Gacad, BSc Candidate, Loran Scholar, University of British Columbia

With the participation of members of the Nourish Sustainable Menu Collaborative Project

Elaine Addison, Director of Nutrition and Food Services, Horizon Health Network, New Brunswick
Kathy Berger, Manager of Food Services & Switchboard, Health Sciences North, Ontario
Béatrice Dagenais, RD, M.Sc. Student, Université de Montréal
Annie Dodier Desroches, RD, Food service Menu Specialist, CHU de Ste-Justine, Quebec
Travis Durham, Director of Dietary Services & Information Technology, Grove Park Home, Ontario
Cheryl Cooke, Manager of Central Okanagan Food Services, Interior Health, BC
Beth Hunter, Program Director, The J.W. McConnell Family Foundation, Quebec
Josée Lavoie, Manager of Food Services, CHU de Ste-Justine, Quebec
Marilyn Lo, Divisional Dietary Systems Specialist, Health Services, Long Term Care, Regional Municipality of Peel, Ontario
Geneviève Mercille, Assistant Professor, Department of Nutrition, Faculty of Medicine, Université de Montréal
Charlotte Pilat Burns, RD, Regional Manager in Food & Nutrition Services, Saskatchewan Health Authority
Jennifer Reynolds, Institutional Food Program Manager, Food Secure Canada, Quebec
Susan Taylor, RD, Provincial Manager Standards and Initiatives, Nutrition and Food Services, Nova Scotia Health Authority
Linda Varangu, Executive Director, Canadian Coalition for Green Health Care, Ontario

External reviews by:

Olivier Boiral, Full Professor, Faculty of Business Administration, Department of Management, Université Laval, Quebec, and Canada Research Chair in Internalization of Sustainability Practices and Organizational Accountability
Marie-Christine Brotherton, Research Assistant, Canada Research Chair in Internalization of Sustainability Practices and Organizational Accountability, Faculty of Business Administration, Department of Management, Université Laval, Quebec
Stacia Clinton, National Director, Healthy Food in Health Care Program, Health Care Without Harm (USA)
Stéphanie Côté, RD at extenso.org
Pamela Mason, co-author of Sustainable Diets
Colleen Thorpe, Director of Educational Programs at Équiterre
Leslie Whittington-Carter, Public Affairs Manager, Health Systems, Dietitians of Canada.
Stephen Jones, Freelance editor and translator

Project funded by:

The J.W. McConnell Family Foundation; Ministère de l'agriculture, des pêcheries et de l'alimentation du Québec; Ministère de la santé et des services sociaux du Québec. CIUSSS Centre-Sud de l'Île-de-Montréal.

Introduction: chapter 1

This is where it all begins

Executive summary

1

What – and who – is this guide for?

The menus served by healthcare facilities have an impact[1] not only on the health, recovery and well-being of patients, residents and staff, but on the environment and local economies as well. Each year, the Canadian healthcare system spends some $4 billion[2] on food—an amount that could have a major effect on the sustainability of food production, processing, distribution and consumption if new criteria for creating menus are used. In addition to the sustainability impacts of food purchasing, there are also major sustainability impacts of food waste from healthcare facilities, which is estimated at up to 50%[3].

Some sustainable development criteria are now included in provincial and national government policies, although decision-makers in healthcare facilities often lack the knowledge[4] necessary to be able to take these criteria into account. The following policies are among those enabling a new direction to be taken[5]:

- Health policies related to food in healthcare settings including menu setting, standards for food services, assessment of patient food experience, serving of Indigenous foods[6], and group purchasing arrangements.
- Agriculture policies defining and supporting local food promotion and procurement.
- Procurement policies supporting values-based procurement to generate triple bottom-line impacts (social, economic, environmental).

1 Ducak, K. and Keller, H. H. (2011). Menu planning in long-term care: toward resident-centred menus. Can J Diet Pract Res, 72(2), 83. doi: 10.3148/72.2.2011.83
2 V-Wilson, G. and Dover, J. (2016) Canadian Institutional Foodservice Market Report, fsSTRATEGY Inc., http://www.restaurantscanada.org/wp-content/uploads/2016/07/2016-Canadian-Institutional-Foodservice-Market-Report-Abridged-Sample.pdf, Retrieved Fall 2017
3 Gooch and Felfel (2014) $27 Billion Revisited: The Cost of Canada's Annual Food Waste, Value Chain Management Internationa
4 Wilson, E. D. and Garcia, A. C. (2011). Environmentally friendly health care food services: a survey of beliefs, behaviours, and attitudes. Canadian Journal of Dietetic Practice and Research, 72(3), 117-122. doi: 10.3148/72.3.2011.117
5 Reynolds, J. Nourishing the Future of Food in Healthcare: a pan-Canadian policy scan (2019). Food Secure Canada/Nourish/McConnell Foundation.
6 Also known as Country or Traditional foods depending on the context

This document provides those responsible for setting menus in Canadian healthcare facilities with a step-by-step guide to creating sustainable menus. As well as facilitating menu creation, it also provides the tools necessary to bring about a significant reduction of the environmental impact of the food served, while contributing to social and economic development. A food service manager may know little about sustainable development, have little time to bring about changes, or be in the process of completely revamping their menu offering. This guide offers ways to make menus increasingly sustainable—one step at a time, one choice at a time.

What is a sustainable menu?

A sustainable menu is one that provides the clientele with sustainable diets. The sustainable choices for menu creation put forward in this guide are based on known, validated concepts, and references are provided for recommendations wherever possible. The advice given is largely founded on a multi-criteria approach to sustainable diets, developed by Mason and Lang (based on the UN Food and Agriculture Organization's definition of food sustainability)[7]. Each criterion represents an aspect of sustainable development with which a product can be identified. While it is virtually impossible for all criteria to be present in any one foodstuff, **even a single criterion brings a degree of sustainability**. The more criteria a product meets, the closer it comes to an environmental, social and economic sustainability ideal.The following sustainable menu practices (see the appendix for a printable version) aim to present these recommendations to menu managers in a clearly understandable framework. It is worth noting that many of these recommendations are consistent with the new Canada's Food Guide[8], released in early 2019, which recognizes that "Food choices can have an impact on

7 Mason, P., Lang, T. (2017). Sustainable diets: how ecological nutrition can transform consumption and the food system. London and New York: Routledge.
8 Government of Canada (2019). Canada's food guide. https://food-guide.canada.ca/en/. Retrieved Winter 2019.

the environment". Details to apply each of these menu practices will be found in each chapter of this guide.

There are international efforts moving in a similar direction, including the EAT-Lancet Commission on Food, Planet, and Health.[9] In recognizing that world population is expected to reach 10 billion by 2050, this report urgently recommends a "planetary health diet": a diet that every person around the world should consume "to highlight the critical role that diets play in linking human health and environmental sustainability." The principles that follow, adapted from Mason and Lang, are used to frame the recommendations of this Guide.

1 QUALITY

- Serve fresh, appetizing food.
- Use recipes that have been approved by a tasting panel made up of patients, residents, staff members, etc. that represents the eaters in the facility.
- Serve regional fruits and vegetables when they are in season.
- Serve food containing as few additives and preservatives as possible.

2 SOCIAL VALUES

- Offer recipes of varied cultural origins representing the population you serve.
- Undertake to learn the cultural importance of foods eaten by Indigenous groups in your community.
- Favour home-made/traditional recipes for enriched products.
- Commit to promoting your sustainable menu for educational purposes.
- Offer fair trade products when possible.

9 Willett et al., 2019.

What is a sustainable menu

Adapted from and with the permission of
Mason & Lang, 2017
Sustainable Diets
Routledge, Chapter 9

QUALITY

- Taste
- Seasonality
- Cosmetic appeal
- Fresh (where appropriate)
- Authenticity

SOCIAL VALUES

- Pleasure
- Identity
- Animal welfare
- Equality & justice
- Trust
- Choice
- Skills (citizenship)

ENVIRONMENT

- Climate change
- Energy use
- Water
- Land use
- Soil
- Biodiversity
- Waste reduction

HEALTH

- Safety
- Nutrition
- Equal access
- Availability
- Social status/affordability
- Information & education

ECONOMY

- Food security & food resilience
- Affordability (price)
- Efficiency
- True competition & fair returns
- Jobs & decent working conditions
- Fully internalised costs

GOVERNANCE

- Science & technology evidence base
- Transparency
- Democratic accountability
- Ethical values (fairness)
- International aid & development

3 ENVIRONMENT

- Serve shellfish and fish from sustainable fishing or aquaculture.
- Reduce the use of processed foods.
- Serve certified or verifiable sustainably produced foods.
- Increase variety in order to contribute to biodiversity.
- Reduce the amount of red meats used and increase the use of proteins with a lesser environmental impact (legumes, organic and fermented soybeans, insects, chicken, nuts, seeds, whole grain).
- Cut waste by using surplus and adjusting serving sizes.
- Reduce the use of products supplied in single use or non-recyclable packaging.
- Offer water as the sole basic beverage.
- Compost and recycle waste.

4 HEALTH

- Define and adjust to the specific needs of each type of clientele served.
- Choose protein foods that come from plants more often (beans, peas, lentils, nuts, seeds, tofu, etc.).
- Limit highly processed foods.
- Serve animal products from animals raised without routine or non-therapeutic antibiotics.

5 ECONOMY

- Manage an efficient (cost-effective) food service that contributes to the local economy.

6 GOVERNANCE

- Engage with all stakeholders and recognize their role (e.g. users, customers, suppliers, purchasing group).
- Make evidence-based decisions.

How to use the guide

As we seek to make our working methods and habits more sustainable, every little change can have a significant impact. This guide provides many tips to help organizations create sustainable menus. However, because some food items may not be easily sourced and because change takes time, putting all of the guide's suggestions into place at once may not be possible. Over time, as food service managers make increasing demands of their suppliers and distributors, the supply should improve and broaden, facilitating the transition to sustainability. **The important point is to begin introducing one change at a time, assessing it, adjusting it, promoting it, and then moving onto the next change.** The various steps should be put into practice at a pace that suits everyone's capacities. The following points indicate which sections of the guide cover which changes.

It is important to bear in mind that food sustainability research continues to evolve and change. Please be conscious that although this guide reflects recent literature, some sections may contain more dated sources than others.

DEFINING A NEW OFFERING FOR A NEW CLIENTELE

Chapter 2 sets out the major stages involved in creating sustainable menus, starting with an analysis of the clientele for the purpose of defining the type of food that best meets their needs. At each stage, choices can be adjusted in accordance with real needs and the food service department's capacities. This is vital to the creation of a sustainable offering (healthy, safe, appropriate, in sufficient quantity).

IMPROVING FOOD SERVICE FUNCTIONING AND EQUIPMENT

Chapter 3 presents some points to consider for the sustainability of a food service department when the time comes to:

- Build a new food service or reconfigure an existing one
- Define or rethink the production and distribution mode for the meal service.

- Repair or recondition old equipment or purchase new energy-efficient equipment.
- Introduce more environmentally responsible methods in the maintenance and the usage of equipment.

PUTTING SUSTAINABLE FOODS ON THE MENU

When making or reviewing menu choices, information on each major food group can be found in the corresponding chapter. Chapters are designed to be read separately, outlining all the considerations involved in choosing the most sustainable product. Chapters are ordered in the sequence in which a menu is generally created:

- Chapter 4. Choose your sustainable Proteins
- Chapter 5. Choose your sustainable Vegetables
- Chapter 6. Choose your sustainable Starches
- Chapter 7. Choose your sustainable Soups
- Chapter 8. Choose your sustainable Desserts
- Chapter 9. Choose your sustainable Condiments and other ingredients
- Chapter 10. Choose your sutainable Beverages and snacks
- Chapter 11. Choose your sustainable Supplement

Each chapter is written in the same way, containing the following sections:

Section 1 explains the importance of sustainable choices for the food type.

Section 2 is a table to be completed in accordance with the features of the healthcare facility and the types of clientele served.

Section 3 is the body of the chapter and contains all possible choices presented in approximate order *from most to least sustainable*. Consequently, foods near the top of the table's left-hand column should generally be used in preference to those at the bottom. Ideally, as a first step the menu should be analyzed to identify items that should be changed and demonstrate the impact of more sustainable products (before/after snapshots that can be communicated).

For each type of food suggested in the left-hand column of the table there are "Tips for choosing" and "Tips for inclusion in recipes." The "Tips for choosing" provide information on the food's characteristics needed to make a more sustainable choice. The number of characteristics can vary between two and ten. The chosen item does not have to have them all. If a food has only one more sustainable characteristic than the item it replaces, your menu will already be more sustainable.

Section 4 helps you plan your menu more effectively to prevent waste, and provide guidance on repurposing ingredients when surpluses do occur—wastage of food is a common challenge for any food service department.

Section 5 references foods that were traditionally eaten in this country before the arrival of European colonizers and the advent of industrial agriculture and livestock rearing practices. In those days, local foods were eaten seasonally and with a view to maintaining biodiversity, completely in line with the principles of sustainable diets. Learning more about traditional eating habits generally, including the eating traditions of Indigenous Peoples of different locations in Canada, brings an important cultural and historical dimension to our current sustainability efforts.

4 Challenges and opportunities to adopting sustainable menus[10]

There are many real or perceived barriers to the implementation of sustainable menus. The following paragraphs present tips to help you and your colleagues understand and communicate the value of a sustainable menu.

Cost

Many managers assume that putting sustainable foods on menus involves increased costs. This is true in that local, organic and fair-

10 Dagenais B. & Mercille G. (2019). Discussion on the barriers to adopting sustainable menu practices. Nourish Healthcare's Innovators Retreat. Montreal, Quebec. January 17, 2019.

trade products may be more expensive and challenging to source initially from existing suppliers. However, many sustainable choices are not in fact more expensive and can even be less expensive. Also, changes can be made to save in one area of the menu in order to spend more in another. Expensive products or processes can be targeted for cost reduction, including reducing waste, giving greater room to manoeuvre in the choice of more sustainable foods. Consequently, a step-by-step action plan must be drawn up, making one small change at a time, as our capacities allow.

A close look at the tables of foods in chapters 4 to 11 will reveal measures that can be introduced without difficulty: those that favour the more sustainable foods listed at the top of the left-hand column will not have too great an impact on the budget. Sustainable proteins (e.g. organic and fermented soya, legumes and potentially insects) are often very affordable. Using the "Tips for inclusion in recipes," plant-based proteins can be used to reduce the quantity of meat per serving without compromising palatability. This can bring down the per-serving cost of meat dishes, and the resultant savings can be used to purchase ingredients that are slightly more expensive but considerably more sustainable.

The section on controlling waste in chapters 4 to 11 will also enable you to make savings. Menus can be designed to facilitate the use of surpluses or the reuse of leftovers. Another key part of creating a more sustainable menu is aiming to increase the satisfaction of those who eat the food (gathering and integrating feedback), thus increasing consumption and minimizing plate waste.

Shortage of resources

A change of any kind requires an investment of time, and some changes also involve a reorganization of tasks in the department (placing individual portions in reusable dishes, making products in-house, using untrimmed fresh vegetables, etc.).

This guide will also help you find changes that can require little time to set up. You can start with changes that fit into your normal routine (replacing an ingredient or changing a recipe when updating the menus, for example). The guide makes information easy to find and gives tips for including more sustainable practices.

If an opportunity arises to introduce bigger changes (department reorganization, renovation, etc.), then it makes sense to formulate a long-term action plan based around the changes. What's more, involving employees by consulting and informing them of the

positive impacts of a change can motivate them to implement it despite a high workload. Also, getting other departments involved in a sustainable development committee can push the entire organization into setting up a sustainable-development culture that may help provide the resources needed.

Negative perception by the clientele

Eating habits are difficult to change, especially if users are fearful of certain foods due to a lack of knowledge. For example, changes towards sustainable menus may be well accepted by young, healthy adults but may be more challenging for the sick and elderly. It is a good idea to introduce small changes that will have less of an impact to begin with and can be promoted as an initial success to build on. Educating clientele through proper communication of changes can help make improvements acceptable to them. One change that is always seen positively is the purchase of regional and seasonal produce. Beginning with items that are appreciated by the clientele (desserts, beverages, fruits, vegetables) can lay the foundations for progress towards a more sustainable menu.

Discussions of sustainable food often involve talk of reducing the consumption of meat and increasing plant proteins as recommended by Canada's Food Guide. There are two things to keep in mind when marketing vegetarian options[11]. First, do not focus on advertising that you are taking away all meat, because the vast majority of people like the taste of meat and don't want to be reminded that what they are about to eat contains none. Second, if a dish does not contain meat, make sure it sounds delicious.

Older members of the clientele will also be more satisfied when they are given familiar, comforting meals. This means it may be better to introduce changes such as increases in plant protein first to younger generations who will find them easy to accept. Otherwise, make use of the "Tips for inclusion in recipes" in chapters 4 to 11 for a gentler introduction (for example, a mixture of vegetable proteins and meat).

Lack of control

Many food service departments must contend with procurement or service contracts that restrict their ability to make more sustainable choices. Chapters 4 to 11 provide a host of suggestions for changes made within the constraints imposed by existing contracts. The purpose of the guide is to make it possible to introduce

11 J Wise, D Vennard, L Bacon. How Language Can Advance Sustainable Diets: A Summary of Expert Perspectives on How Research into the Language of Plant-based Food Can Change Consumption. Better Buying Lab. World Resources Institute. Washington, DC. March 9 2018.

more sustainable menus without necessarily having to search for products or require new clauses in contracts. The information is available and can be shared with suppliers so that they can adapt to new demands gradually.

Organizational support

Food service managers (FSM) recognize the importance of having motivators and agents of change from inside and outside the organization. Without proper support, it is often difficult to know where to begin and how to take steps towards a sustainable menu. There are approaches you can take within your organization to facilitate the adoption of a sustainable-development culture by broadening the understanding of sustainable food.

- Ask to sit on the sustainable-development committee of your own organization. If there is no such committee, discuss the possibility of setting one up with the director and seek allies in the finance and procurement departments.
- Start with small changes that do not create major upheavals.
- Educate decision-makers on the benefits of sustainable menus and the changes they entail.
- Involve all actors in the food chain:
    - Increase the awareness of your purchasing groups by asking questions about the criteria for more sustainable food.
    - Ask manufacturers whether they can supply items that meet your nutritional guidelines and contain desired ingredients.
- Add an item on sustainable foods to the agenda of every meeting at which food service is discussed: with managers, coordinators, the menu committee, dietitians, etc.
- Connect with other food service managers in your province and across Canada (via online forums or peer learning circles) to facilitate searching for sustainable products, local companies offering sustainable products, etc.

- Inform, train, consult and involve employees of the food service department—and other departments that have anything to do with food for users—in order to find more sustainable solutions and working methods.
- Highlight the efforts of food service employees who contribute to making the service more sustainable.
- Promote sustainable initiatives that increase user satisfaction.

Information you will not find in the guide

- Nutritional analyses for making choices based on treatment plans. The choice of plans and guidelines is specific to each facility and must be done ahead of menu creation in collaboration with clinical nutritionists. The choices offered should therefore suit the majority of the clientele in your facility—including those with specific treatment plans.
- Sustainable procurement procedures. The guide provides information needed to make more sustainable choices from among foods generally used by food service departments, as opposed to choices that require suppliers to make significant changes. Many criteria cannot currently be met because calls for tenders do not generally include sustainable-development criteria. Here are some reference documents on the subject:
    - MSSS: *Cadre de référence en approvisionnement responsable* (to be published in 2019)
    - Foodsecurecanada.org: Purchasing Power: 10 Lessons on Getting More Local, Sustainable, and Delicious Food in Schools, Hospitals and Campuses. March 2017

  - Greenhealthcare.ca: Green Hospital Procurement Policy and Procedure Manual, and Implementation Guide. January 2016
  - Health Care without Harm: Leading the transition to healthy and sustainable food in healthcare. August 2018
  - Nourishhealthcare.ca: see documents in Reference section under Sustainable Procurement.

- Ways to introduce Indigenous foods. National and/or provincial legislation currently prevents the inclusion on healthcare menus of foods without food hygiene and safety certification, making procurement of wild game and fish difficult. However, serving traditional Indigenous foods can show respect for traditional cultures and their deep connection to the land, in addition to being a comfort food for vulnerable Indigenous patients. This guide provides a description of such foods in each chapter so that you can include them when possible (e.g. wild blueberries). For more information:
  - Nourishhealthcare.ca: see Resources section under Traditional Foods

Chapter 2

The steps involved in creating a sustainable menu[12]

12 ETMISSS-PL. Élaboration d'un menu harmonisé pour les clientèles hébergées et hospitalisées dans les établissements du réseau de la santé et des services sociaux de la Capitale-Nationale—Note informative. CIUSSS de la Capitale-Nationale. August 2015. 65 pages.

Steps 1 to 6 are preliminary to actual menu creation. Follow them carefully, working as a team. You may want to record them in a document to serve as a reference for future menu and menu change choices.

Define your objectives and basic principles

Depending on the type of facility, its location and the services provided, it is essential that the food service department adopt principles and objectives that will guide all operating decisions. Here are some sample objectives and principles that can be adapted to suit your clientele.

Objectives

- Provide comprehensive principles to guarantee a food service offering and operations (production, distribution, procurement) that are sustainable, safe and user-centred.
- Enable the planning and evaluation of a standardized menu that satisfies the nutritional needs of users through its format and through choices appropriate to their profile (restrictions, diets, likes, dislikes).
- Provide nutritional criteria and procurement standards to ensure that targets defined by provincial policies and national nutrition guides are met and that variations to suit every type of clientele are incorporated.
- Take multidisciplinary work (by department heads, nutritionists, user committees, other professionals, cooks and attendants) into consideration to improve service to users (nutrition and support).

Basic principles

- Menu planning must consider the nutritional needs of the target population and factors affecting food consumption.
- Control of costs must be balanced against quality and variety.
- Sustainable development must be taken into account from the outset of menu planning.
- The following people should be consulted before introducing a new menu (in order):
    - Food service managers
    - Diet technicians
    - Nutritionists and dietitians
    - Cooks and attendants
    - Residents' and users' committees
    - Nursing staff (focus group).
- Established standards must be reviewed regularly for the purpose of continuously improving food service.
- Nutrition must be managed as an integral part of patients' medical treatment.
- Treatment plans prescribed must be based on conclusive data.

2 Determine types of clientele and evaluate their particular needs

Here are some examples of clienteles and specifications that can be adapted to your setting (depending on age, culture, ethnic origin, religion, physical needs, nutritional preferences, length of stay, nutritional risk, allergies, intolerances, dysphagia, etc.). It is important to consult nutritionists, residents and families in order to identify users' needs clearly and to define a number of meals and snacks and the menu format accordingly.

All users

- The average duration of hospitalization should guide the length of the meal cycle.
- Serve a wide variety of popular dishes and vegetarian options.
- Offer hot or cold meals for greater flexibility.
- Comply with nutritional treatment plans.
- Offer enriched foods (added proteins, carbohydrates, fats) as needed.
- Use standardized recipes for dishes with a choice of serving sizes to suit needs.
- Offer personalized snacks to satisfy needs (energy and nutrients).
- Provide flexible meal times that can be adapted to suit the clientele (offer lunch bags or early/late meals).
- Keep food reserves on units, with a certain number of items to treat hypoglycemia.
- Control allergens.

"Children and teenage" users

- Types of food and serving sizes will vary with the age group.
- À la carte (on demand) service with flexible serving powers is often a better fit with needs, which tend to vary depending on general day-to-day condition.

"Adult and senior resident" users (long term)

- Prioritize tasty, familiar foods (traditional choices).
- Maintain interest by using a variety of strategies (longer cycle, greater choice, theme days).
- Post a menu every day with a photograph or diagram.

"Mental health" users

- Serve foods with high-fibre, low-energy, nutrient-dense, low saturated fat content.
- Provide access to snacks and finger food.
- Maintain interest by using a variety of strategies (longer cycle, greater choice, theme days).
- Food may be given on demand, but only if advice and supervision is provided in order to ensure that the user's needs (established by a nutritionist) are met.

3

Define the menu format

Constraints imposed by costs and available resources need to be taken into account before the menu format is defined. The ability to produce and distribute the chosen menu format will depend on the available budget, kitchen equipment, and storage spaces, and on the qualifications of the workers available. Chapter 3 sets out some ideas for rethinking these constraints with a view to a more sustainable offering.

Cycle menu or à la carte menu?

Depending on the analysis of clientele types and their capacities, an à la carte menu could be the best way to meet needs, ensure clientele satisfaction and reduce food waste. An à la carte menu can be combined with a cycle menu of main dishes. But regardless of the type of menu chosen, you will need to define its characteristics.

Menu characteristics

- Menu: number of days in the cycle for personalized snacks, variety, bulk if available (observe health and hygiene standards, control of consumption)
- Breakfast menu: number of days in the cycle, foods offered (number of choices and number of servings), available variety
- Lunch and dinner menu:
  - Number of weeks in the cycle (determine the number of weeks in a menu cycle that suits the average clientele profile and average duration of stay)
  - Typical meal. Example: comprises a soup, a main dish with vegetables and starch, a dessert and a beverage
  - Number of main meal choices on the regular menu and texture of main meal choices per meal when a majority of the clientele require a modified texture
  - Menu review rules. Example:
    - The menu is modifiable: it is changed at least twice a year and as needed in response to feedback from customers and employees.
    - The menu is changed in accordance with fresh seasonal produce

Typical day menu

- Develop a typical day menu for meals and snacks.
- Formulate a plan for the frequency with which dishes appear based on main recipe families (soup, main dish, starch and side vegetable, dessert, beverage, condiments, snacks, supplements) and on needs in terms of textures and therapeutic diets.
- Determine the frequency of daily appearance necessary to comply with established nutritional criteria and sustainability criteria.

Planning nutritional and financial guidelines

Canada's Food Guide and provincial guides

Canada's Food Guide[13] is the basic tool used in most healthcare facilities to define the content of a complete meal and to guide certain product choices. There are also provincial documents that provide guidelines.

Relevant policy documents available are listed, by province, in the following reference document: *Nourishing the Future of Food in Healthcare: a pan-Canadian policy scan by Jennifer Reynolds (Food Secure Canada / Nourish), 2019*

Specific and sustainable nutritional guidelines

A table of nutritional guidelines for the major food groups by type of clientele, based on statistics on nutritional treatments (diet) used, will provide a useful framework for choosing foods and recipes that reflect the needs of the majority of the clientele. When using a sustainable nutrition approach, it is important to set guidelines for potential problem nutrients such as refined sugar, sodium, saturated fats, and trans fats, as well as types of unauthorized additives.

13 Government of Canada (2019). Canada's food guide. https://food-guide.canada.ca/en/. Retrieved June 2019.

Chapters 4 to 11 set out a host of food characteristics that can be partly or entirely incorporated into nutritional guidelines, thereby setting a standard for your sustainable menu.

Size of servings and serving utensils

Serving sizes can be based on required nutrient content (dietary reference intakes), users' needs for nutrients depending on their condition (age, therapeutic diet), and their actual consumption. Finding out users' actual consumption requires conducting quality and satisfaction audits and studies of leftovers. For example, for children, a good strategy to limit waste and serve adequate portions is to ask each child how hungry they are and how much they would like (with an *on demand* service). Consulting personnel directly involved with nutritional clienteles (patient attendants, food service attendants) will also prove informative. In order to respect serving sizes and avoid waste or surpluses, the food service department requires a tool to indicate the serving utensils to be used for every item on the menu. Adequate quantities of each tool must be available for staff to use.

A table setting out serving sizes per type of item on the menu based on clientele types provides a means of standardizing practices and ensuring that serving sizes closely match analyzed needs.

Cost guidelines

To enable food choices to be guided by a budget, it is useful to build a table to set financial guidelines for the major food groups on the menu. A maximum cost per serving of soup, desserts, etc. can thus be set. For main meals, it is a good idea to set a per-serving cost for each type of protein, since prices can vary greatly.

Creating the menu

For a cycle menu, an empty menu template drawn up to match the previously defined standards and characteristics will prove handy.

1. Choose the protein (Chapter 4) for the meal, avoiding repetition in two consecutive meals (lunch and dinner). Use the colours suggested in the chapter to easily visualize repetitions of protein types.

2. Choose the recipe to suit the protein type. Provide a variety of recipes to reflect the clientele (culturally sensitive, modified texture, pediatrics, etc.). When changing a recipe in a cycle menu, it is wise to replace the recipe with one that uses the same type of protein: this will avoid the necessity for a cascade of successive changes.
3. Where there is a choice of several recipes for a single meal, the recipes must be complementary so as to satisfy the majority of the clientele (including special diets: there can be several versions of a recipe to comply with restrictive diets).
4. Choose the accompanying vegetable (Chapter 5) and starch (Chapter 6), which:
    - must not be present in the main recipe
    - must suit the type of recipe (tradition/culture/taste)
    - must be of a colour that will make the plate look appetizing.
5. Choose a soup (Chapter 7) that will complement the meal effectively and will ideally contain the two previous days' side vegetables in order to prevent wastage of leftovers. A meal-soup with a good amount of protein can complement a main dish with a lower protein content.
6. Choose condiments (Chapter 8), beverages (Chapter 10) and desserts (Chapter 9).
7. Choices of beverages and snacks (Chapter 10) can be made using another menu template, which can be cyclic or not.
8. If supplements (Chapter 11) are required, look into using in-house recipes.

6 Evaluate the menu

Engaging eaters

Satisfaction of the clientele is crucial to a menu's durability. Users can validate whether a menu is satisfactory as regards both form (principles, specifications and characteristics) and content (quality and quantity). They must be an integral part of all stages in the menu-creation process.

Stakeholders must be consulted before a new menu is created in order to consider needs expressed by the clientele. Active communication with users, their families, the users' committee, attendants, nursing staff, therapists, nutritionists, and so on will help consolidate the vision and share information necessary for changing the menu, and possibly changing habits.

When introducing sustainable principles into a menu, it is essential to explain to stakeholders the sustainable orientation that the menu will gradually take on so that all interveners give positive support to the change in habits. Meetings should be held before the menu is introduced in order to validate choices, respond to misgivings, and provide arguments that can be used to answer questions from users of the menu.

Then, a policy must be introduced for evaluating the menu once it is in place. Post-implementation evaluation is essential for sustainable production and distribution—that is, production of food that users will enjoy eating. Evaluation can be conducted on an ongoing basis by all interveners who interact with users at meal times. Effective means of communication must be in place so that all comments can be used to adjust a recipe or quantity, or to create a more personalized menu.

Evaluation procedure

Facilities should adopt an evaluation procedure designed to assess a menu's acceptability at the time it is created and subsequently when users are eating from it. Here is a sample procedure.

- Annually, gather and compile information from: satisfaction questionnaires completed by residents, comments from users' committee, audits (studies of leftovers, analyses of cafeteria sales), feedback from nursing and care staff regarding:

  - Nutritional content, variety, colour, texture, flavour, aroma, appearance
  - Serving sizes
  - Food waste.
- Regularly revise the menu in light of data gathered (at least twice a year).
- Nutritionists assess and approve the menu regarding the various textures and consistencies.
- Studies of plate waste in the dishwashing area are conducted annually in a directed manner, but every day a round is made to gather comments from employees in the washing area who notice waste and meals that are less well liked.

Method for gathering comments

- Visits to users by the food service department and “live” changes to their menus
- Direct communication by interveners with the food service department / dietary technicians for changes to a personalized menu
- Email address to allow all interveners and families to contact the food service department directly
- Communication book / software to gather comments on the floor: to be completed by meal helpers (nursing staff, families)
- Questionnaire on the back of the menu in the tray to gather daily comments (if the user’s name is on the menu, these are not confidential, which could result in fewer comments)
- Short questionnaire in the tray / on tables to gather comments on a small change or opinions regarding a choice to be made
- Long questionnaire that could require assistance for users: may contain a bias if assistance is provided by a food service employee/intern, making users give more positive responses. A minimum number of responses must be gathered for them to be meaningful (typically 20% of users).

Chapter 3

Sustainable elements in food service operation and equipment

1 Production and distribution

When there is an opportunity to rethink the entire food service department, it is vitally important to envisage the most sustainable possible ways of working. But chances to completely change the type of system are rare, and menus are dependent on the system.

The most sustainable type of production and distribution from a food-consumption point of view (eliminating waste, increasing satisfaction, reducing costs) is "mixed liaison" production (cook & chill and cook & serve) that responds to immediate food requests, with the foods available for table service or room service ordered by users with flexible service times[14].

In long-stay accommodation, when users are no longer able to think about their mealtimes, to read, or even to feel hungry, it is more sustainable to consider installing a proximity kitchen in care units. With this type of service, users can smell the food as it is being cooked (stimulating appetite), talk directly to the cook about their preferences (increasing satisfaction), and eat a freshly prepared hot meal in the dining room together (breaking isolation, increasing food consumption). On the other hand, managing safety (diet, texture) may be challenging, so employees must be well trained by a dietician.

2 Human resources

Position structure

The structure of positions in the food service department must be reviewed considering the preferred type of operation, since the number of cooks and attendants and their weekday or weekend schedule will have a major effect on the department's efficiency and the choice of foods on the menu. Here are some examples of issues that could be considered:

14 In general, "cook & serve" is preferable to "cook & chill," because chilling and reheating food wastes energy. However, cooking and chilling can save energy when large amounts of food are prepared (e.g. pasta or spaghetti sauce).

- Reorganize task descriptions and schedules for à la carte service
- Organize cooks' timetables to improve flexibility of meal service times and improve food freshness
- Increase attendants' hours for dividing food into reusable containers of house meals.

Training and qualification

Introducing more sustainable habits requires changes in practice, for which employee training is essential—for kitchen employees, service employees and technicians visiting the users. Satisfaction is key and is the responsibility of all interveners.

- Interactions between all players must be efficient so that users receive exactly what they want and what they will eat (user satisfaction, no waste).
- Working methods must be reviewed to identify wasteful practices (e.g. reduce the use of disposable gloves).
- Training in sustainable nutrition must be provided to encourage changes in habits, not only for a healthy lifestyle but also for healthy use of the planet's resources.

Sustainable equipment and storage spaces

The quantity and type of equipment available have a major impact on possible menu choices. When the time comes to repair or recondition an item of equipment or procure a new one, an analysis should be carried out to consider the sustainable aspects of its use — improving satisfaction based on comments received, analyses of waste, increase in the offering of sustainable products, savings in energy and water, reliability (durability) over time, efficient ("lean") production methods, etc.

Here are some thoughts to consider in the management of equipment and storage spaces in the food service department.

Characteristics of sustainable equipment

- Choose equipment with the most sustainable energy source. Electricity is the most sustainable source if it comes from hydroelectricity or from solar or wind-power sources. However, where electric power is produced from natural gas or coal, equipment running on natural gas is to be preferred.
- Equipment with reduced energy consumption (ENERGY STAR certified) or water consumption. These items are more expensive to purchase, but through energy savings they provide a good return on investment.
- Combination ovens (convection, steam) often cut cooking times and therefore save energy.
- Use a rapid cooling unit if large quantities of hot food must be stored in a refrigerator.
- Working with the procurement department, draw up a list of criteria for sustainable purchases of large and small items of equipment. This should be integrated into the procurement department's sustainable procurement policy.
- Use reusable crockery (including lids) for all foods that must be portioned out.
- Promote consumption of water by providing reusable glasses next to water sources.
- Discuss the options of waste management with the appropriate departments to ensure that a suitable onsite waste management option is available (composting, recycling, etc.).
- If disposable dishes must be used[15] :
    - Use compostable, biodegradable dishes and throw them in the compost.
    - Be wary of wax-lining in cardboard packaging: check with your recycling provider to see whether these are recyclable.

15 Chaire internationale sur le cycle de vie pour Recyc-Québec. Analyse du cycle de vie de tasses réutilisables et de gobelets à café à usage unique. CIRAIG, October 2014, 159 pages and CIRAIG. Mémoire déposé dans le cadre de l'évaluation des enjeux et des impacts du bannissement des sacs d'emplettes à usage unique dans les commerces de détail sur le territoire de la ville de Montréal. June 4, 2015, 17 pages

  - Aluminum may or may not be recyclable depending on your recycling provider.
  - Plastics are mostly recyclable: every plastic is stamped with a triangle-shaped logo with the number in the middle which indicates a type of plastic: each facility must check with the local municipality to see which are recyclable. Even polystyrene ("Styrofoam") can be recycled in some area.
  - If no composting or recycling facilities exist and disposable dishes go in the garbage, use polystyrene dishes, since they will have less of an environmental impact than cardboard or "biodegradable plastic" dishes, which cannot decompose in the anaerobic conditions in landfill sites. Even so, using dishes that are destined for landfill has to be considered the worst possible option!
- An industrial dishwasher and pot washer saves water and energy when the quantity of dishes is sufficient.
- Ensure the long-term reliability of equipment by establishing an annual preventive maintenance schedule.
- See that daily equipment maintenance is carried out (cleanliness, air intake kept clear, door seals in good condition) to prevent energy wastage.

Sustainable characteristics of storage spaces

- Fit out spaces for the use of bulk containers and reusable crockery.
- Prioritize cool storage (refrigerator rather than freezer), which requires less energy and allows fresh (more sustainable) foods to be added to menus.
- Make sure that cold rooms are not overly large, and that the doors of cool zones are properly closed.
- Freezers are more efficient when full, so size should suit actual need.

- Maintain inventory for what is needed only and emergency reserve supplies using a Kanban and barcode system.
- Ensure that inventory is taken to automate ordering: electronic dispatch directly to suppliers (no paper, no faxes, no lost sheets of paper).

Production standards

Service tailored to the needs of the clientele

Food production should stay as close as possible to user demand in order to stay in pull, rather than push, production: users make their choices from the menu and the kitchen produces them. Here are some measures to help achieve this:

- Produce in response to actual need: identify quantities of food needed as close to production time as possible.
- Monitor leftovers and sales daily and adjust the quantities to be produced accordingly.
- Monitor inventory (kitchen or care units) to avoid waste; reduce or increase quantities according to actual need.
- Restock foods in accordance with needs.

Working method (preparation, cooking, cooling, washing)

Each chapter on foods (chapters 4 to 11) contains a section on controlling surpluses and leftovers that provides several hints and tips to reduce food waste. Using these tips may bring about a revision of cooks' and attendants' working methods. It is important to raise employees' awareness and train them to reduce waste.

Tour the department (Gemba walk) to check on working methods and identify improvements that will cut out unnecessary energy use while maintaining health and hygiene rules. Here are some avenues for improvement.

- Use cooking methods that preserve the nutritional value of foods (steam) and reduce water use.
- Review the methods of recipes to use fewer pans, utensils, and items of equipment that need cleaning.
- Avoid cooking, cooling, and reheating small quantities of food, because cooling is a non-added-value step (waste of energy and unnecessary movement).
- Don't open oven doors, and put lids on saucepans.
- Increase the efficiency of movements in cold rooms to avoid opening doors.
- Reduce the use of aluminum foil (use reusable lids, recycled aluminum foil or plastic film).
- At the salad bar, put out small containers that need to be changed more often in order to reduce waste.
- Where possible, use or reuse cooking water in the production process.
- Wash floors with water drained from tanks for the washing and disinfection of instruments and equipment.
- Introduce composting and waste recycling, and train staff.
- Use kitchen towels made of recycled paper and compost them.
- Use a steam machine for washing equipment where possible. The high temperature and pressure of the steam jet makes it possible to eliminate the use of soap, reduces water use and increases the speed of cleaning.
- Use organic, biodegradable soaps and disinfectants.
- Use automatic soap dispensers to reduce the amount used.
- Use rainwater to water the kitchen garden.
- Keep large reusable plastic boxes and containers and give them to the recreation/activity department, to

volunteers, to users or to employees; find partners who will make use of containers of all kinds.

C. KEEP ABREAST OF NEW TRENDS

- Ask your suppliers about new food products or new, more sustainable packaging sizes.
- Subscribe to equipment suppliers' newsletters to find out about new cooking methods and new equipment becoming available.
- Create partnerships with organizations in your community or foundations that can fund initiatives for the welfare of users.
- Reserve a space to grow your own herbs, fruits and vegetables outside (roof, terrace, plot of land), and why not try a henhouse to produce eggs?
- Bring in beehives to pollinate your urban garden, with the possibility of harvesting and selling your own honey!

Other References

To learn more about healthy diet for sustainable food systems, see:

EAT-Lancet Commission. (2018). EAT-Lancet Commission brief for Food Service Professionals. Retrieved from https://eatforum.org/content/uploads/2019/01/EAT_brief_food-service-professionals.pdf

Willett, W. Rockström, J. Loken, B. Springmann, M. Lang T. Vermeulen, S. et al. Food in the Anthropocene: the EAT-Lancet Commission on sustainable food systems. The Lancet Commissions. 2019; 393: 447-492

Health Care Food Services Resource Guide—Going Green in the Kitchen with ENERGY STAR® in English and French

Taking a bite out of organic waste—case study: http://greenhealthcare.ca/wp-content/uploads/2017/07/CCGHC-Organic-Waste-Case-Study-June17-2013-FINAL.pdf

St Joseph's Group Purchasing Organisation makes local food an integral part of buying strategy: http://greenhealthcare.ca/wp-content/uploads/2017/07/St-Josephs-GPO-Case-Study-2-LocalFood.pdf

Conducting Food Origin Audits: http://greenhealthcare.ca/food-origin-audits/

K. Zeuli, A. Nijuis, R. Macfarlane and T. Risdale. The impact of climate change on the food system in Toronto. Int. J. Environ. Res. Public Health October 2018, 15(11), 2344

Elansari A., Bekhit A.ED.A. (2015) Processing, Storage and Quality of Cook-Chill or Cook-Freeze Foods. In: Siddiqui M., Rahman M. (eds) Minimally Processed Foods. Food Engineering Series. Springer, Cham

Chapter 4

Choosing your sustainable protein

In healthcare, protein is the heart of a meal—the main component around which all other ingredients revolve. This is the most repetitive component of a meal, and also the most expensive, particularly because it is often meat-based. However, this guide will help you identify other sources of protein that are nutritious, creative, economical and sustainable, and can be used to create meals that are well-balanced rather than being focused solely on protein.

When planning proteins for your menu, the first step is to create meal standards according to the needs of the population you are nourishing. Next, you must look at the type of protein, the frequency with which protein is served, and the frequency of the protein format (cubed, minced, etc.) each week. From an environmental and social perspective, it is also important to take into consi-deration the cycles of nature and to adapt menus according to the seasons where possible.

This chapter will guide you through these steps.

Sustainable proteins

Why eat protein?

Every cell in your body requires protein—it is essential to building bones, muscle, tissue, skin and more. However, protein reserves in the body are minimal in comparison to other energy reserves such as fat and sugar, so protein must be consumed regularly. A healthy person needs about 0.8 g of protein per kg of their body weight daily. (For ill or elderly people, a high protein intake is frequently recommended; in these cases, the quantities and types of protein in the diet need to be adjusted.) People generally consume far more protein than their bodies actually need, particularly in developed countries such as the United States, Canada, and countries of the European Union, where animal-protein consumption exceeds average estimated daily requirements for protein from all sources[16].

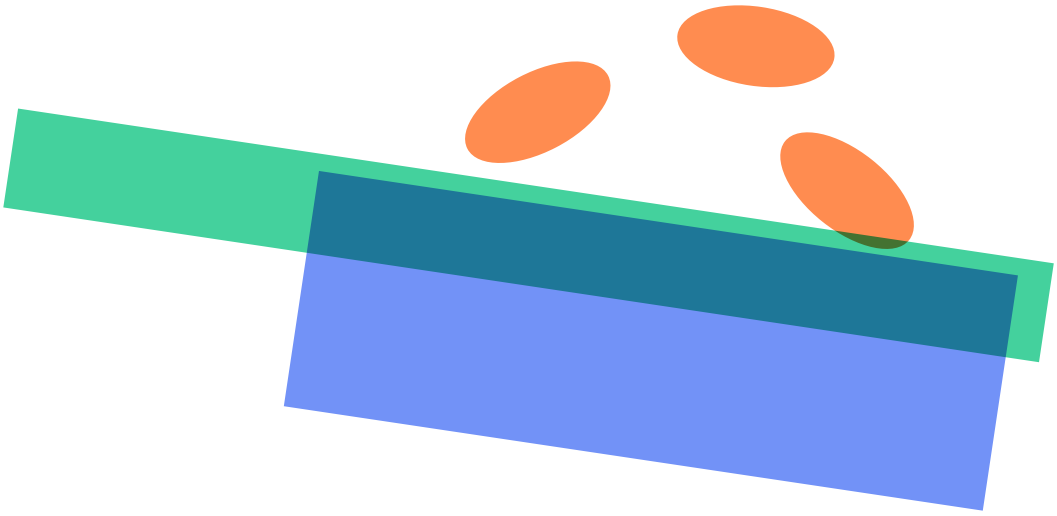
Why are sustainable proteins important?

Added to the fact that we eat too much protein, our protein consumption is not sustainable because of our preference for animal sources. Livestock alone contributes 14.5 % of the world's greenhouse gas emissions, primarily due to fertilizer use, land clearing for pasture, and livestock waste management[17]. Beef is a popular meat, but is the most inefficient source of animal protein, using more land, freshwater, and generating more greenhouse gases than any other commonly consumed food[18]. From an emissions perspective, poultry is the most sustainable form of meat, followed by pork[19]. However, other animal proteins such as dairy and eggs are much more sustainable than meat from an emissions perspective. Sustainable proteins such as pulses, are also used to maintain soil health in crop rotation programs.

16 Ranganathan et al., 2016.
17 Gerber et al., 2013.
18 Shepon et al., 2016.
19 Clune et al., 2015.

These crops grow with dense cover, reducing soil erosion and absorbing excess nutrients that may otherwise runoff into the water. There are various websites that can help us compare the impact our food choices have on the planet, for example: Climate Change Food Calculator (note that figures are based on global averages of studies from different countries).

Research is constantly evolving and while general guidlines on protein intake are unlikely to change substantially, small adjustments could be made.



What is the impact of sustainable protein on health?

Although it is difficult to study the impact of food on long-term health, emerging evidence suggests that, for optimal health, we should move away from meats towards plant proteins. Studies show that ultra-processed proteins (such as "nuggets" made from poultry, fish, and meat) are inefficient sources of protein. The worldwide increase in consumption of these products is linked to a dilution of dietary protein content along with excessive overall caloric intake[20]. The Guiding Principles and Recommendations in the 2019 edition of Canada's Food Guide encourage us to consume less red meat in favour of plant-based foods to promote health and reduce the incidence of chronic disease. Plant-based diets

20 Steele et al., 2017.

are also associated with a lower risk of cardiovascular disease[21]. Moving towards a plant-based diet does not compromise the nutritional quality of one's diet. Consumption estimates indicate that there is ample room in high-consuming populations in countries such as Canada, to maintain adequate protein intake while decreasing animal protein consumption[22]. (Again, exceptions must be made for populations that need protein-rich diets.)

How can I prioritize incorporating sustainable proteins?

- The amount of protein served should be adapted to the client or patient's needs or treatment plan (diet with low or high protein content) and not exceed needs. In some cases, supplements or fortified foods can provide the necessary amounts of nutrients: see chapter 11 for sustainable choices and tips.
- A large variety of proteins should be provided, and the majority of proteins should be chosen according to sustainability criteria.
- When reducing the frequency of meals containing meat and other livestock products (egg, milk, cheese, etc.), it is important to undertake tasting panels with clients and patients, with a goal of ensuring that recipes are as good or better than the previous ones!
- Education by food services and professional dietitians must accompany menu shifts—for example, information demonstrating that vegetarian diets can meet current recommendations for protein, omega-3 fatty acids, iron, zinc, iodine, calcium, vitamin D, and B12.
- Recipe origins should reflect the cultures present in the area of the healthcare facility, including traditional Indigenous foods.

21 Satija & Hu, 2018.
22 Ranganathan et al., 2016.

What are my protein standards?

Before choices are made regarding the type of protein for a menu, protein standards must be written. Protein standards are guidelines that you must work with such as dietary restrictions, allergies, and patient preferences.

Below is an example of meal standards written by a food service manager for their institution. The last two columns indicate the clientele to which they apply (examples might be the elderly, youth, acute care patients, etc.).

Standards	Clientele a	Clientele b
Two choices of protein for lunch and dinner (total 4/day)	X	X
One choice of meat for each meal, with a different variety for each consecutive meal	X	
Consumption of red meat should not exceed 70g/day	X	X
One choice of fish, twice a week	X	X
One choice of vegetarian protein per meal		X
Use plant-based protein regularly; egg and cheese maximum twice a week as protein for vegetarian dishes	X	X
Two choices of sandwich per meal	X	
One choice of salad every meal with one portion of protein and 5 different vegetables	X	X
Dishes should not be repeated in the same week	X	X
One type of traditional Indigenous source of protein / wild meat for an event each month (e.g. National Indigenous Peoples Day on June 21st)	X	

3 Making sustainable protein choices

Below are charts listing different proteins you could include in your menus.

- The chart below explains how to use the two following charts (a and b).
- Chart a) is a simple table that can be printed to work with.
- Chart b) gives the information necessary to make sustainable choices.

LEGEND FOR CHARTS A) AND B).

Choice of protein (ranking criteria to assess sustainability)

Ranking/Order
A ranking of food items, in general order of decreasing sustainability (see the appendix for methodology used).

Nutrition quality: Symbols

- Indicates that the food contains fibre
- Indicates that it contains monounsaturated and polyunsaturated fats
- Indicates no added sodium
- Indicates an unprocessed or minimally processed product
- Indicates a complete source of protein (contains all amino acids)

Tips for choosing

With reference to environmental, social, and economic sustainability, these are tips for choosing your ingredients. If a choice meets one criterion, you have taken a small step towards sustainability. The more criteria met, the more sustainable the choice.

The **labels** are good indicators of sustainable practice. A complete list can be found on the Office of Consumer Affairs Canada website.

In some provinces, other logos are used to identify organic or local food. Look for your province's logo! However, be mindful that there exist producers who have sustainable practices but do not have certification—perhaps due to cost or other limitations.

High level of sustainability Medium level of sustainability Low level of sustainability Not sustainable

What do I need to change?

Use the table below to quantify your meals according to the type of protein served in your menu. Moving from left to right will allow you to determine how to improve your meal options in terms of sustainability and potential cost savings. The "total number of choices per week" column can track how many meals include the mentioned protein or combination of animal and plant protein. The cost column can be used to determine the cost per portion, the cost of the meal including protein, or any other metric that is useful for you to keep track of your spending following the menu changes.

According to the EAT-Lancet commission, North Americans should reduce the amount of beef, lamb and pork they eat each week to around 100 g, and reduce consumption of chicken and other poultry to around 200 g, egg consumption by to around 90 g, and dairy products to around 1.75 litres of milk / 210 g of cheese, and they should increase their weekly consumption of fish to around 200 g, legumes to around 525 g, and nuts to around 350 g.[23]

Protein types and formats will vary with cultural needs. For example, a hospital in an area where the population is predominantly East Asian may prefer to primarily serve beef, chicken strips and cubed tofu but not pasta, cheese or legumes.

23 The recommended figures represent a reduction in average per-person consumption of approximately 638% for beef, lamb and pork, 235% for poultry, 268% for eggs, and 145% for dairy products!

A) BREAKFAST

Choice of protein (listed from most to least sustainable)	**Total number of choices per week** (quantity) Current menu:	**Current Cost**	**To make menus more sustainable, generally**	**Total number of choices per week** (quantity) Current menu:	**New Cost**
Legumes			Increase		
Nuts and seeds			Increase		
Plant-based meat substitutes			Increase		
Eggs			Reduce or leave unchanged		
Dairy			Reduce or leave unchanged		
Pork			Reduce		
TOTAL					

A) LUNCH AND DINNER

Choice of protein (listed from most to least sustainable)	**Total number of choices per week** (quantity) Current menu:	**Current Cost**	**To make menus more sustainable, generally**	**Total number of choices per week** (quantity) New menu:	**New Cost**
Legumes			Increase		
Nuts and seeds			Increase		
Plant-based meat substitutes			Increase		
Wild game meats	With plant proteins:		Increase (Indigenous populations as appropriate)	With plant proteins:	
Eggs	With plant proteins:		Reduce or leave unchanged	With plant proteins:	
Insects	With plant proteins:		Increase	With plant proteins:	
Poultry	With plant proteins:		Reduce or leave unchanged	With plant proteins:	
Dairy	With plant proteins:		Reduce or leave unchanged	With plant proteins:	
Seafood	With plant proteins:		Increase sustainable choices, reduce or remove others	With plant proteins:	
Pork	With plant proteins:		Reduce	With plant proteins:	
Red meats	With plant proteins:		Reduce	With plant proteins:	
TOTAL					

How can I change?

B) CHANGES POSSIBLE

Use this chart to choose a variety of protein and increase sustainable choices.

CHOICE OF PROTEIN (listed from most to least sustainable)

1. Legume/pulses

BEANS - BUTTER, BLACK, PINTO, MUNG, SOY (EDAMAME), KIDNEY, LIMA, NAVY, FAVA, RED (ADZUKI) - **PEAS** - COWPEA, SPLIT PEAS - **LENTILS** - GREEN, RED, YELLOW

TIPS FOR CHOOSING

- **Avoid high sodium and processed options.**
  - Some canned legumes may have high amounts of salts and additives to prolong shelf life.
    Refer to the nutritional guidelines for information on sodium content.
- **Choose regional suppliers from nearby provinces and states.**
  - For example, if you are based in Quebec, it is often better to source from Vermont or Maine than Alberta.
- **Choose bulk.**
  - Dry legumes can be stored for up to a year!
  - Bulk packaging in cardboard boxes has less of an environmental impact than tin cans.
- **Choose organic.**
  - Organic crops are grown without the use of synthetic pesticides.

TIPS FOR INCLUSION IN YOUR RECIPES

Legumes and pulses may not be complete proteins but can round out a day of varied protein consumption. Lentils are a "flavour sponge," meaning they absorb flavours well. Certain spices and herbs can make legumes more easily digestible, including ajwain[24] and epazote[25].

Many cultures use legumes: increase your variety of recipes!

- **Prepare**
  - Use aromatics (carrots, onions, garlic) in the soaking water.
- **Cook**
  - Use aromatics or low-sodium vegetable stock in the cooking water.
    Lightly fry or bake as a snack, topping, or salad bar ingredient, or use as a meal replacement.
  - Include in meals to reduce meat: this will help clients better adjust to the taste and digestion.
  - Mix into meat or fish burgers, meatballs or meat loaves.
  - Use beans in breakfast dishes.
- **Blend**
  - Add to muffins or other baked goods.
  - Thicken soups and sauces.
  - Hummus can be served with bread, crackers, or vegetables.
- **Replace**
  - Whip chickpea brine rather than egg whites.
  - Blend pulses rather than use mayonnaise.
  - Add more beans to your breakfast menu.

2. Tree nuts

CASHEWS - ALMONDS - WALNUTS - PECANS - PISTACHIOS BRAZIL NUTS - NUT BUTTERS

- **Choose low sodium options.**
  - Be wary of nuts that are already salted.
  - Refer to nutritional guidelines for information on sodium content.
- **Choose more local nuts.**
  - Almonds, walnuts, pecans, pistachios, and hazelnuts can all be grown in North America.
- **Choose fair trade exotic nuts.**
  - Brazil nuts and cashews are typically imported into Canada.
- **Choose organic.**
  - Organic crops are grown without the use of synthetic pesticides

Nuts are a good way to add new textures to meals.

- **Prepare**
  - Slightly toast nuts on a stovetop and provide as a salad topping.
  - Offer nuts at your salad bar.
- **Cook**
  - To reduce meat but maintain nutritional quality, mix a blend of nuts with meat in standard meat recipes such as chili or stew.
- **Blend**
  - Use nut butters as the sauce base for Asian noodles or salads.
- **Replace**
  - Offer nut butter sandwiches if appropriate for the patient.
  - Offer more varieties of nut butters for breakfast.

24 Zarshenas et al., 2013.
25 Nolte, n.d.

Contains fibre | Contains monounsaturated & polyunsaturated fats | No added sodium | Unprocessed or minimally processed product | Complete source of protein (contains all amino acids)

CHOICE OF PROTEIN
(listed from most to least sustainable)

3. Seeds

CHIA - HEMP - SUNFLOWER - SESAME - FLAX

TIPS FOR CHOOSING

- **Choose regional suppliers from nearby provinces and states.**
- **Choose organic.**
  - Organic crops are grown without the use of synthetic pesticides.

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Toast sunflower or sesame seeds for additional flavour.
- **Cook**
  - Sprinkle seeds on top of cooked dishes to augment protein content, such as on breakfast porridge, on salads, or in smoothies.
- **Blend**
  - Purchase whole seeds and grind to add to burgers and meatballs. If ground seeds are purchased, store in the freezer for proper preservation.
- **Replace**
  - Use chia or grounded flax to thicken pudding or replace eggs in desserts.
  - Offer a variety of seeds as a garnish in your salad bar.

4. Meat substitutes (plant-based)

TOFU - SEITAN - TEMPEH - TEXTURED SOY PROTEIN - POWDERS AND PROCESSED ITEMS : SOY PROTEIN ISOLATE* - ISOLATED PEA PROTEIN - WHEY PROTEIN - MYCOPROTEIN (NOTE POTENTIAL FOR ALLERGEN SENSITIVITY[26]) **- PLANT HEME/ LEGHEMOGLOBIN**

TIPS FOR CHOOSING

- **Avoid long ingredient lists.**
  - Although tofu, tempeh, and seitan are traditional foods in many cultures, meat substitutes can also have long ingredient lists with salt, sugar, fillers, and additives[27]. However, many minimally processed options are available.

    Refer to the nutritional guidelines for information on sodium content.
- **Choose regional suppliers from nearby provinces and states.**
- **Choose organic.**
  - Organic crops are grown without the use of synthetic pesticides.
- ***Be aware**
  - According to the AFSSA, the overconsumption of soy protein isolate (isoflavone) may have a negative estrogenic interaction, particularly for pregnant women and children under 3, who should avoid products containing this substance.

TIPS FOR INCLUSION IN YOUR RECIPES

Meat substitutes allow for lots of creativity: tofu comes in a variety of textures, seitan is tender and meaty, and tempeh is slightly nutty.

- **Prepare**
  - To increase the flavour of firm tofu, freeze, thaw, drain, and marinate for 24h. You may also freeze the tofu in marinade.
- **Cook**
  - Cut or mince small cubes of tofu or tempeh to blend well with existing recipes.
  - Create patties with seasoned firm tofu, seitan, or tempeh.
  - Scramble tofu for breakfast instead of eggs.
- **Blend**
  - Add silken tofu to smoothies, desserts, sauces.
  - Replace egg with silken tofu.
  - Thicken soups, sauces, with silken tofu.
- **Replace**
  - Offer grilled tempeh in sandwiches rather than slices of deli meats or in burgers or offer meat substitutes imitating deli meat.
  - Replace meats in stir-fries with seitan or extra-firm tofu.

26 Jacobson MF, et al. (2018).
27 Healthcare Without Harm, 2017.

CHOICE OF PROTEIN (listed from most to least sustainable)

5. Wild game meats and seaweeds

SEAWEED - SMALL MAMMALS (RABBIT, SQUIRREL, BEAVER) **- DEER - MOOSE**

TIPS FOR CHOOSING

- **Across Canada it is illegal to serve wild game meats unless with special permission or under special circumstances.**
  - However, they are a sustainable option provided that they are hunted during the appropriate season of the year from populations that are well-managed.

See the section on traditional Indigenous sources in Chapter 4.

TIPS FOR INCLUSION IN YOUR RECIPES

Most wild game meats are higher in nutrients (such as B vitamins, iron, omega 3s), and have a better balance of omega3 and omega 6 than the meat of domestic animals[29].

- **Prepare**
  - Ensure that the inedible parts of game (feathers, hair, etc.) are properly separated from the edible parts (meat).
  - Try placing the game meat in a brine to add moisture and prevent the meat from drying out.
- **Cook**
  - Game meats are quite lean: add marinades to bring out more flavour.
- **Blend**
  - Combine game meats with traditional domestic meats in recipes.
- **Replace**
  - Instead of traditional domestic meats, follow the wildlife hunting calendar to theme your meals; for example, offer moose when it is moose hunting season.

6. Eggs

FRESH EGGS - PROCESSED EGGS: COOKED AND PEELED - LIQUID - POWDER - READY-MADE OMELETTES OR OTHER EGG PRODUCTS

TIPS FOR CHOOSING

- **All Canadian eggs are antibiotic and growth hormone-free. Animals which are treated with antibiotics are not used for human consumption.**
- **Choose free-run or free-range eggs.**
  - Free-run hens have freedom to roam within an enclosed barn, while free-range hens have access to the outdoors, in contrast to conventional hens which remain in battery cages[28].
- **Choose fresh over processed eggs.**
  - However, liquid eggs and pre-cooked eggs without additives are also good options.
- **Choose organic eggs.**
  - Canadian organic poultry is fed with no animal by-products.

TIPS FOR INCLUSION IN YOUR RECIPES

Eggs are also a good source of micronutrients, particularly in B Vitamins.

- **Prepare**
  - Eggs are versatile: plan for different styles of preparation throughout the week such as over-easy, poached, or scrambled.
- **Cook**
  - Make frittatas or omelettes using any combination of vegetables you may have handy.
  - Offer boiled eggs in your salad bar or as a meal replacement.
- **Blend**
  - Make mayonnaise, aioli, and other sauces using eggs.
- **Replace**
  - Instead of deli meats, offer scrambled eggs in sandwiches, burritos, and pitas.

28 Chicken Farmers of Canada, 2018.
29 Medeiros et al, 2002

CHOICE OF PROTEIN (listed from most to least sustainable)

7. Insects

CRICKET POWDERS - CRICKET FLOURS - ROASTED INSECTS - PROCESSED INSECT-BASED PRODUCTS • ENERGY BARS • CHIPS • PASTA SAUCE

TIPS FOR CHOOSING

Insects are a good sustainable choice: they can feed on organic waste, which is a high source of nutrients that is usually disposed of or composted. Although not widely accepted (yet!), insects are a good source of iron, fibre, omega-3, calcium, and B12.

- **Choose regional suppliers from nearby provinces and states.**
- **Choose organic.**

TIPS FOR INCLUSION IN YOUR RECIPES

The following tips can help you integrate them into your recipes. You can augment any existing recipe with insect powder without changing taste: pastas, stews, desserts. Make sure you discuss the addition of insects or insect flours with your clients before including them in a recipe, unless the name of the recipe makes the matter clear.

- **Prepare**
  - Recipes that are low in protein can easily be augmented with cricket powder.
- **Cook**
  - Add powders to savoury dishes such as soups, stews, or curries.
- **Blend**
  - Add powder to smoothies, sauces, or dips to add extra protein.
- **Replace**
  - When baking desserts, replace 10% to 15% by weight of flour with cricket powder.

8. Poultry and rabbit

DUCK - CHICKEN - RABBIT - TURKEY

- **All Canadian poultry is growth-hormone free. Animals which are treated with antibiotics are not used for human consumption.**
- **Choose regional suppliers from nearby provinces and states.**
- **Choose a variety of parts.**
  - Reduce waste at production site by eating all parts of the poultry, including giblets.
- **Choose free-range poultry.**
  - All Canadian poultry raised for meat is free-run, meaning they have space to move freely but do not necessarily have access to the outdoors (free-range).
- **Choose organic poultry.**
  - Organic poultry comes from chickens which are fed with feed free of animal by-products and synthetic pesticides, herbicides, and fungicides: this drastically lowers poultry's global warming impact[30]. Organic poultry also have daily access to the outdoors[31].

PROCESSED POULTRY - CHICKEN SAUSAGE - CHICKEN STRIPS - CHICKEN DELI MEAT - TURKEY DELI MEAT

- **Avoid breaded, pre-fried meat.**
  - The processing results in a loss of nutritional value and increase in sodium and fats.

See the appendix for information on processed foods.

Poultry is the most sustainable form of meat.

- **Prepare**
  - Follow the wildlife hunting calendar to theme your meals; for example, offer duck when it is duck hunting season.
- **Cook**
  - Use minced meat in spaghetti sauce.
  - Create homemade burgers, nuggets, meatballs, meatloaves, with legumes and/or oats to reduce meat consumption.
- **Blend**
  - Use the giblets—the organs inside poultry—to add flavour to your dishes.
    - Puree and add to meatballs, meatloaves, or other mixed meat dishes.
    - Boil and make chicken stock.
  - Use minced meat containing offal.
- **Replace**
  - Choose poultry deli meats and sausages rather than pork or beef.

30 Boggia et al., 2010.
31 British Columbia Society for the Prevention of Cruelty to Animals, 2015.

CHOICE OF PROTEIN (listed from most to least sustainable)

9. Dairy

MILK/CREAM - POWDERED MILK, CREAM - YOGURT - KEFIR - CHEESE

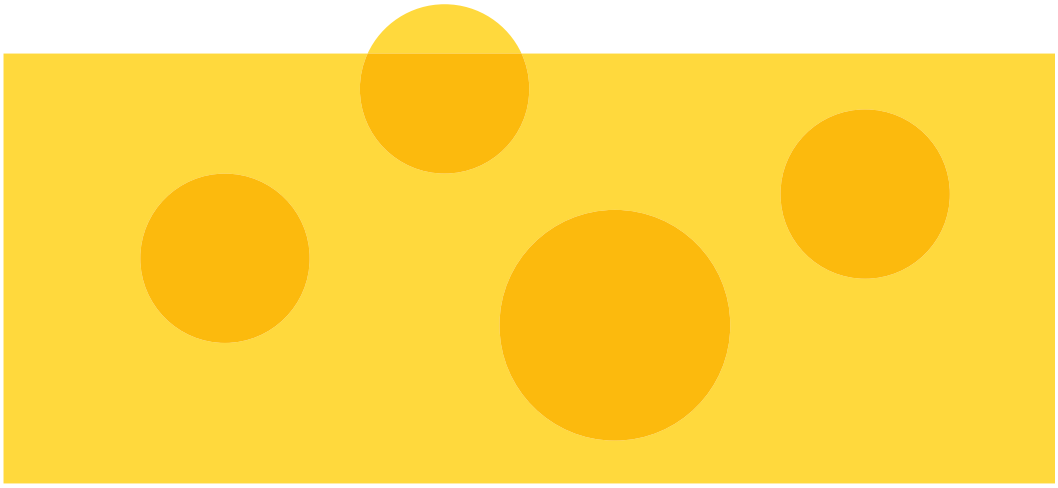
TIPS FOR CHOOSING

- **Animals treated with antibiotics are not used for human consumption.**
- **Avoid high sugar, sodium, and low fat products.**
  - Products can be processed to modify the sugar, sodium, and fat content. Low fat products should only be offered if prescribed by the diet of a specific patient. Avoid flavoured milk, which is high in sugar.
    Refer to nutritional guidelines for information on sodium content.
  - Avoid dairy products from animals treated with antibiotics and growth hormones by asking your suppliers for the provenance of ingredients. **All Canadian dairy products are antibiotic and synthetic growth-hormone free.** However, transformed dairy products (cheese, yogurt, etc.) may contain milk concentrate from the USA.
- **Choose dairy from grass-fed and pasture-raised animals.**
  - Look for certification or language such as "100% grass-fed and finished".
- **Choose organic dairy.**
  - Organic dairy comes from cows which are fed with feed free of synthetic pesticides, herbicides, and fungicides. Organic dairy cows also have more access to pasture[32].

TIPS FOR INCLUSION IN YOUR RECIPES

Fermented dairy products which contain probiotics (cheese, yogurt, and kefir) are good for digestive health.

- **Prepare**
  - Feature the digestive benefits of dairy products such as kefir, yogurt, and cheese.
- **Cook**
  - Consider adding cheese in vegetarian meals to assist the transition away from meat proteins; it can also increase the protein content if needed.
- **Blend**
  - Use yogurt or kefir to thicken sauces, smoothies, and milkshakes.
  - Add milk powder and cream to sauces or liquid meal/desserts to increase protein and energy (homemade supplement).
- **Replace**
  - When baking:
    - Substitute kefir for buttermilk.
    - Use kefir to leaven or ferment dough recipes.



32 Laanela, 2016.

CHOICE OF PROTEIN (listed from most to least sustainable)

10. Seafood

Note: the food items below are not ranked in order of sustainability. See here for purchasing sustainable

SEAFOOD. - SEAWEED - FISH (HERRING, POLLOCK, CARP, MACKEREL, SEA BASS, HADDOCK, SALMON, TROUT) **- MUSSELS - SQUID - NORDIC SHRIMP - LOBSTER - CRAB, SCALLOP, OYSTER, CLAMS, OCTOPUS - SHRIMP**

TIPS FOR CHOOSING

- **Choose a wide variety of regional seafood**
  - This places less pressure on any one population.
  - Choose aquaculture and fisheries supported by local communities (ownership, co-ownership, or partnership) and when possible, Indigenous communities.
- **Choose shellfish from aquaculture, Avoid farmed salmon33.**
  - Farmed shellfish such as mussels, clams, and oysters have minimal ecological impact and animal welfare concerns[34].
- **Choose Canadian shrimp, avoid imported shrimp.**
  - Canadian shrimp is sustainably harvested in comparison to many types of imported shrimp, which is harvested in a manner that destroys local forests and animal habitats[35].
- **Choose sustainable canned tuna.**
  - Reference this Greenpeace report of the most sustainable canned tuna brands.
- **Choose less common seafood.**
  - Seafood at the bottom of the food chain, such as small fish (mackerel, sardines, anchovies), contain less pollutants and are often more sustainably harvested.
- **When choosing seafood, inform yourself by reading about seafood eco-certifications.**
  - and **look for the following eco-certifications and rankings** Ocean Wise, Seafood Watch Green ranking and research fish species and catch methods on the websites of these organizations.
- **In addition, when choosing seafood from fisheries:**
  - look for Marine Stewardship Council label
- **When choosing seafood from aquaculture (farmed):**
  - look for the Global Aquaculture Alliance Best Aquaculture Practice logo (4 stars)
  - look for the Aquaculture Stewardship Council label

PROCESSED SEAFOOD - SMOKED SALMON - FISH STICKS - IMITATION CRAB MEAT - TUNA SALAD

- **Avoid consumption of processed seafood.**
  - Processed seafood often contains less omega-3 fatty acids than raw seafood. Some contain less protein per portion than unprocessed seafood[36].
- **Avoid high-sodium options.**
  Reference the nutritional guidelines for information on sodium content.
- **Choose natural processing.**
  - For example: smoked salmon (heat vs cold smoke, salt vs nitrate processing)

TIPS FOR INCLUSION IN YOUR RECIPES

Seafood is often a good source of omega-3 fatty acids which can be difficult to find in other foods.

- **Prepare**
  - Frozen seafood is sometimes the most sustainable choice, because it can be shipped by rail rather than by air. Pre-cut or minced frozen fish is often a cheaper choice.
- **Cook**
  - Many cultures use seafood—increase your variety of recipes!
- **Blend**
  - Use a variety of seafood to prevent high costs and introduce variety into your meals.
- **Replace**
  - Offer fish patties instead of meat patties in burgers.
  - Make seafood stews, soups, or chili rather than using meat.

33 https://www.seachoice.org/info-centre/aquaculture/disease-parasites-and-chemicals/
34 Jacquet, 2017.
35 Amos, 2014
36 Dietitians of Canada, 2013.

CHOICE OF PROTEIN (listed from most to least sustainable)

11. Pork

RAW PORK

TIPS FOR CHOOSING

- **Choose regional suppliers from nearby provinces and states. Canadian pork is growth-hormone free.**
- **Choose a variety of parts.**
  - Reduce waste at production site by eating all offal and swine parts.
- **Choose pork raised without antibiotics.**
  - The over-use or misuse of antibiotics in animal agriculture is a major driver of antimicrobial resistance[37].
- **Choose pasture-raised pork.**
  - Pasture-raising ensures space for animals to move freely. However, currently, there are a few options for purchasing this type of pork, because few producers are using these methods.
- **Choose organic pork.**

PROCESSED PORK - HAM - BACON - SAUSAGE - CURED PORK (PROSCIUTTO, SALAMI)

- **Avoid processed pork.**
  - The consumption of nitrates and nitrites found in processed pork may be carcinogenic to humans[39]. Refer to the nutritional guidelines for information on sodium content.

Refer to EWG's Food Scores for more information on processed foods.

TIPS FOR INCLUSION IN YOUR RECIPES

Small amounts of pork can result in lots of flavour.

- **Prepare**
  - Offal must be eaten within 24 hours of purchase; can be frozen and consumed within 3-4 months but will change in flavour, appearance, and taste.
- **Cook**
  - Chop pieces of pork and mix with legumes or vegetables.
  - Hearts and tongue
    - Slow cook in liquid.
    - Braise or poach.
  - Liver, kidney, brains
    - Grill or fry.
    - Eat less than once a week. These types of offal are particularly high in Vitamin A, and excessive consumption can be linked to negative effects, particularly for pregnant women[40].
- **Blend**
  - Puree offal and add to meatballs, meatloaves, or other mixed meat dishes.
- **Replace**
  - Offer tempeh or turkey bacon in place of pork bacon at meals.
  - Look for soy sausages or ground soy substitutes to replace hot dog sausages, for example.

See the appendix for offal use.

12. Red meats

VEAL - LAMB - BEEF

- **Purchase smaller portions of red meat.**
  - Canada's Food Guide recommends consumption of less red meat, particularly processed meats.
- **Choose regional suppliers from nearby provinces and states.**
- **Choose a variety of parts.**
  - Reduce waste by eating all parts and offal such as tongue, heart, and liver.
- **Choose antibiotic- and hormone-free red meats.**
  - The use of preventative antibiotics in livestock contributes to antimicrobial resistance[38].
- **Choose pasture-raised, grass-fed red meats.**
  - These animals have enough space to move freely. Grass-fed cattle do not depend on grain production for feed.
- **Choose organic meats.**

PROCESSED RED MEATS - HOT DOGS - SAUSAGES - DELI MEATS

- **Avoid consumption of processed red meats.**
  - See the appendix for information on nitrates and nitrites.

Refer to EWG's Food Scores for more information on processed foods.

Unhealthy consumption of red meats is linked to various types of cancer, chronic disease, and shortened lifespans[41].

- **Prepare**
  - Feature "Meatless Mondays" serving only vegetarian or vegan dishes.
  - Minimize portion size of beef and make other elements of the meal the highlight.
- **Cook**
  - Hearts, and tongue
    - Slow cook in liquid.
    - Braise or poach.
  - Liver, kidney, brains
    - Grill or fry.
    - Eat less than once a week. These types of offal are particularly high in Vitamin A, and excessive consumption can be linked to negative effects, particularly for pregnant women[42].
- **Blend**
  - Instead of 100% meat burgers, blend with mushrooms or legumes.
- **Replace**
  - Offer vegetarian burgers at meals: look for plant-based sausages or ground soy substitutes which replicate the taste and texture of meat, but be cautious—they may contain isolated soy and high sodium.

37 Michael et al., 2015.
38 IPES-Food, 2017.
39 See the appendix.
40 Coyle, 2017.
41 Sun, 2012.
42 Coyle, 2017.

Varying protein format

In order to offer a different experience for each meal, it is important to vary the format of the protein offered from one meal to another.

Frequency by format	**# of choice per week: _____** **# of choice per format**
Pasta sauce with meat or meat substitutes	
Legumes or minced protein	
Eggs	
Meatballs / patties / loaves	
Cubed meat or tofu, tempeh, seitan	
Strips of meat or tofu, tempeh, seitan	
Whole pieces of meat or meat substitutes	
Sausage, deli meat or meat substitutes	

Protein types and formats will vary with cultural needs. For example, a hospital in an area where the population is predominantly East Asian may prefer to primarily serve beef and chicken strips and cubed tofu but not pasta, cheese or legumes.

Controlling waste (general)

Food waste is a large source of economic, environmental, and nutritional loss. Approximately one third of the food produced in the world is lost or wasted[43] —a statistic to which healthcare is a significant contributor. However, this provides us with an opportunity to be part of the solution. There are two types of food waste: waste produced in the kitchen and "plate waste" produced by residents or patients not finishing their meals. Kitchen waste results from failing to maximize the potential use of an ingredient. Food left on the plate can be an indicator of dissatisfaction and be associated with malnutrition. It is important to monitor plate waste carefully, since doing so can help identify recipes and portion sizes that need to be improved.

You can also see The Amazing Waste Cookbook for recipes on how to incorporate food scraps and repurpose leftover food. Visit The Amazing Waste Website for videos and more tips and tricks.

Reducing packaging waste

- **Buy items in bulk when possible.**
  - Bulk items are cheaper, store well, and minimize use of plastic.
- **Look for eco-friendly packaging and recycle packaging in accordance with municipal regulations.**
  - Look for compostable or biodegradable materials made out of corn, starch, or cellulose.
- **Commit to reusable containers.**
- **Prioritize serving in reusable bowls, glasses, plates, and utensils, when possible.**

Reducing kitchen waste

- **Reduce the amount of steps needed to prepare a meal.**
  - The more steps needed, the more waste produced in the process in terms of food ingredients, energy and water.
- **Revise your production quantities according to real needs.**
  - Analyze how much food is left on a plate on a daily basis. This will allow you to plan appropriate amounts of food to prepare.
- **Repurpose parts normally thrown out.**
  - Animal organs can be used to make tasty soup stocks; vegetable stems and peelings can be frozen and used for making stocks.

Reducing patient /resident waste

- **Watch out for portion size!**
  - Make half portions available. Choose different portion sizes according to the needs of each clientele. Use smaller serving bowls. Encourage and allow for second helpings.
- **Introduce selective or semi-selective menus.**
  - For example, room service. This allows patients to choose a portion or a full serving. Less waste is produced when patients can choose what they want to eat.
- **Observe what is left on the plate.**
  - Items left on the plate may be less popular: make serving adjustments in the future as necessary.

Managing overall food waste

- **Refrigerate and freeze leftovers.**
  - See the Government of Canada's guidelines on safe fridge and freezer storage.
- **Introduce compost infrastructure.**
  - See Practice Greenhealth's guidelines for composting in healthcare facilities. And consult the Compost Council of Canada for more info.
- **Donate leftover meal portions.**
  - Find local organizations that want food donations (homeless centres, women's shelters, etc.).

43 Food and Agriculture Organization of the United Nations. (n.d.).

6 Controlling protein waste

Save the protein

- **Refrigerate leftover proteins.**
  - These must be reheated and served within three days.
- **Freeze leftover proteins.**
  - Freeze in a large pan to use it for the next menu cycle, or in individual portions to serve as patient specials.
- **Freeze defrosted, cooked meat.**
  - Instead of disposing of thawed meat, freeze after cooking for use in future recipes.

Repurpose the protein

- **Plan your menu in anticipation of leftover proteins, rather than using fresh proteins.**
- **Puree, dice, and add to soups or salad.**
  - This adds plenty of flavour while adding high protein nutritional content.
- **Boil to create a broth.**
  - Protein broth can be used for soups or sauces.
- **Mince to make a meatloaf.**
  - This is also a good opportunity to incorporate legumes. Must be served within three days.

Serve the protein

- **Serve as a menu "special."**
  - Use leftover proteins from the day before, repurpose into a new meal and serve as a "special" menu item. Can be sold at a lower price.
  - Serve cold in a new salad recipe or as a source of protein at the salad bar.

7 Sustainable meat

Sustainable meats contribute to healthy clients and healthy ecosystems. This includes organic, free range, and grass-fed meats. It is important to note the existence of suppliers who have sustainable practices but are not certified organic or grass-fed; this may be due to the cost or time constraints of certification. As mentioned in the *Sustainable protein* section earlier in this chapter, health and environmental considerations impel us to move to limit consumption of meats with large environmental footprints and move to more plant-based diets in Canada. Meats listed in the charts in that section are generally ordered from more to less sustainable options.

Organic

Canadian organic agriculture is built on the pillars of health, ecology, fairness, and care[44]. Organic feed must not contain a) genetically modified crops b) crops treated with synthetic chemicals c) animal by-products. As a result, organic feed is typically sourced

44 Canadian General Standards Board, 2018.

from a diversity of crops which encourage healthy treatment of soil and ecosystems.

See Dalhousie University's Resources for organic livestock.

Poultry

The biggest factor in poultry farming's potential contribution to climate change is the feed the birds eat: it accounts for 70% of poultry's "global warming potential" (see the explanation under Methodology later in this chapter), trumping the potential of land use, and water use and production. As a result, organic, vegetable-grain fed, and pasture-raised poultry have a significantly lower impact on the environment than conventional poultry.

See Chicken Farmers of Canada's Wheel of Chicken to understand your poultry options.

- Free-range
  This is typically used to describe birds that have access to the outdoors. There is no legal definition for free-range and practices can vary from farm to farm.

Pork

The primary difference between organic and conventional pork is the facility the animals are raised in. Organically raised pigs have access to the outdoors, and different standards for bedding and stocking density apply[45].

- Pasture
  This is typically used to describe meat from pigs that have access to the outdoors and feed on pasture. There is no legal definition of pasture and practices can vary from farm to farm.

Beef

Overall, beef from cattle raised on pasture contains less total fat than conventional beef, and the fat that it does contain is much healthier[46].

- 100% grass fed
  According to Healthcare Without Harm: 100%

45 Simpson, 2012
46 Gunnars, 2018

grass-fed beef can contain 2–4 times more omega-3 fatty acids than its grain-fed counterpart[47]. Grass-fed beef cattle also contribute to carbon sequestration—a form of storing carbon in the soil. This can compensate for carbon released through the animals' life cycle, improve soil health, reduce the need for synthetic fertilizers, and maintain biodiversity and habitat[48].

Learning about traditional Indigenous proteins

"Harvesting food for a healthy lifestyle: Go to the land and waters to find your first foods. Be active in exercising your right to hunt, fish, harvest and gather in your territory. Ask the old people and the traditional and environmental knowledge keepers how to do this in a good way. It will be good for the mind, body and spirit, and contribute to a self-reliant future."

- First Nations Health Authority, British Columbia

In this section we highlight different protein sources from traditional Indigenous diets. These proteins can be challenging to source as they cannot always be bought, and serving wild meat is often prohibited in healthcare facility kitchens, but reflecting on our way of eating begins with understanding traditional sources of sustainable protein.

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

47 Healthcare Without Harm, 2017.
48 Teague et al, 2016.

It is also important to note that there may be health risks associated with consuming game meats. See Health Canada's guidelines for safe preparation of game meats.

Fish and seafood

Seafood is a good source of protein, omega-3 fatty acids, and several vitamins; soft bones are a source of calcium. However, many current fishing and fish farming practices have social and environmental impacts inconsistent with the values of the healthcare sector. Industrial-scale fishing is overfishing certain key species and threatening ecosystem health, and fish farming (aquaculture) is harming ecosystems with overuse of chemicals and antibiotics that can lead to antibiotic resistance.

Making better choices involves getting to know your fish and ideally, the people who fish or farm your seafood. Purchasing low on the food chain and locally, while avoiding seafood that has been overfished or raised in environmentally or socially destructive ways are good general principles. For more information, a recommended resource is Healthcare without Harm's Choosing Seafood for Healthcare.

Taking inspiration from traditional Indigenous practices can also be a good place to start. Over 50 species of wild fish from oceans, lakes, ponds, and rivers are fundamental to Indigenous culture and nutrition. Indigenous knowledge includes an awareness of harvesting seasons for particular species (e.g. salmon all summer, eulachon in spring, herring late winter into spring). Fish are caught using a variety of traditional methods including rakes, nets, or traps created with wood, branches, and roots found in the forest, and processed by wind drying, smoke curing, canning, and freezing. In Indigenous culture, no edible parts are wasted: head, eyes, and offal are all prepared and eaten.

Seaweed beds have provided highly nutritious food for thousands of years: seaweeds are rich in protein, calcium, iron, iodine, B vitamins, and vitamins A and C. Red laver, giant kelp, and dulse are the most common varieties. Because of their high salt content, seaweeds are mostly used to season various foods: they can be added to soups, cooked with salmon eggs, diced and toasted, dipped into fish grease, or mixed with rice.

Wild meat

Indigenous peoples consume a variety of wild meats. For many communities, moose meat is a staple food. The hunting season is in late summer and early fall. Traditionally the stomach and small and large intestine were eaten. Deer are also hunted in the fall when they are still fat. Deer liver is a source of iron as well as vitamins A and C. Small mammals such as rabbit, hare, ground squirrel, and beaver are hunted in all seasons. Very little was not used in some way. Common kinds of birds and eggs are harvested such as duck, grouse, ptarmigan, quails, oystercatcher, goose, and the eggs from seagulls.

The meat is eaten fresh, roasted, dried, smoked, or boiled and supplies protein, iron, B vitamins, and vitamin C. Most wild meat contains less saturated fat than beef, pork, and chicken.

Appendix

Choice of protein	Additional resources
Legumes	Legumes: Health Benefits and Culinary Approaches to Increase Intake
Plant-based meat substitutes	https://noharm-uscanada.org/content/us-canada/better-meat-alternative Food Scores (ranking system for processed foods)
Wild game meats and seaweed	Food safety: hunting Food safety: game meats
Eggs	Food Scores (ranking system for processed foods)
Insects	Insects as human food
Poultry	Antibiotics in meats Food Scores (ranking system for processed foods)
Dairy	Antibiotics in dairy Food Scores (ranking system for processed foods)
Seafood	Choosing seafood for healthcare Food Scores (ranking system for processed foods)

Pork	Antibiotics in meats Food Scores (ranking system for processed foods)
Red meats	Antibiotics in meats Food Scores (ranking system for processed foods)

Methodology

Ranking of the items in terms of sustainability is primarily based on a Life Cycle Assessment (LCA) of each item, which takes into account all the steps involved in producing the ingredient: production, manufacturing, packaging, distribution, and transportation. This information was derived from a meta-analysis across all available food groups with respect to a food's "global warming potential" (kg CO2-eq/kg produced).[49]

Global warming potential is the estimated equivalent emissions of carbon dioxide (CO2), a greenhouse gas, per kg of ingredient.

It is important to note that this methodology ranks food from the sole environmental perspective of global warming potential, not taking into account other metrics such as fine particulate matter emissions, land and water use, and biodiversity loss[50] . However, there is typically a strong correlation between sustainable environmental practice and animal welfare and social sustainability. For example, organic poultry have access to the outdoors, and organic feed means that farmworkers do not come in contact with synthetic fertilizers and pesticides.

Limited data is available for processed items in particular, but it was assumed that additives and additional steps involved in creating the product result in increased input of energy and increased CO2 eq/kg. This assumption was also derived from the Environmental Working Group's Food Scores[51].

Processed meats

The distinctive taste and colour of cured meats—including bacon, ham, and other processed deli meats—are due to the addition of synthetic nitrites and a lot of salt.

Nitrites have the potential to form nitrosamines in the human body, which are classified as "probably carcinogenic to humans."[52] As a result a there is a trend towards natural, "uncured" meats.

49 Clune et al., 2015.
50 Frischknecht et al., 2016
51 Environmental Working Group, 2018.
52 Song et al., 2015.

But descriptions of processed meats as "uncured" or "natural" are misleading. The synthetic additives are replaced by other ingredients such as celery powder or sea salt that contain significant amounts of naturally occurring nitrates, a small percentage of which can be transformed into nitrites on ingestion. Also, numerous studies have demonstrated similar levels of nitrites in meats labelled "cured" and "uncured". Always prioritize meats in their natural state, or minimally processed meats. Processed meats have been changed from the natural state using additional ingredients, additives, and/or preservatives. In addition, this includes physical transformations such as pureeing, cubing, or cooking. The more steps taken to transform the meat, the less sustainable it is.

Processed meats are also often rich in salt and saturated fats and do not represent a good source of protein for that reason.

Organic versus conventional dairy

Organic milk is produced without the use of pesticides, synthetic fertilizer or antibiotics. A study of Life Cycle Assessments comparing conventional and organic milk production in Livestock Production Science found that organic milk reduces synthetic pesticide use but uses more land per unit of milk[53].

Ultimately, however, organic methods cover the entire supply chain of milk production, including feed, access to pasture, and use of antibiotics (this is upheld by certification bodies who regularly check farms to ensure that they continue to comply with organic standards). Bearing these factors in mind, organic dairy production can be considered more sustainable than conventional production, in spite of greater land use.

References

Amos, H. (2014, June 10). Unsustainable shrimp a jumbo problem. Retrieved from https://news.ubc.ca/2014/06/03/unsustainable-shrimp-a-jumbo-problem/

Anaphylaxis Campaign. (2017). Quorn. Retrieved from https://www.anaphylaxis.org.uk/knowledgebase/quorn/

Benjamin, N. 2000. Nitrates in the human diet - good or bad?. Annales de zootechnie, INRA/EDP Sciences, 49 (3), pp.207-216.

53 Boer, 2003.

Boer, I. J. (2003). Environmental impact assessment of conventional and organic milk production. Livestock Production Science, 80(1-2), 69-77. doi:10.1016/s0301-6226(02)00322-6

Boggia, A., Paolotti, L., & Castellini, C. (2010). Environmental impact evaluation of conventional, organic and organic-plus poultry production systems using life cycle assessment. Worlds Poultry Science Journal, 66(01), 95-114. doi:10.1017/s0043933910000103

British Columbia Society for the Prevention of Cruelty to Animals. (2015). Canada Organic Standards - Assessing Improvements to Farm Animal Welfare: A Comparison of 2011 and 2015 Standards for Livestock Production. Retrieved from https://spca.bc.ca/wp-content/uploads/organic-standards-improvements.pdf

Canadian General Standards Board. (2018). Organic production systems- General principles and management standards. Retrieved from http://publications.gc.ca/collections/collection_2018/ongc-cgsb/P29-32-310-2018-eng.pdf

Chicken Farmers of Canada. (2018, January 12). The Wheel of Chicken - Understanding Your Choices. Retrieved from https://www.chickenfarmers.ca/the-wheel-of-chicken-understanding-your-choices/

Clune, S., Crossin, E., & Verghese, K. (2017). Systematic review of greenhouse gas emissions for different fresh food categories. Journal of Cleaner Production, 140, 766-783. doi:10.1016/j.jclepro.2016.04.082

Coyle, D. (2017). Are organ meats healthy? Retrieved from https://www.healthline.com/nutrition/organ-meats#section6

Dietitians of Canada. (2013). Food Sources of Omega-3 Fats. Retrieved from https://www.dietitians.ca/getattachment/de95e92c-3fb3-40db-b457-173de89bdc3a/FACTSHEET-Food-Sources-of-Omega-3-Fats.pdf.aspx

Environmental Working Group. (2018). EWG's Food Scores. Retrieved from https://www.ewg.org/foodscores#.WwbldJPwa34

Fehrenbach, K. S., Righter, A. C., & Santo, R. E. (2015). A critical examination of the available data sources for estimating meat and protein consumption in the USA. Public Health Nutrition, 19(08), 1358-1367. doi:10.1017/s1368980015003055

Food and Agriculture Organization of the United States. (n.d.). Key facts on food loss and waste you should know! Retrieved from http://www.fao.org/save-food/resources/keyfindings/en/

Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. 2013. Tackling climate change through livestock—A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO), Rome.

Gunnars, K. (2018, May 7). Grass-Fed vs. Grain-Fed Beef - What's the Difference? Retrieved from https://www.healthline.com/nutrition/grass-fed-vs-grain-fed-beef

Healthcare Without Harm. (2017). Balanced Menus. Retrieved from https://noharm-uscanada.org/sites/default/files/documents-files/469/BalancedMenus_Hybrid_R8_Booklet_hiRes.pdf

Health Care Without Harm. (2017). Redefining Protein: Adjusting Diets to Protect Public Health and Conserve Resources.

Ingested nitrate and nitrite, and cyanobacterial peptide toxins. (2010). Lyon: IARC Press.

IPES-Food. 2017. Unravelling the Food–Health Nexus: Addressing practices, political economy, and power relations to build healthier food systems. The Global Alliance for the Future of Food and IPES-Food.

Jacquet, J. (2017, January 23). Why oysters, mussels and clams could hold the key to more ethical fish farming. Retrieved from https://www.theguardian.com/sustainable-business/2017/jan/23/aquaculture-bivalves-oysters-factory-farming-environment

Laanela, M. (2016, October 20). What's the difference between regular and organic milk? | CBC News. Retrieved from https://www.cbc.ca/news/canada/british-columbia/milk-antibiotics-1.3803799

Martin, M. J., Thottathil, S. E., & Newman, T. B. (2015). Antibiotics Overuse in Animal Agriculture: A Call to Action for Health Care Providers. American Journal of Public Health, 105(12), 2409-2410. doi:10.2105/ajph.2015.302870

Medeiros, L. C., Busboon, J. R., Field, R. A., Williams, J. C., Miller, G. J., & Holmes, B. (2002). Nutritional Content of Game Meat: Wyoming Extension. Retrieved from http://www.wyomingextension.org/agpubs/pubs/B920R.pdf

Mongeon, M., & Summerhayes, B. (2010 November). Organic Dairy Production. Retrieved from http://www.omafra.gov.on.ca/english/livestock/dairy/facts/10-087.htm

Nolte, K. (n.d.). Epazote : Yuma Country Cooperative Extension. Retrieved from https://cals.arizona.edu/fps/sites/cals.arizona.edu.fps/files/cotw/Epazote.pdf

Ranganathan, J. et al. 2016. "Shifting Diets for a Sustainable Food Future." Working Paper, Installment 11 of Creating a Sustainable Food Future. Washington, DC: World Resources Institute. Accessible at http://www.worldresourcesreport.org

Satija, Ambika, and Frank B. Hu. "Plant-Based Diets and Cardiovascular Health." Trends in Cardiovascular Medicine, 2018, doi:10.1016/j.tcm.2018.02.004.

Shepon, A., Eshel, G., Noor, E., & Milo, R. (2016). Energy and protein feed-to-food conversion efficiencies in the US and potential food security gains from dietary changes. Environmental Research Letters, 11(10), 105002.

Simpson, G. Introduction to Organic Swine Production [Powerpoint slides]. Retrieved from https://www.agrireseau.net/agriculturebiologique/documents/FS12_Organic_Pork_Production_Greg_Simpson.pdf

Song, P., Wu, L., & Guan, W. (2015). Dietary Nitrates, Nitrites, and Nitrosamines Intake and the Risk of Gastric Cancer: A Meta-Analysis. Nutrients, 7(12), 9872-9895. doi:10.3390/nu7125505

Steele, E. M., Raubenheimer, D., Simpson, S. J., Baraldi, L. G., & Monteiro, C. A. (2017). Ultra-processed foods, protein leverage and energy intake in the USA. Public Health Nutrition, 21(01), 114-124. doi:10.1017/s1368980017001574

Sun, Q. (2012). Red Meat Consumption and Mortality. Archives of Internal Medicine, 172(7), 555. doi:10.1001/archinternmed.2011.2287

Teague, W. R., Apfelbaum, S., Lal, R., Kreuter, U. P., Rowntree, J., Davies, C. A., . . . Byck, P. (2016). The role of ruminants in reducing agricultures carbon footprint in North America. Journal of Soil and Water Conservation, 71(2), 156-164. doi:10.2489/jswc.71.2.156

Zarshenas, M. M., Moein, M., Samani, S. M., & Petramfar, P. (2013). An overview on ajwain (Trachyspermum ammi) pharmacological effects; modern and traditional. Journal of Natural Remedies, 14(1), 98-105.

Chapter 5

Choosing your sustainable starch

After your protein is chosen, starches should be added as the next step. First, create your starch standards according to the needs of your clientele. Then, identify meals that already contain sufficient starch (such as pasta). Last, be sure to choose a variety of starches: this contributes to creating a menu that represents a well-rounded diet.

This chapter will guide you through these steps.

1 Sustainable starches

Why eat starches?

Starches are an essential source of complex carbohydrates, which are broken down into sugars in the body to give energy. Starches come from either a) cereal or grain crops such as wheat, rice, barley or b) root and tuber crops such as potatoes, cassavas, and parsnips. Unrefined whole grains are an important source of fibre, which contribute to intestinal and immune-system health, lower blood cholesterol, and induce satiety. Some can also be a good source of protein such as quinoa, spelt, buckwheat and farro. In addition, they are a good source of essential micronutrients such as B vitamins, magnesium, calcium, and iron.[54] [55] Root and tuber crops also contain antioxidant properties and help maintain blood sugar and cholesterol.[56]

Why are sustainable starches important?

Cereal or grain crops can be used to maintain soil health in crop rotation programs. These crops grow with dense cover, reducing soil erosion and absorbing excess nutrients that might otherwise leach out in water runoff. They also act as a weed suppressant, preventing the need for application of herbicides[57].

Root and tuber crops are staple crops for many cultures around the world, particularly in Africa and Asia. They are an affordable source of nutrition and a major source of income in developing countries[58]. In addition, they are "nutritionally productive." For example, for every cubic metre of water used in cultivation, potatoes produce twice as many calories and four times as much calcium as rice[59].

54 Health Canada, 2012.
55 Health Canada, 2012.
56 Chandrasekara and Kumar, 2016.
57 North American Miller's Association, 2011.
58 National Resources Institute, 2018.
59 FAO, 2008.

What is the impact of sustainable starches on health?

Whole grains and unprocessed starches are key to maintaining a healthy diet and environment. North American diets are often rich in highly refined and processed starchy foods such as white bread, fried potatoes, and ready-to-eat pizzas and rolls. These have little nutritional value and are associated with the prevalence of chronic diseases such as type 2 diabetes and coronary heart disease[60]. In contrast, whole grains contribute to lowering the risks of heart disease, stroke, and some cancers.[61] Potato—one of the few starches that can also be considered as a vegetable—can only retain its antioxidants (phenolic acid, flavonoid, vitamin C) when unprocessed or minimally processed.

How can I prioritize incorporating sustainable starch?

The amount of starch served is controlled according to the treatment plan (diet with low or high content as determined) and should not exceed clientele needs.

- Starches are part of a varied and complete diet (complex carbohydrate, B vitamins, iron, zinc, magnesium, fibre).
- A large variety of starch choices should be provided, with the majority of starches chosen according to sustainable criteria.
- Whole grains should be available every day for clients whose diet allows it.
- Food services and professional dietitians must provide education to increase amount and variety of whole grains in diets (for example, information on quinoa and how it can be served).
- Recipes should reflect the cultural diversity of the client base on site, and should include traditional Indigenous foods where appropriate.

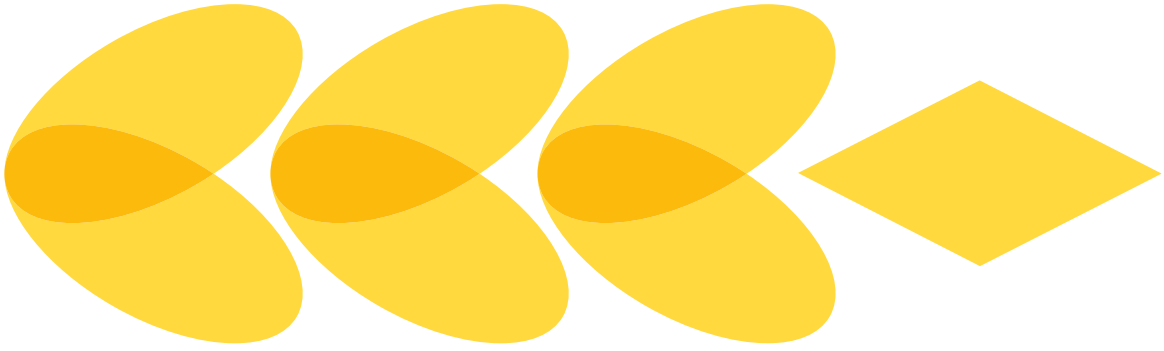
60 Gross, Li, Ford, & Liu, 2004
61 Dietitians of Canada, 2018.

2

What are my starch standards?

Before choosing starches for a menu, meal standards must be written. These are guidelines that you need to work with, such as dietary restrictions, menu format, the kitchen's capacities, the preferences of patients, etc. Here are some examples of what you could write as a chart standard. If you have different types of clientele requiring different standards, use columns such as the last two to show for which clientele items apply (e.g. elderly, youth, acute care patients, etc.).

Starch standards	Clientele a	Clientele b
A selection of bread is available, particularly whole wheat and whole grain bread	X	X
A variety of sustainable starch must be served throughout the menu cycle	X	
Dessert with cereal as the primary ingredient should be offered	X	X
Two choices of starch are available at each meal	X	X
Breakfast menu: offer 1 type of hot cereal and 4 choices of cold cereal including whole grains choices	X	



Making sustainable starch choices

LEGEND FOR CHARTS A) AND B).

Choice of starch	Tips for choosing
Ranking/Order A ranking of food items, in general order of decreasing sustainability (See the appendix for methodology used).	With reference to environmental, social, and economic sustainability, these are tips for choosing your ingredients. If a choice meets one criterion, you have taken a small step towards sustainability. The more criteria met, the more sustainable the choice.
Variety: Colour Colour helps you choose variety for the weekly menu. Use it in your menu template to easily see the repetition/variety.	The **labels** are good indicators of sustainable practice. A complete list can be found on the Office of Consumer Affairs Canada website. In some provinces, other logos are used to identify organic or local food. Look for your province's logo! However, be mindful that there exist producers who have sustainable practices but do not have certification—perhaps due to cost or other limitations.

What do I need to change?

Use the table below to quantify your meals according to the type of starch served. Moving from left to right will allow you to determine how to improve your meal options in terms of sustainability and potential cost savings. The cost column can be used to determine the cost per portion, the cost of the meal including starches, or any other metric that is most useful for you to keep track of your spending.

According to the EAT-Lancet commission, North Americans should reduce their consumption of starchy vegetables (potatoes) to 50 g per day (-170%) and increase whole grain consumption (rice, wheat, corn) to 230 g per day. However, recommendations in the yellow column of the tables (on what to change in order to increase sustainability generally) also take cultural habits into consideration.

High level of sustainability Medium level of sustainability Low level of sustainability Not sustainable

A) BREAKFAST STARCHES

Choice of starch (listed from most to least sustainable)	**Total number of choices per week** (quantity)	**Current Cost**	**To make menus more sustainable, generally**	**Total number of choices per week** (quantity)	**New Cost**
Root vegetable			Reduce or leave unchanged or increase		
Ancient grain			Increase variety		
Oat			Increase variety		
Barley			Increase variety		
Quinoa			Increase variety		
Baked goods/ breakfast cereal			Increase variety of whole cereal		

A) LUNCH AND DINNER STARCHES

Choice of starch (listed from most to least sustainable)	Total number of choices per week (quantity)	Current Cost	To make menus more sustainable, generally	Total number of choices per week (quantity)	New Cost
Root vegetable			Reduce or leave unchanged or increase variety and fresh choices		
Ancient grain			Increase variety		
Oat			Increase variety		
Barley			Increase variety		
Quinoa			Increase variety		
Pasta/noodles			Increase whole-grain variety		
Baked goods			Reduce or increase whole ingredients		
Rice			Reduce, or increase Canadian wild rice		

How can I change?

B) CHANGES POSSIBLE

Use this chart to choose a variety of protein and increase sustainable choices.

CHOICE OF STARCH (listed from most to least sustainable)

1. Root vegetables

POTATOES - CASSAVA - PARSNIPS - RUTABAGA - SUNCHOKE - SWEET POTATOES - PLANTAINS - TARO - YAMS
(NOT IN ORDER OF SUSTAINABILITY)

TIPS FOR CHOOSING

- **Avoid processed, pre-fried, and added-sodium products.**
  - Instead, prefer fresh root vegetables that are pre-peeled and pre-cut. Fried roots contain acrylamide, a chemical that occurs when cooking carbohydrate-rich foods at high temperatures—it is a potential risk to human health[62].
- **Choose organic root vegetables.**
  - Conventionally grown potatoes were found to have more pesticide residues by weight than any other crop[63].
- **Choose a large variety of seasonal root vegetables.**
  - In the fall and winter, look for parsnips, rutabagas, and sunchokes.
- **Choose regional suppliers from nearby provinces and states.**

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Keep your pre-peeled root vegetables in cold water in the fridge to maintain firmness. Change the water every 24 hours.
  - Cut into smaller pieces to cook quickly and thoroughly.
  - To increase fibre, keep the skin on fresh potatoes when serving.
- **Cook**
  - Root vegetables are versatile: they can be steamed, boiled, pureed, baked, or roasted.
  - **Avoid** frying them or, if you must, do not offer more than once a week on menu cycle.
- **Replace**
  - Take advantage of the naturally sweet flavour of root vegetables: for example, try sweet potatoes in a dessert dish, such as a pie.
  - To introduce new root vegetables, create a recipe that contains half potato and half of the new root vegetable, for example.
  - Try a sweet potato or radish and turnip hash with fried eggs for breakfast.

2. Ancient grains

KAMUT - SORGHUM - AMARANTH - MILLET - SPELT - FREEKEH - FARRO

- **Choose organic grains.**
  - Organic farming results in higher soil fertility and biodiversity, important factors in preserving the environment[64].
- **Choose fair trade grains.**
  - Look for fair trade options for certain grains such as farro, which may not be grown in Canada.
- **Choose regional suppliers from nearby provinces and states.**

- **Prepare**
  - Toast grains in a dry pan to enhance the naturally nutty flavour.
- **Cook**
  - Try offering grain bowls, with ancient grains as the base and varying colours and textures as toppings.
- **Replace**
  - Begin by serving ancient grains with a 50/50 mix of traditional starches, such as rice. This will help transition your clientele into eating ancient grains.
  - Add different kinds of grain flour into recipes for muffins, bread, pancakes, cake, etc.

62 Health Canada, 2017.
63 EWG, 2017.
64 Maeder et al, 2002.

CHOICE OF PROTEIN (listed from most to least sustainable)

3. Oats

GROATS - STEEL-CUT - ROLLED - INSTANT

TIPS FOR CHOOSING

- **Choose organic oats.**
  - Organic farming reduces pollution by not using synthetic fertilizers, preventing the runoff of chemicals into bodies of water[65].
- **Choose minimally processed oats.**
  - Groats contain the endosperm and bran, which retain fibre, B vitamins and protein. In contrast, instant oats lose these nutrients during processing; instead a long list of ingredients are added to replace the vitamins and give a texture similar to that of regular oats.
- **Choose regional suppliers from nearby provinces and states.**

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Groats and steel-cut oats take longer to prepare - plan time in advance.
- **Cook**
  - Cook oats with dairy or other plant-based milk alternatives for a creamy flavour with added nutritional value.
  - Add flavour by cooking with fresh or frozen fruit and a little maple syrup or honey.
- **Replace**
  - Instead of instant oats, offer groats or steel-cut oats. These alternatives will keep clientele full for a longer period of time (due to the protein content). If cooking time is a problem, prefer rolled oats.

4. Barley

WHOLE GRAIN - HULLED - POT - PEARL

- **Choose organic barley.**
  - Organic farming keeps soil healthy by not using synthetic fertilizers, preventing erosion, and enhancing nutrient and water absorption capabilities[66].
- **Choose pot or whole-grain barley.**
  - Most of the bran—the outermost layer of barley - is present, which ensures a complete source of B vitamins and minerals. Pearl barley is more polished than pot barley (some bran is left) and so contains fewer nutrients.
- **Choose regional suppliers from nearby provinces and states.**

- **Prepare**
  - Barley has a subtle nutty taste that blends well with other flavours and won't overpower a dish. Cook barley in a broth for optimal flavour.
- **Cook**
  - Ensure a colour and texture contrast with food served with barley bowls.
- **Replace**
  - Offer barley instead of rice as a side dish.
  - Create barley salads, chilis, stews.
  - Use barley as a thickening agent for hamburger patties, mousse, and pudding.
  - Because barley can agglutinate when kept warm, mix it with other types of grain to obtain an accompanying starch that is ideally suited to a food service context (e.g. a mixture of barley, whole oats and wild rice).

65 FAO, 2018.
66 FAO, 2018.

CHOICE OF PROTEIN
(listed from most to least sustainable)

5. Quinoa

RED - BLACK - WHITE

6. Pasta/noodles

MADE FROM THE FOLLOWING INGREDIENTS:
WHOLE GRAINS - LEGUMES - RICE - WHITE FLOUR - EGG

TIPS FOR CHOOSING

- **Choose fair trade quinoa.**
  - Quinoa is typically grown in South America; ensure purchases are certified fair trade, which means that they support values of social, environmental, and economic sustainability.
  - Production of Canadian quinoa is beginning to increase; local sourcing could be available in the near future.

- **Choose whole-grain pasta.**
  - Whole-grain pasta contains bran—the outermost layer of the grain—which is high in B vitamins and minerals. This is typically stripped in refined pastas.
- **Choose uncommon varieties of whole grain, such as ancient grains.**
  - Traditional wheat is typically produced by extensive monoculture that does not contribute to biodiversity.
- **Choose regional suppliers from nearby provinces and states.**
  - Canadian durum wheat is high in protein and low in starch compared to other types of wheat[67]. However, look for organic options, since synthetic pesticide use may be high.

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Use quinoa in a variety of hot and cold dishes.
  - Rinse uncooked quinoa under running water until water runs clear (takes about a minute) to remove the bitter taste.
- **Cook**
  - Instead of using lettuce, offer a quinoa-based salad at the salad bar.
- **Replace**
  - Quinoa contains a full set of amino acids, making it a great protein replacement. Pair it with another familiar, popular grain to better transition your clientele.
  - Replace a part of flour with quinoa in muffins for breakfast and desserts.

- **Prepare**
  - Pasta and noodles are used in many cultures—increase your diversity of dishes by looking to different menus!
  - Try different grains in pasta (quinoa, barley).
  - Use whole-grain pasta with heavy-sauce meals (e.g. with parmesan or other cheese).
- **Cook**
  - To begin the switch to whole-grain pasta; start half and half with white pasta (be aware that cooking time is not the same!).
  - Save some of the pasta water used for cooking—this starchy water can add substance to sauces.
- **Replace**
  - Look for pasta that contains legume flour such as chickpea for added protein.

67 Canadian Pasta Manufacturers Association, 2011.

CHOICE OF PROTEIN
(listed from most to least sustainable)

7. Baked goods

BREAD - BAGELS - TORTILLAS - PITAS - PIZZAS - PASTRIES
MADE FROM THE FOLLOWING TYPES OF FLOUR: - OAT - BULGUR - RYE - SPELT - CHICKPEA - LEGUME - SOY - BARLEY - MAIZE - CORN - WHEAT - RICE

TIPS FOR CHOOSING

- **Avoid high-sugar products.**
  - Read the nutrition label to ensure that sugar is not a prominent ingredient.
- **Choose whole ingredients with minimal preservatives and additives.**
  - Store-baked goods often have long ingredient lists to maintain shelf life; for example, instead of using whole eggs, dried egg-white powder is used.
- **Choose whole-grain products with minimal other ingredients.**
  - A product that contains whole grains is not necessarily healthy—ensure that the product is high in fibre.
- **Consider sprouted grains.**
  - These are products made with whole-grain seeds that have just begun to sprout—resulting in more available nutrients and amino acids, and less starch[68].
- **Choose regional suppliers from nearby provinces and states.**

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Homemade baked goods can be a way to create new flavours with fewer ingredients, but requires more time—plan in advance. Possibly an activity to suggest to the leisure/activity department!
- **Bake**
  - Try bannock (see traditional Indigenous starches) with blueberries or raisins for added flavour. It is possible to cook bannock without frying.
  - Consider adding seeds, berries, and oat groats for extra nutritional value.
- **Replace**
  - Try substituting white wheat flour with whole-grain flour when baking. Begin with a half-quantity of each to facilitate the switch.
  - Adding legume flour can also increase the protein and fibre content of baked goods.
  - If commercial products must be used, ask your supplier if he can modify his recipe (ingredients) to meet your sustainable criteria.

8. Breakfast cereals

(INCLUDING BABY CEREALS)
WHOLE CEREALS - PROCESSED CEREALS

- **Avoid colourants and additives in cereal.**
  - Processed cereals are often high sources of artificial food dyes.

    See the appendix for information on artificial colourants and flavourings.
- **Limit processed rice cereal or rice-containing processed foods.**
  - These foods contain high amounts of arsenic: examples include CHEX cereal, Rice Krispies, and rice cakes, particularly in infant rice cereals[69] [70].
- **Choose cereals with little or no added sugar.**
  - Many breakfast cereals contain enough sugar to contribute up to 50% of total daily calorie intake. Child-targeted cereals in particular are significantly higher in sodium and sugar, while lower in fibre and protein[71].
- **Choose cereals that are high in fibre and protein.**
  - These cereals start off the day strong and will keep your clientele feeling full. They are also associated with a lower risk of diabetes and cardiovascular disease[72].
- **Choose bulk cereal.**
  - To reduce the packaging, use reusable dishware to portion cereal or leave big boxes on the floors for self-service.

- **Prepare**
  - Portion cereal in reusable bowls or use a cereal dispenser in the cafeteria to prevent food waste.
- **Cook**
  - Toast nuts and add berries to add to breakfast cereals.
  - Create homemade granola recipe to minimize the ingredient list.
- **Replace**
  - Prioritize the whole-grain cereal at each meal; serve the highly processed cereal in exceptional circumstances only.

68 Whole Grains Council, 2018.
69 Consumer Reports, 2014.
70 Houlihan, 2017.
71 Kent, Cameron, & Philippe, 2017.
72 Williams, 2014.

CHOICE OF PROTEIN
(listed from most to least sustainable)

9. Rice

CANADIAN WILD RICE - PARBOILED - WHITE - JASMINE - BASMATI - JAPANESE (SHORT-GRAIN) - BROWN

TIPS FOR CHOOSING

- **Limit rice consumption.**
  - Rice can be a valuable source of nutrition but it inevitably contains higher levels of arsenic, a toxic compound naturally occurring in foods. Take precautions with rice consumption and ensure that rice is not the primary starch served daily for your clientele.

    See the appendix for details on consumption of arsenic.
- **Choose regional variety.**
  - Canadian wild rice is the only native grain.
- **Choose organic rice**
  - from a reputable company that is transparent about its growing practices and tests for arsenic.

TIPS FOR INCLUSION IN YOUR RECIPES

- **Prepare**
  - Soak rice overnight in a 5:1 ratio of water to rice to cut arsenic levels by up to 80%. [74]
- **Cook**
  - Cook rice in a much larger volume of water (up to 12:1 ratio of water to rice) to remove arsenic levels by up to 60%. [75]
- **Replace**
  - Replace rice with a mixture of whole-grain including a small amount of rice (with barley for example).
  - Vary the type of rice used throughout the week. Brown rice has 80% more arsenic on average than white rice. However, brown rice overall has more nutrients; brown basmati from California, India, or Pakistan is the best choice; they have about a third less arsenic than other varieties of brown rice.[76]

10. Processed root vegetables

DEHYDRATED (POWDER / PARTICLES) **- FRIES - CHIPS**

- **Choose processed starches with no additives.**
  - Limit your consumption of processed root vegetables. Dehydrated potatoes have minimal vitamin C content compared to fresh potatoes; fries and chips often have high amounts of sodium, fat, and trace amounts of acrylamide, a carcinogen.[73]

73 Health Canada, 2017.
74 Mosley, 2017.
75 Carey et al., 2015.
76 Consumer Reports, 2014.

4 Controlling starch waste

Save the starch

- **Freeze bread products.**
  - Freeze any type of bread, bread crust, or expired bread and store (for up to 6 months) to use in recipes.
  - Freeze natural starch products in single-serve portions for specials.
- **Store peeled potatoes in water.**
  - If peeled potatoes are bought, put them into water as fast as possible to prevent oxidation.
  - Be sure to cook them before they turn black. If they turn black they can still be used, but may taste bad—remove black spots before using them.

Repurpose the starch

- **Re-bake bread products.**
  - Make bread pudding as dessert.
  - Bake breadcrumbs for meat patties.
  - Bake croutons to serve at the salad bar or in French onion soup.
- **Re-use starch leftovers.**
  - In salad (rice, potato, barley, pasta)
  - In a soup or cream soup to thicken
- **Fresh baked potato leftovers can be used in:**
  - breakfast roasted potato
  - meat stew or pie
  - Rice leftovers can be used in:
  - stuffed recipe (cabbage rolls, stuffed peppers)

5 Learning about traditional Indigenous starch sources

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

Wild rice

Wild rice, the only grain native to Canada, has been harvested for thousands of years in Ontario, Saskatchewan, and Manitoba[77]. The Ojibwa people recognize it as man-o-min; from Manitou (The Great Spirit) and meenun (delicacy). "The Ojibwa would paddle through the rice beds and sweep the long stalks of the plant over the sides of the canoe with sticks so the green rice would fall off and fill the canoe. Then they would let it dry on shore, roast it till it turned nut-brown, and toss it into the air from blankets, so the husks would blow away in the wind."[78]

Maize

Maize was introduced to Canada from the southern parts of North America and quickly became integral to Indigenous Peoples, with the Iroquois recognizing corn as one of the "Three Sisters": corn, beans, and squash.[79]

It was said that the earth began when "Sky Woman" who lived in the upper world peered through a hole in the sky and fell through to an endless sea. The animals saw her coming, so they took the soil from the bottom of the sea and spread it onto the back of a giant turtle to provide a safe place for her to land. This "Turtle Island" is now what we call North America. Sky Woman had become pregnant before she fell. When she landed, she gave birth to a daughter. When the daughter grew into a young woman, she also became pregnant (by the West Wind). She died while giving birth to twin boys. Sky Woman buried her daughter in the "new earth." From her grave grew three sacred plants—corn, beans, and squash. These plants provided food for her sons, and later, for all of humanity. These special gifts ensured the survival of the Iroquois people.[80]

Root vegetables

Root vegetables not only were a source of nutrition but also had economic and ceremonial values. Large roots were gathered while small roots were left in the ground for future cultivation. Some nations held a "First Roots" ceremony to show respect for roots prior to digging them out of the ground. Once harvested, these roots were often dried, traded, and kept as a "back-up" in times of food shortage.[81]

77 Chavich, 2007.
78 Indian Affairs and Northern Development, Canada, 1998.
79 Wabano Centre for Aboriginal Health, 2014.
80 Erney, 1996.
81 First Nations Health Authority, 2014.

"As early as 1800 BC, ancestors of the Katzie First Nation in B.C.'s Lower Mainland were engineering the wetland environment to increase the yield of a valuable semi-aquatic plant known as a wapato... prized as a valuable trading commodity and served as an important source of starch over the winter months."[82]

Bannock

Indigenous bannock was first made using ground wild plant roots and bulbs such as bracken or camas[83]. Modern-day bannock, using wheat flour, was introduced by European settlers. It is a hardy source of carbohydrates, durable in transportation and easy to prepare. Today, it is recognized as an empowering comfort food, but many variants exist: fried, baked, wheat flour, plant roots, etc.

Appendix

Arsenic consumption

See Health Canada's information page on arsenic.

Exposure to arsenic, particularly during pregnancy, can be a public health concern. Consumption is linked with chronic diseases such as diabetes, heart disease, and various forms of cancer[84]. Arsenic, a heavy metal, occurs naturally in soil and water, but rice has a much stronger ability to uptake arsenic than other plants. Rice is linked to higher proportions of inorganic arsenic, the most dangerous form over long-term exposure, which can lead to human cancers and damage to the gastrointestinal tract.[85] Studies show that just a single serving of processed rice foods can exceed the recommended exposure for arsenic in children for an entire week. Rice paddies are also one of the largest human sources of methane, and rice is the world's second-most produced staple crop.[86]

82 Omand, 2016.
83 Colombo, 2006
84 Karagas et al., 1998; Hopenhayn-Rich, et al., 1998; Tsenget al., 2003; Hassan et al., 2017.
85 Health Canada, 2017.
86 van Groenigen, van Kessel, & Hungate, 2012.

Additives

See Health Canada's complete list of approved additives.

ARTIFICIAL FLAVOURINGS

The chemical composition of artificial flavours and natural flavours are the same. The only difference is the source of the chemicals: synthesized from numerous chemicals in the former or derived from numerous chemicals found in plants and/or foods in the latter.[87] Natural does not necessarily mean "good" or "safe" and neither does artificial. Ultimately, dosage dictates toxicity: flavourings are safe for consumption in appropriate amounts.

ARTIFICIAL COLOURING, ARTIFICIAL FOOD COLOURANTS (AFCS)

Most of the controversy surrounding artificial food colourants (AFCs) involves links between its consumption and children's behaviour, and attention deficit disorder in particular. It is statistically challenging to come to a hard conclusion of the effect of one variable on the other because of the variance in data collection and methodologies over the past 35 years.[88] Ultimately, the United States Food and Drug Administration along with the European Food Safety Authority have concluded that there is no substantial link between the tested colourants and behavioural effects.[89] Again, dosage dictates toxicity: artificial colourants are safe for consumption in appropriate amounts.

ARTIFICIAL SWEETENERS

Artificial sweeteners are a sugar substitute which can either come in low-calorie or zero-calorie forms. They are commonly used by diabetic patients and those looking to lose weight.[90] However, few studies support their efficacy: most provide evidence of their contribution to high blood sugar and obesity as a result of altering the gut microbiota.[91] [92]

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able

87 Bloom, 2017.
88 Nigg et al., 2012.
89 International Food Information Council (IFIC) & U.S. Food and Drug Administration (FDA), 2010.
90 Dietitians of Canada, 2018.
91 Suez et al., 2014.
92 Feehley & Nagler, 2014.

to domesticate plants into the fruits and vegetables we consume today.[93] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assessment by Health Canada to ensure it is safe for human consumption.[94] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides).[95] GM crops are commonly genetically engineered to resist herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[96] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects.[97] [98] However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[99] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[100]

References

Bloom, J. (2017). Natural and Artificial Flavours: What's the Difference? *American Council on Science and Health.* Retrieved from https://www.acsh.org/sites/default/files/Natural-and-Artificial-Flavors-What-s-the-Difference.pdf

Carey, M., Jiujin, X., Farias, J. G., & Meharg, A. A. (2015). Rethinking Rice Preparation for Highly Efficient Removal of Inorganic Arsenic Using Percolating Cooking Water. Plos One, 10(7). doi:10.1371/journal.pone.0131608

Chandrasekara, A., & Kumar, T. J. (2016). Roots and Tuber Crops as Functional Foods: A Review on Phytochemical Constituents and Their Potential Health Benefits. *International Journal of Food Science,2016,* 1-15. doi:10.1155/2016/3631647

Chavich, C. (2007, October 10). Not really rice, but truly Canadian. *The Globe and Mail.* Retrieved July 4, 2018, from https://www.theglobeandmail.com/life/not-really-rice-but-truly-canadian/article18146882/

Colombo, J. R. (2006, June 2). Bannock. Retrieved from https://www.thecanadianencyclopedia.ca/en/article/bannock/

Consumer Reports. (2014, November 18). How Much Arsenic Is in Your Rice? Retrieved from

93 Gepts, 2001.
94 Health Canada, 2012.
95 Canadian Biotechnology Action Network (cban.ca)
96 Gilbert, 2013.
97 Dietitians of Canada, n.d.
98 Health Canada, 2018.
99 Healthcare Without Harm, n.d.
100 Dietitians of Canada, n.d.

https://www.consumerreports.org/cro/magazine/2015/01/how-much-arsenic-is-in-your-rice/index.htm

Dale, P. J., Clarke, B., & Fontes, E. M. (2002). Potential for the environmental impact of transgenic crops. *Nature Biotechnology,*20(6), 567-574. doi:10.1038/nbt0602-567

Dietitians of Canada. (n.d.). Understanding Genetically Modified Foods. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Understanding-Genetically-Modified-Foods.aspx

Dietitians of Canada. (2018). Facts on Artificial Sweeteners. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Facts-on-Artificial-Sweeteners.aspx

Dietitians of Canada. (2018). Choosing Whole Grains FAQs. Retrieved from http://www.unlockfood.ca/en/Articles/Canada-s-Food-Guide/Choosing-Whole-Grains-FAQs.aspx#important

Erney, Diana. 1996. Long live the Three Sisters. Organic Gardening. November. p.37-40.

Feehley, T., & Nagler, C. R. (2014). The weighty costs of non-caloric sweeteners. *Nature*, 514(7521), 176-177. doi:10.1038/nature13752

First Nations Health Authority. (2014, August 26). First Nations Traditional Foods Fact Sheets. Retrieved July 4, 2018, from http://www.fnha.ca/Documents/Traditional_Food_Fact_Sheets.pdf

Food and Agriculture Organization of the United Nations. (2008). Potato and Water Resources. Retrieved from http://www.fao.org/potato-2008/en/potato/water.html

Gepts, P. 2001. Origins of plant agriculture and major crop plants. p. 629–637. In M. Tolba (ed.) Our fragile world: Challenges and opportunities for sustainable development. EOLSS Publishers, Oxford, UK.

Gilbert, H. (2013). A Hard Look at GM Crops. Nature, 497, 24-26. Retrieved from https://www.nature.com/polopoly_fs/1.12907!/menu/main/topColumns/topLeftColumn/pdf/497024a.pdf?origin=ppub

Gross, L. S., Li, L., Ford, E. S., & Liu, S. (2004). Increased consumption of refined carbohydrates and the epidemic of type 2 diabetes in the United States: An ecologic assessment. *The American Journal of Clinical Nutrition*,79(5), 774-779. doi:10.1093/ajcn/79.5.774

Hassan, F., Niaz, K., Khan, F., Maqbool, F., & Abdollahi, M. (2017). The relation between rice consumption, arsenic contamination, and prevalence of diabetes in South Asia. *Experimental and Clinical Sciences.* doi:10.17179/excli2017-222

Health Canada. (2017, March 08). Acrylamide and Food. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/food-processing-induced-chemicals/acrylamide/acrylamide-food-food-safety.html

Health Canada. (2012, December 04). Carbohydrates. Retrieved from https://www.canada.ca/en/health-canada/services/nutrients/carbohydrates.html

Health Canada. (2017, March 01). Arsenic. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants/arsenic.html

Health Canada. (2018, February 27). Frequently Asked Questions - Biotechnology and Genetically Modified Foods. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods/factsheets-frequently-asked-questions/part-1-regulation-novel-foods.html#b8

Health Canada. (2012, December 12). The Regulation of Genetically Modified Food. Retrieved from https://www.canada.ca/en/health-canada/services/science-research/reports-publications/biotechnology/regulation-genetically-modified-foods.html

Healthcare Without Harm, n.d. Position Statement on Genetically Modified Foods. Retrieved from https://noharm.org/sites/default/files/lib/downloads/food/Genetic_Engineered_Food_Stmnt.pdf

Hopenhayn-Rich C, Biggs ML, Smith AH (1998) Lung and kidney cancer mortality as- sociated with arsenic in drinking water in Cordoba, Argentina. Int J Epidemiol 27: 561-569.

Houlihan, J. (2017). Arsenic in 9 Brands of Rice Cereal. Retrieved from https://www.healthybabycereals.org/

International Food Information Council (IFIC) and U.S. Food and Drug Administration (FDA). (2010). Food Additives & Ingredients - Overview of Food Ingredients, Additives & Colors. Retrieved from https://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm094211.htm#qa

Karagas MR, et al. (1998) Design of an epidemiologic study of drinking water arsenic exposure and skin and bladder cancer risk in a U.S. population. Environ Health Perspect 106(Suppl 4): 1047-1050.

Kees Jan van Groenigen, Chris van Kessel, Bruce A. Hungate. Increased greenhouse-gas intensity of rice production under future atmospheric conditions. *Nature Climate Change*, 2012; DOI: 10.1038/nclimate1712

Minister of Indian Affairs and Northern Development. (1998). Chances are, it's Aboriginal! A Conversation about Aboriginal Foods. Retrieved July 4, 2018, from http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/ach_lr_ks_rrds_fd_1302786193164_eng.pdf

Mosley, M. (2017). Should I worry about arsenic in my rice? BBC: Retrieved from https://www.bbc.com/news/health-38910848

Natural Resources Institute (2018). Development Programme: Root and Tuber Crops in Development. Retrieved from https://www.nri.org/development-programmes/root-and-tuber-crops-in-development/overview

Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-Analysis of Attention-Deficit/Hyperactivity Disorder or Attention-Deficit/Hyperactivity Disorder Symptoms, Restriction Diet, and Synthetic Food Color Additives. *Journal of the American Academy of Child & Adolescent Psychiatry,* 51(1). doi:10.1016/j.jaac.2011.10.015

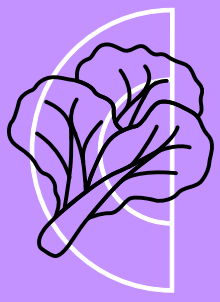
Oat Sustainability. (2011, September). Retrieved from http://www.namamillers.org/issues/sustainability/oat-sustainability/

Omand, G. (2016, December 21). Study explores how ancient First Nations gardened the ocean on B.C.'s coast. *The Canadian Press*. Retrieved from https://toronto.citynews.ca/2016/12/21/study-explores-how-ancient-first-nations-gardened-the-ocean-on-b-c-s-coast/

Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., . . . Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. *Nature*, 514(7521), 181-186. doi:10.1038/nature13793

Tseng CH, et al. (2003) Long-term arsenic exposure and ischemic heart disease in arseniasis-hyperendemic villages in Taiwan. Toxicol Lett 137(1-2):15—21.

Wabano Centre for Aboriginal Health. (2014, August). Clan Connection. Retrieved July 4, 2018, from http://www.wabano.com/wp-content/uploads/2014/06/CLANconnections-AUGUST-2014-final-2.pdf



Chapter 6

Choosing your sustainable vegetables

1 Sustainable vegetables

Why eat vegetables?

Vegetables are part of the most strongly recommended type of food in the new Canada's Food Guide, which recommends that along with fruit, they should comprise half of your diet. Vegetables are rich in vitamins, minerals, and fibre[101] and consumption can reduce the risk of some types of cancer and lower your risk for heart disease.[102] They also add a variety of colours, textures, and tastes to your plate!

Why are sustainable vegetables important?

For food service managers who make dietary choices, moving towards a plant-based diet is the most effective way to reduce greenhouse gas emissions.[103] When assessing the life cycle of fruits and vegetables, transportation accounts for the highest proportion of greenhouse gas emissions.[104] Local foods, which reduce transportation distances, are also fresh, have great variety, save money, and support local farmers.[105] Local fruit and vegetables can also be frozen to maintain highest content of nutrients and be available all year long to reduce imports.

What is the impact of sustainable vegetables on health?

Regional, in-season foods have the potential to possess higher nutritional quality. For example, imported out-of-season broccoli was found to contain half the vitamin C of regional broccoli grown in season.[106]

See the appendix regarding pesticide use in vegetables.

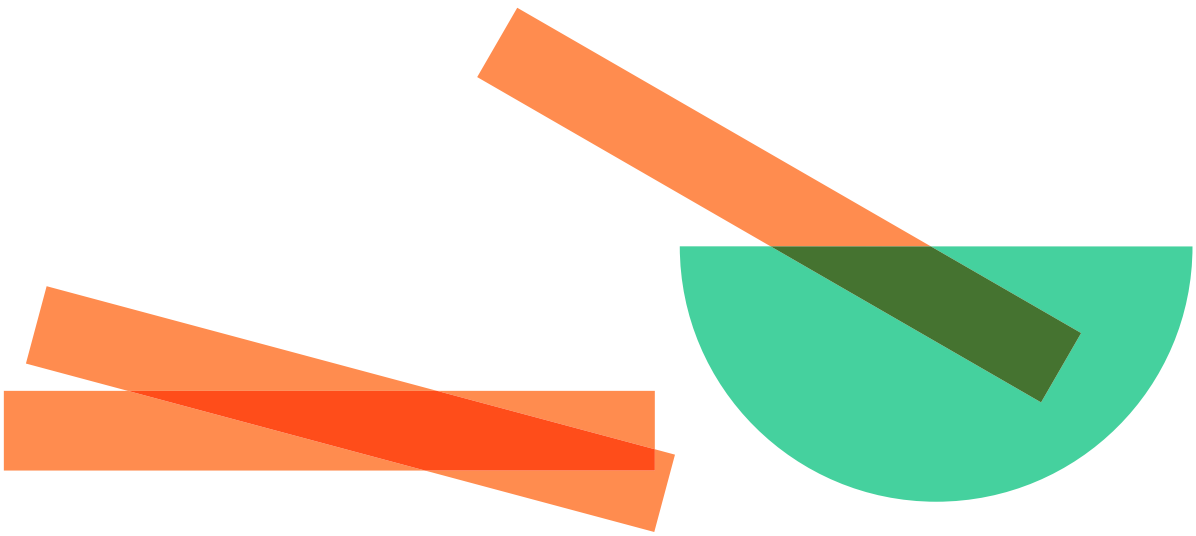
101 Dietitians of Canada, 2018.
102 Health Canada, 2008.
103 Poore & Nemecek, 2018.
104 Weber & Matthews, 2008.
105 Dietitians of Canada, 2017
106 Wunderlich et al., 2008.

2 What are my vegetable standards?

Before choosing the type of vegetable for a menu, standards must be written. Vegetable standards are guidelines that you must work with such as dietary restrictions, allergies, and patient preferences.

Below is an example of vegetable standards written by a food service manager for their institution. The last two columns indicate a clientele to which they may apply (examples might be the elderly, youth, acute care patients, etc.).

Criteria	Clientele a	Clientele b
5 varieties of vegetable and fruit per day	X	X
Choice of 2 hot vegetables for each meal, including low residue and soft texture	X	X
Vegetable salad available as a side dish	On demand	On demand
Cook vegetables with steam instead of boiling them	X	X
Limit repetition to 2 days	X	X



3 Making sustainable vegetable choices

What do I need to change?

The needs of healthcare users may vary and vegetables are not always the priority on the plate. It is important to respond well to the needs of the user (diets, preference) to limit waste. The freshness and quality of the products offered often make the difference between a vegetable consumed and a vegetable discarded.

The EAT-Lancet Commission recommends that North Americans should consume 300 g of vegetables per day, a significant increase from the current average consumption.

How can I change?

VEGETABLE GARDEN

Consider starting your facility's own vegetable garden! The advantages are plentiful: fresh, healthy, sustainable vegetables that cost less and are free of pesticides. A garden can also serve as a therapeutic centre for patients, encouraging physical, nutritional, and mental health benefits.[107] Consult this blog to learn more about garden: Louise Quenneville, Nourish Innovator at Hôpital Glengarry Memorial Hospital.

107 CBC News, 2016.

Seasonal vegetable table

The table below is a national guide to seasonal vegetables in Canada. Consult the appendix for province-appropriate and imported references.

Vegetable colour ▸	Green	Orange	Yellow	White	Other colours	Tips for choosing	Tips for inclusion
Vegetable season ▾							
Spring	Asparagus Spinach Brussel sprouts Cabbage Fiddleheads	Carrots	Artichoke	Rutabaga Potatoes	Radishes Rhubarb Peppers	• **Choose organic.** · Organic farming keeps soil healthy by not using synthetic fertilizers and pesticides, preventing erosion, and enhancing nutrient and water absorption capabilities.[108] See the appendix for information on pesticide and fertilizer use. • **Choose regional.** · Prioritize Canadian; however, if you are based in Quebec, for example, it is better to source from Vermont or Maine than Alberta. • **Choose fresh, field-grown.** · Cultivation in greenhouses, especially those heated with fossil fuels, emit more greenhouse gases than cultivation on open land.[109] · If unavailable, choose frozen or canned options if out of season. Canned options may contain more sodium. See the appendix for canned produce.	• **Consider freezing local produce when it's in season.** · Long-term storage of local produce (freezing) may be a better alternative than imported produce.[110] • **If a vegetable is out of season, consider the imported variety rather than the local, greenhouse-grown kind.** · Increased storage and technology to produce vegetables out of season could have a higher environmental impact than imported produce.
Summer	Broccoli Celery Cucumber Lettuce Leeks Green onions Peas Snow peas Kale Artichoke Cabbage Spinach Beans Swiss chard Leeks	Carrots	Zucchini Sweet corn Beans	Cauliflower Garlic Parsnips Potatoes	Peppers (field) Beets Tomatoes (field) Red onions		
Fall	Broccoli Brussels sprouts Cabbage Celery Leeks Artichoke Kale	Pumpkin Carrots Squash	Zucchini	Parsnips Cauliflower Garlic Turnips Potatoes	Eggplants Beets Peppers Red onions, sweet onions		
Winter	Leeks Kale Brussels sprouts Okra	Sweet potatoes Squash		Turnips Rutabaga	Red onions Beets Parsnips		

108 FAO, 2018.
109 Blomgren, 2013.
110 Canals, Munoz, Hospido, Plassman, McLaren, 2008.

5 Controlling vegetable waste

Prevent the waste

- **Eat the leafy tops of vegetables.**
  - Root vegetables such as beets and carrots have nutritious, flavourful green tops that can be added to salads or sautéed with other greens.
- **Retain vegetable peels and trimmings.**
  - Onion skins and carrot tops can be kept and boiled to make a soup broth. Freeze peels and trimmings until you have enough to prepare at a later time.

See sustainable soup for more details.

Repurpose the waste

- **Make compost!**
  - This would be appropriate for your vegetable garden. See Practice Greenhealth's frequently asked questions about compost.
- **Make vegetable stock from scraps.**
  - Onion, zucchini, mushrooms: collect the ends of these vegetables, boil and create a vegetable stock.

6 Learning about traditional Indigenous vegetable sources

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

Indigenous peoples have used plants for thousands of years for numerous purposes including food, medicine, and ceremonies. Plants are always harvested consciously and mindfully, according to the seasons[111]. Consumption of plants provided vitamins and minerals unavailable in game meats and gave a wide variety of

111 First Nations Health Authority, 2014.

flavour and texture to dishes.[112] These specific plants can be found by searching for "ancestral seeds" online.

The following information is derived from *Traditional Plant Foods of Canadian Indigenous Peoples, Kuhnlein and Turner*, 1991.

ROOT VEGETABLES

See Chapter 5.

GREEN VEGETABLES

Green vegetables include stems, leaves, shoots and buds. Examples of stem and shoot vegetables include thimbleberry and salmonberry, fireweed, cow-parsnip, Indian celery, and fiddleheads. Leaf vegetables are plants such as lambsquarters, watercress, mustard greens and nettles. Green vegetables can be expected to have a high moisture content, carotene and other vitamins (vitamin C and folic acid) and minerals such as iron, calcium, and magnesium.[113]

MUSHROOMS AND FUNGI

A relatively small number of mushroom and fungi species featured in traditional Indigenous diets, some of them still being used. Few studies have been done on the nutrient contents of wild mushrooms, but indications are that their nutrient content is comparable to that of commercially available types.[114]

LICHENS, SEAWEED, AND ALGAE

See also chapter 4 on proteins.

Lichens, especially rock tripe and black tree lichen, were used in some areas, both as food and emergency food. In the far North, lichens were also utilized in a partially digested state from the rumens of caribou. Marine algae, or seaweeds, were used by virtually all coastal peoples, and sometimes were traded inland. Still used at present, they are important sources of vitamins and several minerals, particularly iodine. Both algae and lichens can be difficult to digest unless specially processed. There is little documentation on their nutrient contribution to the diets of Indigenous Peoples. Algae have also been used as an emergency food (energy source) in coastal areas where fish and game were for some reason limited.

112 Kuhnlein & Turner, 1991.
113 Ibid
114 Turner et al., 1987.

FLOWERS

Flowers are unusual plant foods which are not usually available on a commercial basis today. Indigenous Peoples took advantage of such delicacies as rose petals, fireweed flowers, and mariposa lily buds. Flowers are high moisture-containing foods, usually low in protein and fat, but some can be surprisingly rich in vitamin A (as carotene) or vitamin C. There is extremely little published information on the mineral content of flowers.

Appendix

Regional produce

Consult the following websites for provincial produce guides:

Province	Site
British Columbia	We Heart Local B.C local
Alberta	Alberta local food week
Saskatchewan	Saskatchewan Vegetable Growers' Association
Manitoba	Manitoba Agriculture: Manitoba local produce guide
Ontario	Foodland Ontario: Availability guide
Québec	Équiterre: produits de saison
New Brunswick	The Spruce Eats: New Brunswick seasonal fruits and vegetables
Newfoundland and Labrador	Newfoundland and Labrador Farm Guide
Nova Scotia	Select Nova Scotia: Seasonal Availability
Prince Edward Island	Canada's Food Island: What's in Season

While it is difficult to learn about and influence the working conditions under which most purchased food is produced, buying produce directly from regional producers can provide greater access to this information: even in Canada, migrant workers can have limited access to labour rights. See the 2015 report Status of Migrant Farm Workers in Canada, (published by United Food and Commercial Workers Canada and the Agriculture Workers Alliance) as well as Farm Workers in Western Canada: Injustices and Activism (published by the University of Alberta Press).

Fresh vs canned vs frozen produce

In terms of nutritional content, fresh produce is only superior if consumed immediately post-harvest. Otherwise, the nutritional value of fresh, canned or frozen produce is relatively similar (although canned vegetables may be high in sodium).).[115]

There are few studies comparing the environmental impact of frozen and of canned produce. Most are completed by steel-affiliated industries, which conclude that canned food uses less energy than frozen food. The energy used to store frozen food represents the main environmental impact of frozen produce, while the energy used to manufacture steel cans represents the main the environmental impact of canned food. [116]

However, transportation can play a large role in the environmental impact of frozen and canned produce. While how far away the food is produced plays a role in food's environmental impact, the mode of transportation can be even more important. Air transportation produces the greatest volume of carbon emissions: increased use of ship and rail transportation is desirable, as well as maximizing truckloads in road transportation.[117] While it can be difficult to quantify transportation-related emissions of various options, in some cases it is clear (for example, fresh beans from California would have more transportation-related emissions than canned ones from Ontario).

115 Brown, 2017.
116 Institute for Environmental Research and Education, 2007.
117 Wakeland et al., 2012.

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able to domesticate plants into the fruits and vegetables we consume today.[118] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assessment by Health Canada to ensure it is safe for human consumption.[119] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides).[120] GM crops are commonly genetically engineered to resist herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[121] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects[122] [123]. However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[124] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[125]

Imported produce

In 2017, the top vegetables (including field and greenhouse) imported into Canada were tomatoes, lettuce, peppers and cabbages. The top imports from the United States were lettuce, cabbage and broccoli/cauliflower, whereas imports from Mexico consisted primarily of tomatoes, peppers and cucumbers/gherkins.[126]

It is important to be aware of your supplier's source for produce. In 2014, the Los Angeles Times published an 18 month investigative report exposing inhumane labour conditions, including child labour

118 Gepts, 2001.
119 Health Canada, 2012.
120 Canadian Biotechnology Action Network (cban.ca)
121 Gilbert, 2013.
122 Dietitians of Canada, n.d.
123 Health Canada, 2018.
124 Healthcare Without Harm, n.d.
125 Dietitians of Canada, n.d.
126 Agriculture and Agri-Food Canada, 2017.

at produce farms in Mexico for export to the United States[127] – and it would be safe to assume that there are similar issues with exports to Canada.

Pesticides, fertilizers

THE ENVIRONMENTAL PERSPECTIVE

Pesticides can pose risks to all ecosystems: terrestrial, aerial, and most significantly, aquatic and marine. From 1981 to 2011, Agriculture and Agri-Food Canada assessed the risk of water contamination by pesticides across Canada. Within this period of time, they found the risk had risen by up to 50% due to an increase in the area treated by pesticides and by unusual wet weather.[128] In a review published in Science, researchers additionally argued that studies on pesticides in the environment fail to account for the diversity in environmental conditions and the transformations of those pesticides in the environment, particularly by microorganisms, which are not replicable in laboratory settings.[129]

Fertilizers—which are primarily composed of the elements nitrogen, phosphorus and potassium—can also affect water quality. From 1981 to 2011, Agriculture and Agri-Food Canada found that the risk of nitrogen loss through leaching into ground and surface water had increased by up to 36%. This can lead to algal blooms, acidification, and increase in greenhouse gas emissions.[130] Within the same period of time, the risk of phosphorus contamination increased by up to 50%, contributing to eutrophication and algal blooms.[131]

THE HUMAN HEALTH PERSPECTIVE

Health Canada sets a maximum residue level for pesticides on food well below the residue level that could pose a health concern.[132] The annual publication of *Environmental Working Group's* "Dirty Dozen" highlights the top 12 fruits and vegetables which contain the highest amounts of pesticide residue: however, it is important to recognize the context of this report with regard to human consumption. Pesticide residue (product of food consumption and residue level) is not equivalent to the direct pesticide exposure that occurs during production. A study in the *Journal of Toxicology* estimated average pesticide exposure from consuming the 12 fruits

127 Morosi & Bartletti, 2014.
128 Agriculture and Agri-Food Canada, 2011.
129 Fenner et al., 2013.
130 Agriculture and Agri-Food Canada, 2011.
131 Agriculture and Agri-Food Canada, 2011.
132 Health Canada, 2015.

and vegetables using a database of 2000 people.[133] This estimate was then compared to the reference dose, which is an estimate of the amount of a chemical that a person could be exposed to on a daily basis throughout the person's lifetime that is likely to carry no appreciable risk of harm.[134] The study found that in 90% of the comparisons, the average pesticide exposure was 1000 times less than the reference dose.

Although pesticide exposure may be low, there are also indirect and chronic human health impacts. There is much uncertainty regarding the synergistic effects of exposure to multiple pesticides, particularly in low doses over a long period of time. This is of particular interest to those who may live near agricultural operations, or who work directly with pesticides. A study published in Frontiers in Public Health found the following:

"The combination of substances with probably carcinogenic or endocrine-disrupting effects may produce unknown adverse health effects. Therefore, the determination of "safe" levels of exposure to single pesticides may underestimate the real health effects, ignoring also the chronic exposure to multiple chemical substances." [135]

When working towards a sustainable diet that supports reduced synthetic chemical use overall, choose organic whenever possible.

References

Agriculture and Agri-Food Canada. (2017, August 23). Statistical Overview of the Canadian Vegetable Industry - 2016. Retrieved from http://www.agr.gc.ca/eng/industry-markets-and-trade/canadian-agri-food-sector-intelligence/horticulture/horticulture-sector-reports/statistical-overview-of-the-canadian-vegetable-industry-2016/?id=1501890793620

Agriculture and Agri-Food Canada. (2011). Pesticides Indicators. Retrieved from http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/water/pesticides-indicator/?id=1462401144426

Agriculture and Agri-Food Canada. (2011). Nitrogen Indicators. Retrieved from http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/water/nitrogen-indicator/?id=1461713461325

133 Winter & Katz, 2011.
134 Winter & Francis, 1997.
135 Nicolopoulou-Stamati et al., 2016.

Agriculture and Agri-Food Canada. (2011). Phosphorus Indicators. Retrieved from http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/water/phosphorus-indicator/?id=1462404259528

Benefits of therapeutic hospital gardens compiled by Carleton students | CBC News. (2016, April 19). Retrieved from https://www.cbc.ca/news/canada/ottawa/hospital-garden-study-carleton-1.3541892

Blomgren, M. (2013). The connection between the issue of food waste and its collection for biogas: A case study of the municipality of Stockholm. Retrieved from https://www.diva-portal.org/smash/get/diva2:625400/FULLTEXT01.pdf

Brown, M. (2017, June 15). Fresh vs Frozen Fruit and Vegetables - Which Are Healthier? Retrieved from https://www.healthline.com/nutrition/fresh-vs-frozen-fruit-and-vegetables#section6

Calvin, L. & Martin, P. (2010, November). The U.S. Produce Industry and Labor: Facing the Future in a Global Economy. Retrieved from https://ageconsearch.umn.edu/record/262245/files/8069_err106.pdf

Canals, L. M., Munoz, I., Hospido, A., Plassmann, K., McLaren, S. (2008). Life Cycle Assessment (LCA) of Domestic vs. Imported Vegetables. Case studies on broccoli, salad crops and green beans. Surrey: Centre for Environmental Strategy, University of Surrey.

Dale, P. J., Clarke, B., & Fontes, E. M. (2002). Potential for the environmental impact of transgenic crops. Nature Biotechnology,20(6), 567-574. doi:10.1038/nbt0602-567

Dietitians of Canada. (2017). Benefits of Buying Local Food. Retrieved from http://www.unlockfood.ca/en/Articles/Food-Production/Benefits-of-Buying-Local-Food.aspx

Dietitians of Canada. (n.d.). Understanding Genetically Modified Foods. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Understanding-Genetically-Modified-Foods.aspx

Dietitians of Canada. (2018, May 1). How Many Vegetables and Fruit Do you Need? Retrieved from http://www.unlockfood.ca/en/Articles/Canada-s-Food-Guide/How-Many-Vegetables-and-Fruit-Do-you-Need.aspx

Fenner, K., Canonica, S., Wackett, L. P., & Elsner, M. (2013). Evaluating pesticide degradation in the environment: blind spots and emerging opportunities. science, 341(6147), 752-758.

First Nations Health Authority. (2014). Traditional Foods Fact Sheet. Retrieved from http://www.fnha.ca/wellnessContent/Wellness/Traditional_Food_Facts_Sheets.pdf

Food and Agriculture Organization. (2014). Organic Agriculture. Retrieved from http://www.fao.org/organicag/oa-home/en/

Gepts, P. 2001. Origins of plant agriculture and major crop plants. p. 629–637. In M. Tolba (ed.) Our fragile world: Challenges and opportunities for sustainable development. EOLSS Publishers, Oxford, UK.

Gilbert, H. (2013). A Hard Look at GM Crops. Nature, 497, 24-26. Retrieved from https://www.nature.com/polopoly_fs/1.12907!/menu/main/topColumns/topLeftColumn/pdf/497024a.pdf?origin=ppub

Health Canada. (2008, January 14). Vegetables and Fruit. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/canada-food-guide/choosing-foods/vegetables-fruit.html

Health Canada. (2012, December 12). The Regulation of Genetically Modified Food. Retrieved from https://www.canada.ca/en/health-canada/services/science-research/reports-publications/biotechnology/regulation-genetically-modified-foods.html

Health Canada. (2018, February 27). Frequently Asked Questions - Biotechnology and Genetically Modified Foods. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods/factsheets-frequently-asked-questions/part-1-regulation-novel-foods.html#b8

Health Canada. (2019, January 16). Pesticides and food safety. Retrieved from https://www.canada.ca/en/health-canada/services/about-pesticides/pesticides-food-safety.html

Health Canada. (2015, February 17). Maximum Residue Limits for Pesticides. Retrieved from https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/pesticides-food/maximum-residue-limits-pesticides.html

Healthcare Without Harm, n.d. Position Statement on Genetically Modified Foods. Retrieved from https://noharm.org/sites/default/files/lib/downloads/food/Genetic_Engineered_Food_Stmnt.pdf

Institute for Environmental Research and Education. (2007). Canning Green Beans, Ecoprofile of Truitt Brothers Process. Retrieved from: http://nbis.org/nbisresources/life_cycle_assessment_thinking/casestudy_canned_frozen_beans_ecoprofile_iere.pdf

Kuhnlein, H. V., & Turner, N. J. (1991). *Traditional plant foods of Canadian Indigenous peoples: Nutrition, botany, and use*. New York: Gordon and Breach.

Morosi, R. & Bartletti, D. (2014, December 7). Product of Mexico: Hardship on Mexico's farms, a bounty for U.S. tables. Retrieved from http://graphics.latimes.com/product-of-mexico-camps/

Nicolopoulou-Stamati, P., Maipas, S., Kotampasi, C., Stamatis, P., & Hens, L. (2016). Chemical pesticides and human health: the urgent need for a new concept in agriculture. Frontiers in public health, 4, 148.

Network for Business Innovation and Sustainability; Institute for Environmental Research and Education. (2007). *Canning Green Beans Ecoprofile of Truitt Brothers Process*. Schenck, R.

Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science,360(6392), 987-992. doi:10.1126/science.aaq0216

Quenneville, L. (2017, October 11). HGMH's therapeutic garden has become a model space for natural healing. Retrieved from https://www.nourishhealthcare.ca/blog/2017/10/10/hgmhs-therapeutic-garden-has-become-a-model-space-for-natural-healing

Thompson, P., Newsome, K., & Commander, J. (2012). 'Good when they want to be': Migrant workers in the supermarket supply chain. Human Resource Management Journal, 23(2), 129-143. doi:10.1111/j.1748-8583.2011.00186.x

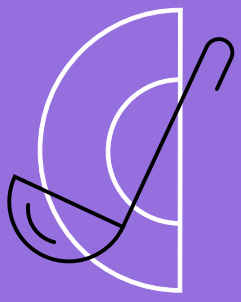
Wakeland, W., Cholette, S., & Venkat, K. (2012). Food transportation issues and reducing carbon footprint. In Green technologies in food production and processing (pp. 211-236). Springer, Boston, MA.

Winter, C. K. & Francis, F. J. (1997). Assessing, managing, and communicating chemical food risks. *Food Technology, 51*(5), 85-92. Retrieved from http://www.ift.org/~/media/Knowledge%20Center/Science%20Reports/Scientific%20Status%20Summaries/assessingfoodrisk_0597.pdf

Winter, C. K., & Katz, J. M. (2011). Dietary Exposure to Pesticide Residues from Commodities Alleged to Contain the Highest Contamination Levels. *Journal of Toxicology,*2011, 1-7. doi:10.1155/2011/589674

Weber, C. L., & Matthews, H. S. (2008). Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environ. Sci. Technol.*, 42 (10), 3508–3513. doi: 10.1021/es702969f

Wunderlich, S. M., Feldman, C., Kane, S., & Hazhin, T. (2008). Nutritional quality of organic, conventional, and seasonally grown broccoli using vitamin C as a marker. *International Journal of Food Sciences and Nutrition*,59(1), 34-45. doi:10.1080/09637480701453637



Chapter 7

Choosing your sustainable soup

1 Sustainable soup

Why eat soup?

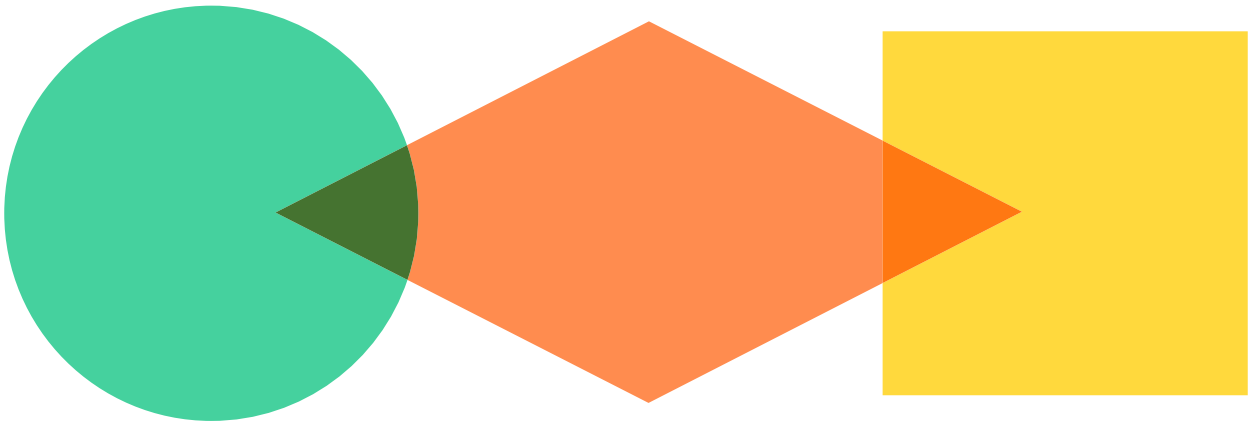
Soups can be used to fill any nutritional gaps left by the main meal—such as starches, vegetables, and proteins. They can also be a comfort food but remain of high nutritional value.

Why is sustainable soup important?

Sustainable soups use whole food ingredients. In addition, they prevent food waste and make use of leftover ingredients that would otherwise be thrown away.

What is the impact of sustainable soups on health?

Sustainable soups retain all of the nutritional value of the ingredients used in them. Depending on your ingredients, they can be a good source of protein, carbohydrates, and vitamins and minerals.



2

What are my soup standards?

Standards must be defined before choosing the soup for your menu—these are guidelines that you must work with such as dietary restrictions, menu format, kitchen capacities, or the preferences of clientele. Here are some examples of what you could write as a chart standard. If you have different types of clientele who require different standards, use columns such as the last two to show for which clientele items apply (e.g. elderly, youth, acute care, etc.).

Standards	Clientele a	Clientele b
One enriched soup is available per day (protein)	X	X
Three choice of: soup, cream soup, broth available each day	X	X
Do not contain the main meal protein	X	X
Same soup does not repeat more than twice a week	X	X
Vegetable soup or cream soup are made with vegetarian broth only	X	X
One type of soup is always available for low salt and soft texture	X	

3 Making sustainable soup choices

LEGEND FOR CHARTS

Choice of soup	Tips for inclusion in your recipes
• **Ranking/Order** · A ranking of food items, in general order of decreasing sustainability. Consideration has been given to the ingredients and energy input needed to produce soup.	· With reference to environmental, social, and economic sustainability, these are tips on integrating soups into your recipes.

WHAT DO I NEED TO CHANGE?

Use the table below to consider the changes needed when serving soup as part of your menu

Criteria	Details
Soup must complete the meal (taste, colour, nutrition)	The soup is the completion of the meal. It should be chosen to fit the type of meal or to add nutritional value such as a source of vegetable or protein if the main meal does not include a lot of them. Soup is the fourth item that should be added to the menu (after the main meal, starch, and vegetable).
Soups are a way to reuse leftovers	Soup should be planned in anticipation of leftover vegetables, starches, or protein from the main meal. For example, side dish vegetables can be kept in the refrigerator up to three days after being cooked: a soup recipe can be planned within these days to make use of these leftovers. Ensure that specific diets, allergies, and textures are taken into account when planning soup recipes. A tip is to include all possible ingredients (allergens) in the recipe (including 1 g of each as a possible ingredient) so that production management software recognizes the possible existence of allergens.
Soups (particularly broths) are a way to prevent waste	Vegetable trimmings and animal bones can be saved from going to waste and instead find a second life as broth. Making home made broth is easy and environmentally friendly, brings a wonderful smell in the kitchen, and forms the basis of a delicious soup. Tips for use are found below. Ensure that specific diets, allergies, and textures are taken into account when planning soup recipes. A tip is to include all possible ingredient (allergen) in the recipe (put 1 g of each as a possible ingredient).

HOW CAN I CHANGE?

CHOICE OF SOUP (listed from most to least sustainable)

1. Homemade broth

LEFTOVERS FROM: **VEGETABLE - FISH - CHICKEN - PORK BEEF**

TIPS FOR INCLUSION IN YOUR RECIPES

Broths are a good base for other soups and main dishes.

- **Make your own broth:**
  - Making homemade broth (instead of using dried stock or broth powders) is the ultimate way to repurpose leftovers: boil meat leftovers with wilted greens, carrots tops, celery, onions. Add in herbs and spices, bring to a boil, and simmer for an hour.
  - Keep or buy bones (fish, animal): boil and simmer for at least 4 hours. Animal bones contain trace amounts of valuable nutrients such as calcium and magnesium[136], as well as amino acids.[137]

    See Chapter 6 (on vegetables) and Chapter 9 (on condiments) for more information.
  - Any broth recipe can be followed as a baseline: for additional flavour, add condiments as desired. Adapt as necessary; if salt is an issue for your clientele, do not add salt at all.
- **Plan ahead to use your leftovers to make broth.**
  - This is easier than it sounds: in a pot, place all the vegetables, protein, and bones that cannot be served. Add seasoning as needed and place in the refrigerator. Every three days (cooked meat cannot be kept in the refrigerator for more than three days), boil everything together. A cook should taste the broth after one hour of boiling to adjust the recipe.
- **Store well.**
  - Broth keeps well in a large container stored in the refrigerator. It can also be frozen if too much is produced.

2. Puree

LENTILS - VEGETABLES - SEAFOOD - MEAT

PUREE WITH CREAM: **PLANT-BASED MILKS - DAIRY**

Pureed soups, particularly vegetable soups, are a great way to introduce more fibre into the diet. They are also an easy way to repurpose leftovers and can be very nutritious for clientele with modified diets.

- **How to make pureed soups:**
  - When possible, use homemade broth and add leftovers or fresh regional ingredients.
  - Boil everything until cooked to perfection, then purée to a good consistency.
  - Ensure that the vegetables, starches, and proteins you are using are clean and cooked well.

    The addition of dairy or plant-based milks can make cream-based soups a good source of protein.
- **How to make cream-based soups:**
  - Cream-based soups can be a good source of fat and protein.
  - If using dairy, try to look for organic and/or grass-fed dairy.
  - If using plant-based milk, ensure that it is fortified with sufficient nutrients.

    See Chapter 10 for more information on sustainable creams.

136 Hsu et al., 2017.
137 Yoon et al., 2015.

CHOICE OF SOUP
(listed from most
to least sustainable)

3. Processed

FROZEN - CANNED - POWDERED

TIPS FOR INCLUSION
IN YOUR RECIPES

Processed soups—both canned and dried—require more energy and produce more waste than homemade soups.[138] In addition, they can be high in sodium—even those claiming to be "sodium-reduced."

- **Processed soups should not be served "as is": they must be improved with the addition of fresh vegetables or proteins.**

- **How to choose processed soups:**
  - Read the list of ingredients: it should consist of whole foods. Avoid soups with long ingredient lists containing additives and preservatives. See the appendix for more information.
  - Whenever possible, priority should be given to seasonally appropriate regional ingredients.
  - Prioritize low-sodium options.
  - Dried, powdered soups should be considered as a last option.

138 Canals et al., 2010.

4 Learning about traditional Indigenous soups

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

A soup native to First Nations such as the Iroquois and Ouendat is the *Three Sisters Soup*, made out of corn, beans, and squash. These three vegetables are grown, harvested, and cooked together. They are companion crops: corn grows tall, allowing bean vines to climb and grow, while squash stays low to the ground, its large leaves providing shade to prevent the growth of weeds. All three are indigenous to North America, with thousands of varieties found across the continent.[139]

Bone broth is also integral to traditional culture. Hunters boiled the bones of carcasses to ensure that nothing went to waste. This resulted in a flavourful broth filled with nutritional benefits, including protein, minerals, and vitamins.[140] Nourish Innovator Leslie Carson has been successful in sourcing local bone broth for clients at Yukon Hospital.

139 Midland Mirror, 2010.
140 Gimbar, 2017.

Appendix

ADDITIVES

See Health Canada's complete list of approved additives.

ARTIFICIAL FLAVOURINGS

The chemical composition of artificial flavours and natural flavours are the same. The only difference is the source of the chemicals: synthesized from numerous chemicals in the former or derived from numerous chemicals found in plants and/or foods in the latter.[141] Natural does not necessarily mean "good" or "safe" and neither does artificial. Ultimately, dosage dictates toxicity: flavourings are safe for consumption in appropriate amounts.

ARTIFICIAL COLOURING, ARTIFICIAL FOOD COLOURANTS (AFCS)

Most of the controversy surrounding artificial food colourants (AFCs) involve links between its consumption and children's behaviour, and attention deficit disorder in particular. It is statistically challenging to come to a hard conclusion of the effect of one variable on the other because of the variance in data collection and methodologies over the past 35 years.[142] Ultimately, the United States Food and Drug Administration along with the European Food Safety Authority have concluded that there is no substantial link between the tested colourants and behavioural effects.[143] Again, dosage dictates toxicity: artificial colourants are safe for consumption in appropriate amounts.

ARTIFICIAL SWEETENERS

Artificial sweeteners are a sugar substitute which can either come in low-calorie or zero-calorie forms. They are commonly used by diabetic patients and those looking to lose weight.[144] However, few studies support their efficacy: most provide evidence of their contribution to high blood sugar and obesity as a result of altering the gut microbiota.[145] [146]

141 Bloom, 2017.
142 Nigg et al., 2012.
143 International Food Information Council (IFIC) & U.S. Food and Drug Administration (FDA), 2010.
144 Dietitians of Canada, 2018.
145 Suez et al., 2014.
146 Feehley & Nagler, 2014.

References

Bloom, J. (2017). Natural and Artificial Flavours: What's the Difference? American Council on Science and Health. Retrieved from https://www.acsh.org/sites/default/files/Natural-and-Artificial-Flavors-What-s-the-Difference.pdf

Canals, L. M., Sim, S., García-Suárez, T., Neuer, G., Herstein, K., Kerr, C., . . . King, H. (2010). Estimating the greenhouse gas footprint of Knorr. The International Journal of Life Cycle Assessment,16(1), 50-58. doi:10.1007/s11367-010-0239-5

Dietitians of Canada. (2018). Facts on Artificial Sweeteners. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Facts-on-Artificial-Sweeteners.aspx

Feehley, T., & Nagler, C. R. (2014). The weighty costs of non-caloric sweeteners. Nature, 514(7521), 176-177. doi:10.1038/nature13752

Gimbar, M. (2017). A Sip Above the Rest...Is Bone Broth All Its Boiled up to Be? Journal of Renal Nutrition, 27(6). doi:10.1053/j.jrn.2017.08.003

Hsu, D., Lee, C., Tsai, W., & Chien, Y. (2017). Essential and toxic metals in animal bone broths. Food & Nutrition Research,61(1), 1347478. doi:10.1080/16546628.2017.1347478

International Food Information Council (IFIC) and U.S. Food and Drug Administration (FDA). (2010). Food Additives & Ingredients - Overview of Food Ingredients, Additives & Colors. Retrieved from https://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm094211.htm#qa

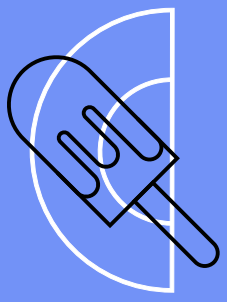
Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-Analysis of Attention-Deficit/Hyperactivity Disorder or Attention-Deficit/Hyperactivity Disorder Symptoms, Restriction Diet, and Synthetic Food Color Additives. Journal of the American Academy of Child & Adolescent Psychiatry, 51(1). doi:10.1016/j.jaac.2011.10.015

Moskin, J. (2015, Jan 6). Bones, broth, bliss. The New York Times. Retrieved from https://www.nytimes.com/2015/01/07/dining/bone-broth-evolves-from-prehistoric-food-to-paleo-drink.html

Midland Mirror. (2010, Nov 18). 'Three Sisters' harvest deeply spiritual to Ouendat. Simcoe.com. Retrieved from https://www.simcoe.com/community-story/2042231--three-sisters-harvest-deeply-spiritual-to-ouendat/

Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., . . . Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. Nature, 514(7521), 181-186. doi:10.1038/nature13793

Yoon, J. Y., Choi, S., Jeong, H. S., Park, Y. I., Kim, D., & Joo, N. (2015). A Comparative Study on Quality and Physicochemical Characteristics of Segmental Bone Korean Beef Broth. The Korean Journal of Food And Nutrition,28(3), 470-477. doi:10.9799/ksfan.2015.28.3.470



Chapter 8

Choosing your sustainable dessert

Sustainable desserts

Why serve dessert?

Desserts give users an opportunity to satisfy their sweet tooth while providing nutritional value and a sense of satiety. Sometimes, they are also an opportunity to complete the meal.

Why are sustainable desserts important?

Sustainable desserts are made from sustainable ingredients (for sources, see other chapters such as Proteins and Starches). In addition, they prevent food waste. For example, using leftover bread for bread pudding or overripe bananas for muffins is a great way to prevent food waste and serve delicious dessert. Sustainable desserts also have minimal packaging.

What impact do sustainable desserts have on health?

Sustainable desserts typically have good nutritional value. They are made from whole ingredients, have limited amounts of added sugar, and are a good source of nutrients.

2 What are my dessert standards?

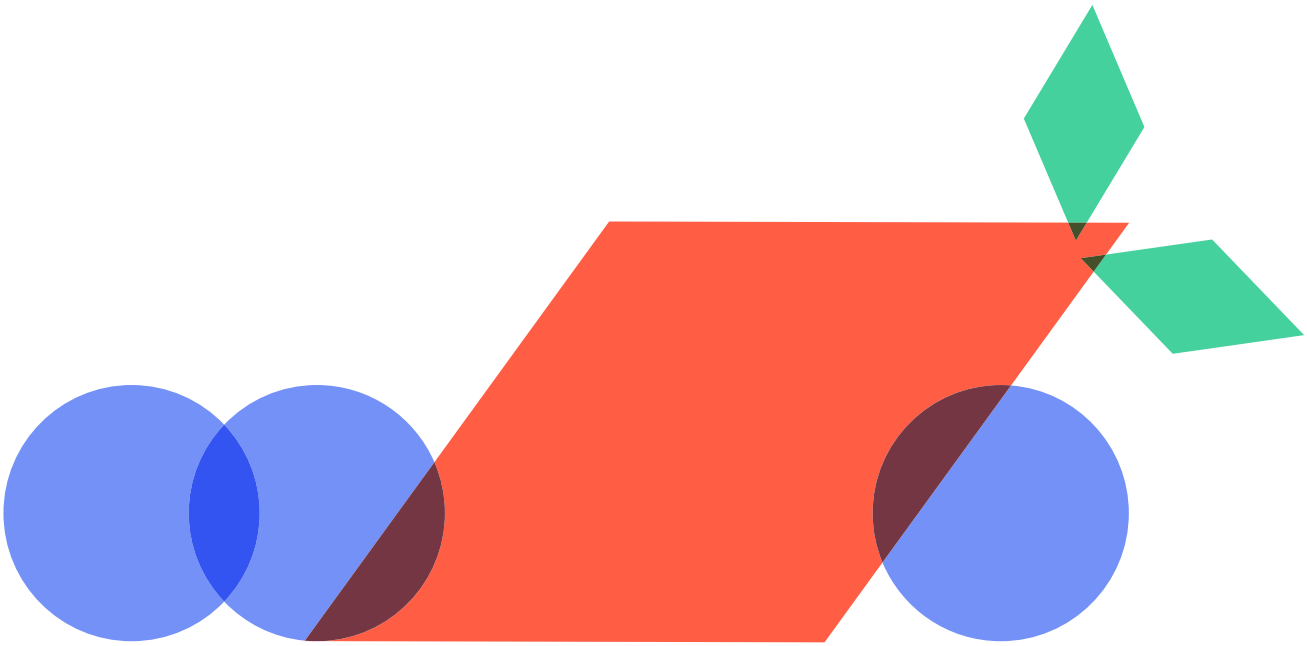
Before choosing the type of dessert for a menu, dessert standards must be written. Dessert standards are guidelines that you must work with such as dietary restrictions, allergies, and patient preferences. Below is an example of meal standards written by a food service manager for an institution. The last two columns indicate a clientele to which they may apply (examples might be the elderly, youth, acute care, etc.).

Standards	Clientele a	Clientele b
2 choices of fruit per day on the menu	X	X
2 choices of fresh fruit per week on the menu	X	X
1 choice of dairy (or vegetarian milk) dessert per day	X	X
À la carte each day: fresh fruit, pureed fruit	X	X
Frozen dessert available at each meal	Upon request	Upon request
Fruit yogurt with or without fruit pieces available each meal (lactose-free upon request)	X	X
Cake and pastries are homemade twice a week	X	X
Repetition of fruit and yogurt: maximum twice a week	X	X
Prefer dessert with maximum of 30g of carbohydrates per portion	X	X
Enriched desserts are at available each meal		X

3 Making sustainable dessert choices

HOW CAN I CHANGE?

The EAT-Lancet commission recommends that North Americans should increase their consumption of fruit to 200 g per day. Dessert should be made with simple ingredients: whole grains, fruits, whole milk products, oils (40g of unsaturated fat and 11.8 g of saturated fat per day), sugar (31 g per day).



CHOICE OF DESSERT (listed from most to least sustainable)

1. Regional fruit in season

See calendar in appendix

SUMMER FRUITS. BERRIES: **STRAWBERRIES - BLUEBERRIES BLACKBERRIES - GOOSEBERRIES - SASKATOON BERRIES MULBERRIES -** STONE FRUITS: **PEACHES - PLUMS - APRICOTS - CHERRIES -** MELONS: **WATERMELON - CANTALOUPE - HONEYDEW**
FALL FRUITS: **CRANBERRIES - APPLES - PEARS**

TIPS FOR CHOOSING

- **Choose organic.**
  - Organic farming keeps soil healthy by not using synthetic fertilizers, preventing erosion, and enhancing nutrient and water absorption capabilities.[147]
- **Choose fresh fruits in season.**
  - If unavailable or out of season, consider frozen alternatives from regional suppliers when possible.
  - If canned: be wary of added sugars and syrups.
- **Choose regional.**
  - If you are based in Quebec, for example, it is better to source from Vermont or Maine than BC.
  - Choose minimal packaging or recyclable packaging.
  - Prefer bulk fruit if possible.
- **Be conscious of sulphites in dried fruits.**
  - Sulphites occur naturally in food but are often added to preserve dried fruits. Be conscious of clientele who may be sulphite-sensitive (often seen in children who have asthma [148]): they may develop allergy-like symptoms.[149] Prefer organic dried fruit without added sulphites.
- **Be conscious of sugar and portion size for dried fruits.**
  - People usually eat more dried fruit than the equivalent quantity of fresh fruit, which contributes to a higher sugar intake. Dried fruits may also have high amounts of added sugar.
  - The fruit-drying process is currently lengthy and energy-intensive, but advances in technology will make it more sustainable and cost effective.[150]

TIPS FOR INTEGRATING INTO YOUR RECIPES

- Highlight the seasonality of local fruits! Serve fruits during the peak season: this is when they are most visually appealing and taste the best.
- **Pair**
  - Slice a variety of fruits to create fruit cups, or serve at a fruit salad bar with yogurt and granola options to make parfaits.
  - Granola should not be added to yogurt prior to selling.
- **Grill**
  - Grilling fruits is a great way to bring out caramelized flavour from natural sugars.
- **Preserve**
  - Before fruit rots, freeze it in a container for future use.
- **Replace**
  - Rather than using refined sugar, try baking with dried fruits.

2. Imported fruit

*ALL LOCAL FRUITS, WHEN OUT OF SEASON

BANANAS - ORANGES - MANDARINS - CLEMENTINES - PINEAPPLES GRAPES

- **Choose organic.**
  - Organic farming keeps soil healthy by not using synthetic fertilizers, preventing erosion, and enhancing nutrient and water absorption capabilities.[151]
- **Choose fair trade.**
  - Fair trade certification guarantees that producers receive equitable pay and working conditions and encourages responsible environmental practices.[152]
- **Prioritize fresh or frozen regional, seasonal fruits.**
  - This is the best way to provide fruits with excellent taste and nutritional quality, while also supporting local economies.
- **When choosing canned exotic and out-of-season fruits, prioritize those with no added sugar.**
  - Canned fruits have a stable shelf life and are typically transported by ship or rail. Fresh exotic and out-of-season fruits may require air transportation to minimize travel time, which is incredibly energy-intensive.[153]
- **Be conscious of sulphites in dried fruits.**
  - Sulphites occur naturally in food but are often added to preserve dried fruits. Be conscious of clientele who may be sulphite-sensitive (often seen in children who have asthma[154])—they may develop allergy-like symptoms.[155] Prefer organic dried fruit without added sulphites.
- **Be conscious of sugar and portion size for dried fruits.**
  - People usually eat more dried fruit than the equivalent quantity of fresh fruit, which contributes to a higher sugar intake. Dried fruits may also have high amounts of added sugar.
  - The fruit-drying process is currently lengthy and energy-intensive, but advances in technology will make it more sustainable and cost effective.[156]

147 FAO, 2018.
148 Vally et al., 2009.
149 Health Canada, 2017.
150 Sagar & Kumar, 2010.
151 FAO, 2018.
152 Fairtrade Canada, n.d.
153 Piecyk & McKinnon, 2010.
154 Vally et al., 2009.
155 Health Canada, 2017.
156 Sagar & Kumar, 2010.

CHOICE OF DESSERT (listed from most to least sustainable)

3. Homemade mousse/ pudding desserts

See Chapter 4 for sustainable dairy choices. See Chapter 5 for sustainable flour choices. See Chapter 9 and appendix for sustainable sugar choices.

BREAD PUDDING - TOFU PUDDING, MOUSSE - ALMOND, COCONUT, SOY, CASHEW PUDDING, MOUSSE - DAIRY PUDDING, MOUSSE

TIPS FOR CHOOSING

- Homemade desserts are a sustainable approach to serving desserts. When whole ingredients are used, they are less energy-intensive and produce less waste than processed desserts.[157] In addition, there allow more control over nutritional value and often taste better.
- **Avoid using too much refined sugar.**
  - Instead of sugar, try using fresh, frozen, or dried fruit.
  - Dates are also a good sweetener and provide plenty of fibre.
- **Choose plant-based ingredients.**
  - Plant-based ingredients have a lesser environmental impact than dairy products. In addition, they can also increase fibre and unsaturated fat content (soy milk, coconut milk: see Chapter 4 for more information).

TIPS FOR INTEGRATING INTO YOUR RECIPES

- **Replace**
  - Try a 50/50 combination of dairy and plant-based milk to make steps towards sustainable choices.
  - Use date puree to replace refined sugar.

4. Homemade baked goods

See Chapter 5 for sustainable flour choices. See Chapter 9 and appendix for sustainable sugar choices.

BREADS - COOKIES - CAKES - PASTRIES

- Homemade baked goods are an opportunity to provide good nutritional value, particularly when preserved fruits are used, and to prevent food waste.
- **Avoid refined wheat flours.**
  - Desserts often call for refined white flour: consider using a 50/50 combination of whole wheat and white flours to provide the nutritional benefits of fibre and micronutrients.
- **Consider using alternative flours for added nutritional benefits and to encourage biodiversity.**
  - Although wheat is a popular flour, choosing alternative flours encourages greater genetic diversity of grain crops.[158]
- **Prefer recipes with fibre and protein and less sugar.**
  - Pastries often contain high levels of fat and sugar and are low in fibre.

- **Replace**
  - Vary the classic oatmeal with different grains (buckwheat, spelt, quinoa, etc.).
  - Instead of using refined sugar, try using local maple syrup or honey (replace 1:1): this also reduces the amount of liquid needed in your recipe: reduce 105ml of liquid for each cup of syrup or honey added.
  - Use silken tofu, ground flaxseed, or chia instead of eggs.
  - Replace wheat flour with oat, bulgur, chickpea, or legume flours that can be sources of protein in your desserts.
- **Preserve**
  - Consider making a larger batch of batter than needed and freezing the remainder for future use.

157 Ganesh, 2013.
158 Mujeeb-Kazi et al., 2013.

CHOICE OF DESSERT
(listed from most to least sustainable)

5. Ready-made processed desserts

See Chapter 9 for more information.See the appendix for information on artificial colourants and flavourings.

POWDERED PUDDINGS - CAKE MIXES - FROZEN DESSERTS

TIPS FOR CHOOSING

- Ready-made processed desserts may be unsustainable due to the energy expended in processing and packaging and to the lengthy list of ingredients.
- **Be cautious of palm oil.**
  - Palm oil production is extremely damaging to the environment, wildlife, and human health. Seek out oil from sustainable production practices or limit consumption. See the appendix.
- **Avoid desserts which have high amounts of added sugar.**
  - Added sugar can disguise itself under many names. See the appendix for good resources on sugar. If you must choose desserts that are high in sugar, those containing fibre are to be preferred.
- **Choose desserts with good overall nutritional value.**
  - When possible, choose desserts which contain protein.
  - If a dessert has no or low fibre content, choose a dessert with low saturated-fat content.
- **Choose a regional company that can personalise ingredients to match your needs.**
  - Small regional companies can often supply good homemade desserts at a reasonable price when bought in large quantities.
- **Choose whole ingredients with minimal preservatives and additives.**
  - Store-baked goods often have long ingredient lists to maintain shelf life; for example, instead of using whole eggs, dried egg white powder is used.

TIPS FOR INTEGRATING INTO YOUR RECIPES

- **Optimize**
  - To improve the nutritional value of powdered, processed desserts, consider adding fruits, nuts or seeds.
- **Portion**
  - Serve smaller portions of desserts and enhance by adding fresh or frozen fruits.

4 Learning about traditional Indigenous desserts

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

Traditional Indigenous desserts often make use of sweet berries found in nature, depending on the region: wild saskatoon berries, redberries, and buffalo berries, to name a few. In the far North, whipping berries and greens together with fat and snow made a type of ice cream.[159] In the West, buffalo berries were also whipped to create jams and jellies.[160] These were the primary sources of sweetness in Indigenous diets before refined sugars were introduced. These fruits also gave rise to variations of traditional recipes, such as sweet bannock.

Appendix

Additives

See Health Canada's complete list of approved additives.

ARTIFICIAL FLAVOURINGS

The chemical composition of artificial flavours and natural flavours are the same. The only difference is the source of the chemicals: synthesized from numerous chemicals in the former or derived from

159 Kuhnlein & Turner, 1991.
160 BC Food History Network, 2016.

numerous chemicals found in plants and/or foods in the latter.[161] Natural does not necessarily mean "good" or "safe" and neither does artificial. Ultimately, dosage dictates toxicity: flavourings are safe for consumption in appropriate amounts.

ARTIFICIAL COLOURING, ARTIFICIAL FOOD COLOURANTS (AFCS)

Most of the controversy surrounding artificial food colourants (AFCs) involve links between its consumption and children's behaviour, and attention deficit disorder in particular. It is statistically challenging to come to a hard conclusion of the effect of one variable on the other because of the variance in data collection and methodologies over the past 35 years.[162] Ultimately, the United States Food and Drug Administration along with the European Food Safety Authority have concluded that there is no substantial link between the tested colourants and behavioural effects.[163] Again, dosage dictates toxicity: artificial colourants are safe for consumption in appropriate amounts.

ARTIFICIAL SWEETENERS

Artificial sweeteners are a sugar substitute which can either come in low-calorie or zero-calorie forms. They are commonly used by diabetic patients and those looking to lose weight.[164] However, few studies support their efficacy: most provide evidence of their contribution to high blood sugar and obesity as a result of altering the gut microbiota.[165] [166]

Palm oil

Palm oil is a common ingredient found in processed foods. It's the world's most versatile vegetable oil it is also a very productive crop. It offers a far greater yield at a lower cost of production than other vegetable oils. Its high melting point (solid at room temperature) makes it a cheap alternative to animal fats and an healthier alternative to hydrogenated oils that contains trans fat for processes such as baking and frying, or for use in spreads.[167] Items such as bread, margarine, ice cream, and chocolate are likely to contain substantial amounts of palm oil. The high demand for palm oil has caused massive deforestation in concentrated areas, particularly in forests which are key to storing CO2, a greenhouse

161 Bloom, 2017.
162 Nigg et al., 2012.
163 International Food Information Council (IFIC) & U.S. Food and Drug Administration (FDA), 2010.
164 Dietitians of Canada, 2018.
165 Suez et al., 2014.
166 Feehley & Nagler, 2014.
167 Spinks, 2014.

gas.[168] Consequently, native wildlife such as orangutans, elephants, and tigers have lost habitat with only 15% of these species surviving the transition from forest to palm oil plantation.[169] The change also comes at a cost to human health, since smoke from burning of the forest to prepare for the cultivation of palm oil brings exposure to particulate matter.[170]

Regional produce

Consult the following websites for provincial produce guides:

Province	Site
British Columbia	We Heart Local B.C local
Alberta	Alberta Agriculture and Forestry: availability of Alberta grown crops, commercial
Saskatchewan	Pick your own: Saskatchewan guide
Manitoba	Manitoba Agriculture: Manitoba local produce guide
Ontario	Foodland Ontario: Availability guide
Québec	Équiterre: produits de saison
New Brunswick	The Spruce Eats: New Brunswick seasonal fruits and vegetables
Newfoundland and Labrador	Newfoundland and Labrador Farm Guide
Nova Scotia	Select Nova Scotia: Seasonal Availability
Prince Edward Island	Canada's Food Island: What's in Season

While it is difficult to learn about and influence the working conditions under which most purchased food is produced, buying produce directly from regional producers can provide greater access to this information: even in Canada, migrant workers can have limited access to labour rights. See the 2015 report Status of Migrant Farm Workers in Canada, (published by United Food and Commercial Workers Canada and the Agriculture Workers Alliance) as well as Farm Workers in Western Canada: Injustices and Activism (published by the University of Alberta Press).

168 Scientific American, n.d.
169 Nicholas et al., 2017.
170 Goodman & Kulik, 2015.

Fresh vs canned vs frozen produce

In terms of nutritional content, fresh produce is only superior if consumed immediately post-harvest. Otherwise, the nutritional value of fresh, canned or frozen produce is relatively similar (although canned vegetables may be high in sodium).).[171]

There are few studies comparing the environmental impact of frozen and of canned produce. Most are completed by steel-affiliated industries, which conclude that canned food uses less energy than frozen food. The energy used to store frozen food represents the main environmental impact of frozen produce, while the energy used to manufacture steel cans represents the main the environmental impact of canned food.[172]

However, transportation can play a large role in the environmental impact of frozen and canned produce. While how far away the food is produced plays a role in food's environmental impact, the mode of transportation can be even more important. Air transportation produces the greatest volume of carbon emissions: increased use of ship and rail transportation is desirable, as well as maximizing truckloads in road transportation.[173] While it can be difficult to transportation-related emissions of various options, in some cases it is clear (for example, fresh beans from California would have more transportation-related emissions than canned ones from Ontario).

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able to domesticate plants into the fruits and vegetables we consume today.[174] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assessment by Health Canada to ensure it is safe for human consumption.[175] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides)[176]. GM crops are commonly genetically engineered to resist

171 Brown, 2017.
172 Institute for Environmental Research and Education, 2007.
173 Wakeland et al., 2012.
174 Gepts, 2001.
175 Health Canada, 2012.
176 Canadian Biotechnology Action Network (cban.ca)

herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[177] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects[178] [179]. However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[180] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[181]

Imported produce

In 2017, the top vegetables (including field and greenhouse) imported into Canada were tomatoes, lettuce, peppers and cabbages. The top imports from the United States were lettuce, cabbage and broccoli/cauliflower, whereas imports from Mexico consisted primarily of tomatoes, peppers and cucumbers/gherkins.[182]

It is important to be aware of your supplier's source for produce. In 2014, the Los Angeles Times published an 18 month investigative report exposing inhumane labour conditions, including child labour at produce farms in Mexico for export to the United States[183]– and it would be safe to assume that there are similar issues with exports to Canada.

Pesticides, fertilizers

THE ENVIRONMENTAL PERSPECTIVE

Pesticides can pose risks to all ecosystems: terrestrial, aerial, and most significantly, aquatic and marine. From 1981 to 2011, Agriculture and Agri-Food Canada assessed the risk of water contamination by pesticides across Canada. Within this period of time, they found the risk had risen by up to 50% due to an increase in the area treated by pesticides and by unusual wet weather.[184] In a review published in Science, researchers additionally argued that studies on pesticides in the environment fail to account for the

177 Gilbert, 2013.
178 Dietitians of Canada, n.d.
179 Health Canada, 2018.
180 Healthcare Without Harm, n.d.
181 Dietitians of Canada, n.d.
182 Agriculture and Agri-Food Canada, 2017.
183 Morosi & Bartletti, 2014.
184 Agriculture and Agri-Food Canada, 2011.

diversity in environmental conditions and the transformations of those pesticides in the environment, particularly by microorganisms, which are not replicable in laboratory settings.[185]

Fertilizers—which are primarily composed of the elements nitrogen, phosphorus and potassium—can also affect water quality. From 1981 to 2011, Agriculture and Agri-Food Canada found that the risk of nitrogen loss through leaching into ground and surface water had increased by up to 36%. This can lead to algal blooms, acidification, and increase in greenhouse gas emissions.[186] Within the same period of time, the risk of phosphorus contamination increased by up to 50%, contributing to eutrophication and algal blooms.[187]

THE HUMAN HEALTH PERSPECTIVE

Health Canada sets a maximum residue level for pesticides on food well below the residue level that could pose a health concern.[188] The annual publication of Environmental Working Group's "Dirty Dozen" highlights the top 12 fruits and vegetables which contain the highest amounts of pesticide residue: however, it is important to recognize the context of this report with regard to human consumption. Pesticide residue (product of food consumption and residue level) is not equivalent to the direct pesticide exposure that occurs during production. A study in the Journal of Toxicology estimated average pesticide exposure from consuming the 12 fruits and vegetables using a database of 2000 people.[189] This estimate was then compared to the reference dose, which is an estimate of the amount of a chemical that a person could be exposed to on a daily basis throughout the person's lifetime that is likely to carry no appreciable risk of harm.[190] The study found that in 90% of the comparisons, the average pesticide exposure was 1000 times less than the reference dose.

Although pesticide exposure may be low, there are also indirect and chronic human health impacts. There is much uncertainty regarding the synergistic effects of exposure to multiple pesticides, particularly in low doses over a long period of time. This is of particular interest to those who may live near agricultural operations, or who work directly with pesticides. A study published in Frontiers in Public Health found the following:

185 Fenner et al., 2013.
186 Agriculture and Agri-Food Canada, 2011.
187 Agriculture and Agri-Food Canada, 2011.
188 Health Canada, 2015.
189 Winter & Katz, 2011.
190 Winter & Francis, 1997.

"The combination of substances with probably carcinogenic or endocrine-disrupting effects may produce unknown adverse health effects. Therefore, the determination of "safe" levels of exposure to single pesticides may underestimate the real health effects, ignoring also the chronic exposure to multiple chemical substances."[191]

When working towards a sustainable diet that supports reduced synthetic chemical use overall, choose organic whenever possible.

Sugar

Added sugar comes in many forms under a multitude of names: see the SugarScience resource from scientists at the University of California, San Francisco.

References

BC Food History Network. (2016, October 25). Buffaloberry: Canada's new super fruit - BC Food History Network. Retrieved from http://www.bcfoodhistory.ca/buffaloberry-canada-super-fruit/

Bloom, J. (2017). Natural and Artificial Flavours: What's the Difference? *American Council on Science and Health*. Retrieved from https://www.acsh.org/sites/default/files/Natural-and-Artificial-Flavors-What-s-the-Difference.pdf

Brown, M. (2017, June 15). Fresh vs Frozen Fruit and Vegetables - Which Are Healthier? Retrieved from https://www.healthline.com/nutrition/fresh-vs-frozen-fruit-and-vegetables#section6

Dietitians of Canada. (2018). Facts on Artificial Sweeteners. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Facts-on-Artificial-Sweeteners.aspx

Fairtrade Canada. (n.d.). What Fairtrade does. Retrieved from http://fairtrade.ca/en-CA/What-is-Fairtrade/What-Fairtrade-does

Feehley, T., & Nagler, C. R. (2014). The weighty costs of non-caloric sweeteners. *Nature*, 514(7521), 176-177. doi:10.1038/nature13752

Food and Agriculture Organization. (2014). Organic Agriculture. Retrieved from http://www.fao.org/organicag/oa-home/en/

Ganesh, V. R. (2013). Life cycle analysis of the processed food versus the whole food (Potato). *International Journal of Applied Science and Engineering Research*, 2(1), 70-78. doi:10.6088/ijaser.020100008

Goodman, L. K., & Mulik, K. (2015). Clearing the Air: Palm Oil, Peat Destruction, and Air Pollution (pp. 1-16, Rep.). Union of Concerned Scientists. Retrieved from https://www.ucsusa.

191 Nicolopoulou-Stamati et al., 2016.

org/sites/default/files/attach/2015/03/clearing-the-air-ucs-2015.pdf

Health Canada. (2015, February 17). Maximum Residue Limits for Pesticides. Retrieved from https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/pesticides-food/maximum-residue-limits-pesticides.html

Health Canada. (2017, September 05). Sulphites - Priority allergens. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/reports-publications/food-safety/sulphites-priority-allergens.html

Institute for Environmental Research and Education. (2007). Canning Green Beans, Ecoprofile of Truitt Brothers Process. Retrieved from: http://nbis.org/nbisresources/life_cycle_assessment_thinking/casestudy_canned_frozen_beans_ecoprofile_iere.pdf

International Food Information Council (IFIC) and U.S. Food and Drug Administration (FDA). (2010). Food Additives & Ingredients - Overview of Food Ingredients, Additives & Colors. Retrieved from https://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm094211.htm#qa

Kuhnlein, H. V., & Turner, N. J. (1991). Traditional plant foods of Canadian Indigenous peoples: Nutrition, botany, and use. New York: Gordon and Breach.

Morosi, R. & Bartletti, D. (2014, December 7). Product of Mexico: Hardship on Mexico's farms, a bounty for U.S. tables. Retrieved from http://graphics.latimes.com/product-of-mexico-camps/

Mujeeb-Kazi, A., Kazi, A. G., Dundas, I., Rasheed, A., Ogbonnaya, F., Kishii, M., . . . Farrakh, S. (2013). Genetic Diversity for Wheat Improvement as a Conduit to Food Security. *Advances in Agronomy*, 179-257. doi:10.1016/b978-0-12-417187-9.00004-8

Nicholas, K., Fanzo, J., & Macmanus, K. (2017). Palm Oil in Myanmar: A Spatiotemporal Study of How Industrial Farming Affects Biodiversity Loss and the Sustainable Diet. *Annals of Global Health*, 83(1), 188. doi:10.1016/j.aogh.2017.03.473

Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-Analysis of Attention-Deficit/Hyperactivity Disorder or Attention-Deficit/Hyperactivity Disorder Symptoms, Restriction Diet, and Synthetic Food Color Additives. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(1). doi:10.1016/j.jaac.2011.10.015

Piecyk, M. I., & Mckinnon, A. C. (2010). Forecasting the carbon footprint of road freight transport in 2020. *International Journal of Production Economics,* 128(1), 31-42. doi:10.1016/j.ijpe.2009.08.027

Sagar, V. R., & Kumar, P. S. (2010). Recent advances in drying and dehydration of fruits and vegetables: A review. *Journal of Food Science and Technology,* 47(1), 15-26. doi:10.1007/s13197-010-0010-8

Scientific American. (n.d.). Is Harvesting Palm Oil Destroying the Rainforests? Retrieved from https://www.scientificamerican.com/article/harvesting-palm-oil-and-rainforests/

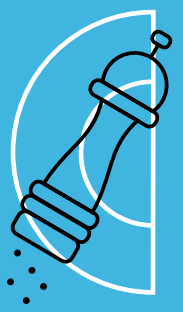
Spinks, R. (2014, December 17). Why does palm oil still dominate the supermarket shelves? Retrieved from https://www.theguardian.com/sustainable-business/2014/dec/17/palm-oil-sustainability-developing-countries

Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., . . . Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. Nature, 514(7521), 181-186. doi:10.1038/nature13793

Vally, H., Misso, N. L., & Madan, V. (2009). Clinical effects of sulphite additives. *Clinical & Experimental Allergy*, 39(11), 1643-1651. doi:10.1111/j.1365-2222.2009.03362.x

Winter, C. K. & Francis, F. J. (1997). Assessing, managing, and communicating chemical food risks. *Food Technology,* 51(5), 85-92. Retrieved from http://www.ift.org/~/media/Knowledge%20Center/Science%20Reports/Scientific%20Status%20Summaries/assessingfoodrisk_0597.pdf

Winter, C. K., & Katz, J. M. (2011). Dietary Exposure to Pesticide Residues from Commodities Alleged to Contain the Highest Contamination Levels. *Journal of Toxicology*,2011, 1-7. doi:10.1155/2011/589674



Chapter 9

Choosing your sustainable condiments, seasonings, sweeteners, and fats

Sustainable condiments, seasonings, sweeteners, and fats

Why consume condiments, seasonings, sweeteners, and fats?

Condiments, seasonings, sweeteners, and fats are ways to add flavour to your prepared meals! In addition, small amounts can enhance synergistic nutrient properties[192] that may not be found in prepared meals. For example, consuming tomatoes with olive oil has been found to enhance the function of nutritional compounds in tomatoes.[193]

Why are sustainable condiments, seasonings, sweeteners, and fats important?

Sustainable condiments, seasonings, sweeteners, and fats are local products which support local economies, are created with whole ingredients and minimize waste. Using a variety of these products also moves away from reliance on the production of staple products such as salt and pepper, thereby encouraging a diversity of crops grown sustainably, globally. It also widens the taste palate of your clientele.

How do sustainable condiments, seasonings, sweeteners, and fats impact health?

Condiments, seasonings, sweeteners, and fats can be a source of hidden calories. However, they are good for your health when consumed responsibly. Consumption in small amounts is harmless; however, large amounts of any product can result in an excess of sodium or sugar, for example, and have detrimental effects on health and the environment.

192 Arnarson, 2017.
193 Ahuja et al., 2006.

2 Making sustainable condiment, seasoning, sweetener, and fat choices

LEGEND

Choice of condiment and seasoning	Tips for using
• **Ranking/Order (when indicated)** · A ranking of food items per category, in general order of decreasing sustainability. See the appendix for methodology used.	· With reference to environmental, social, and economic sustainability, these are tips for choosing your ingredients. If a choice meets one criterion, you have taken a small step towards sustainability. The more criteria met, the more sustainable the choice. · External links are embedded: explore these websites for more information. · The labels below are good indicators of sustainable practice. In some provinces, other logos are used to identify organic or local food. Look for your province's logo! However, be mindful that there exist producers who have sustainable practices but do not have certification—perhaps due to cost or other limitations.

HOW CAN I CHANGE?

Use this chart to choose a variety of condiments, seasonings, sweeteners, and fats, and increase sustainable choices.

CHOICE OF CONDIMENT, SEASONING, SWEETENER, AND FAT

1. Herbs and spices

INDIGENOUS[194] **: MINT - NETTLES - POPLAR - ROSEHIP - SORREL - WILLOW - YARROW**

CANADIAN[195] **: CARAWAY - CORIANDER - DILL SEED - FENUGREEK - MUSTARD**

IMPORTED (DRIED)*: **ALLSPICE - BASIL - BAY LEAF - CARDAMOM - CILANTRO - CINNAMON - CHIVES - CLOVES - CUMIN - FENNEL - GARLIC POWDER - GINGER - LEMONGRASS - MARJORAM - NUTMEG - OREGANO - ONION POWDER - PAPRIKA - PARSLEY - PEPPERMINT - ROSEMARY - SAFFRON - SAGE - SUMMER SAVORY - TARRAGON - THYME - TURMERIC - VANILLA**

See the appendix for potential antimicrobial health properties.

2. Salt and alternatives

ITEMS LISTED IN ORDER OF SUSTAINABILITY

NUTRITIONAL YEAST - TABLE SALT (IODIZED) **- SEA SALT - KOSHER SALT - ROCK SALT** (EX: HIMALAYAN PINK SALT) **- BLACK SALT** (INDIAN BLACK SALT, KALA NAMAK)

See the appendix for sustainability of salt extraction.

TIPS FOR CHOOSING

See Gourmet Garden's herb pairing guide for more information on how to integrate herbs into your recipes.

- **Grow fresh herbs.**
  - Herbs grown from root have the same health benefits as dried herbs, and will last longer than cut herbs, which are highly perishable. Consult this Arctic Gardens webpage on fresh herbs.
- **Grind fresh spices.**
  - This can give you a stronger, fresher flavour. It can be easier to find fresh local herbs.
- **Choose local herbs.**
  - A small variety of herbs are grown in Canada, some of which have been used by Indigenous peoples for thousands of years; source regionally if possible. *While dry basil, oregano or garlic powder can be available in Canada it is not produce at large enough scale to provide all buyers with regional dried herbs. Most foodservice format of dried herbs are imported (ex: basil from Egypt, garlic from China, oregano from Turkey)
- **Choose fair-trade herbs.**
  - Many diverse herbs are imported from all over the world; seek fair-trade sources if possible.
- **Buy dried herbs and spices in bulk.**
  - Dried herbs and spices are high sources of polyphenols, which have antioxidant and anti-inflammatory properties.[196] Instead of purchasing packets of herbs and spices, invest in large containers. This reduces the waste that you produce.

- **Choose regional suppliers from nearby provinces and states.**
  - Goderich, Ontario is home to the world's largest salt mine[197].
- **Consider alternatives to salt.**
  - Nutritional yeast is a species of yeast grown for its nutty, cheesy taste. When fortified, it is a great source of protein, B vitamins, and trace minerals.[198] It is often found in vegan recipes as a healthy, sustainable substitute for cheese and salt.
- **Be conscious of salt extraction processes.**
  - See the appendix for more information on the extraction of salt.
- **Moderate salt intake.**
  - Salt is essential to the diet as an electrolyte in the body. However, overconsumption of salt can lead to increased incidence of cardiovascular problems; underconsumption can lead to the same effects[199].

194 Ford, 2015.
195 Small, 2015.
196 Opara & Chohan, 2014.
197 Compass Minerals, n.d.
198 Julson, 2017.
199 O'Donnell et al., 2011.

CHOICE OF CONDIMENT, SEASONING, SWEETENER, AND FAT

3. Sugar syrups

ITEMS LISTED IN ORDER OF SUSTAINABILITY

MAPLE SYRUP - HONEY - AGAVE - CORN SYRUP

See the appendix for potential antimicrobial health properties.

TIPS FOR CHOOSING

- **Avoid corn syrup.**
  - Excessive use of nitrogen fertilizers for corn crops can pollute the air, soil, and water[200] and intensive corn production reduces soil fertility.
  - Production of corn syrup is also an energy-intensive process from field to bottling. Starch is liquefied and treated with enzymes to produce syrup—the duration of this treatment determines the level of sweetness.[201] Global warming impact primarily comes from growing raw materials (511 kg CO2 equivalents) with processing as a secondary impact (332 kg CO2 equivalents).[202] There is little to no nutritional benefit because corn syrup is pure sugar.
- **Moderate sugar syrup intake.**
  - See the appendix for good resources on sugar.
  - Sugar syrups such as maple syrup and honey have exhibited promising health effects in studies, but only if consumed in relatively large quantities. It is important to be cautious of sugar intake: although maple syrup and honey are alternatives to raw sugar, they are still high sources of sugar. The EAT-Lancet commission proposes that for a planetary healthy diet, sugar intake should be around 31g per day.
- **Purchase locally produced sugar syrups.**
  - Canada is the world's largest producer of maple sap, supplying about 80% of the world's output![203] Purchasing local honey also supports local crops: some colonies of honeybees are also used for pollination to ensure crop health.[204]
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing packets of syrup, invest in large containers and refill containers placed for serving. This reduces the waste that you produce.

4. Sugar and alternatives

WHITE SUGAR - BROWN SUGAR - STEVIA - COCONUT SUGAR PALM - SUGAR PALM - SUCRALOSE - ASPARTAME

There are many types of sugars: see this website for information on all of the types!

Globally, sugar production has a range of environmental impacts. A number of factors including soil erosion, intensive irrigation and chemical use, and discharge of pollutants all contribute to the unsustainable nature of sugar production. See WWF's Sugar and the Environment report for more detailed information regarding its impacts.

Sugar comes from two sources: sugarcane, produced in tropical environments, and sugar beet, produced in more temperate environments: for example, Southern Alberta maintains the last remaining sugar beet processing plant in Canada.[205]

Alternative sources of sugar, such as coconut palm sugar, are emerging. In Southeast Asia, coconut palm sugar is known as an indigenous sweetener because of its simple processing procedure: collect the liquid sap of coconut palm sugar trees and place under heat until evaporation.[206] Coconut palm sugar trees are multi-functional with other industry uses such as fibre: in addition, when planted as part of an agroforestry strategy, they can reduce erosion and contribute to the health of the environment.[207] However, consider the great distances required for transportation to Canada!

- **Avoid artificial sweeteners.**
  - Artificial sweeteners are not optimal for human health: they are not fully metabolized by the human body and can leach into our environment through wastewater.[208] These compounds accumulate and can degrade into other active compounds in the environment. There is little research on the long-term impact of these compounds but aquatic organisms have been found to be damaged by these residues.[209]
- **Reduce added sugar intake.**
  - Added sugar can disguise itself under many names. See the appendix for good resources on sugar. Sugar in excessive quantities can cause many of the same problems as alcohol in excessive quantities.[210] The EAT-Lancet commission proposes that for a planetary healthy diet, sugar intake should be around 31g per day.
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing packets of sugar, invest in large containers and refill containers placed for serving. This reduces the waste that you produce.

200 Government of Saskatchewan, n.d.
201 Corn Refiners Association, 2009.
202 An & Katrien, 2015.
203 Peritz, 2017.
204 Statistics Canada, 2018.
205 Alberta Sugar Beet Growers, 2017.
206 Mogea et al., 1991.
207 Ibid.
208 Subedi & Kannan, 2014.
209 Kattel et al., 2017.
210 Lustig et al., 2012.

CHOICE OF CONDIMENT, SEASONING, SWEETENER, AND FAT

5. Flavoured spreads

FRUIT JAMS AND JELLIES - NUT BUTTERS

See Chapter 4 for sustainable nut butter choices.

TIPS FOR CHOOSING

- **Avoid long ingredient lists with additives and preservatives.**
  - Additives and preservatives prolong ingredient lists to maintain shelf life. Look for healthier alternatives, such as condiments made out of whole foods.
- **Avoid spreads which have high amounts of added sugar.**
  - Added sugar can disguise itself under many names. See the appendix for good resources on sugar.
  - Sugar in excess quantities can cause many of the same problems as alcohol in excess quantities.[211]
- **Make your own or purchase local.**
  - This allows you to control the sugar content and retain fresh nutritional benefits, such as the fibres in pectin.
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing packets of spreads, invest in large containers and refill containers placed for serving. This reduces the waste that you produce.

6. Oils, butters, margarines

WHITE SUGAR - BROWN SUGAR - STEVIA - COCONUT SUGAR PALM - SUGAR PALM - SUCRALOSE - ASPARTAME

Globally, vegetable oil production has a range of environmental impacts. A study on five different vegetable oils found that canola and soybeans are often grown as monocultures with high agrochemical inputs; palm oil produces methane, a greenhouse gas, during processing; peanut oil uses large amounts of energy for cultivation; while sunflower oil uses large amounts of land for cultivation.[212]
See the appendix for diagram of vegetable oil production.

- **Choose regional suppliers from nearby provinces and states for local oils.**
  - Genetically modified canola and soybean are among Canada's principal field crops[213] and drive the Canadian oilseed industry, much of which is processed domestically.[214]
    See the appendix for information on genetically modified organisms.
- **Look for certifications and labelling on imported oils.**
  - Labels such as USDA/Canada Organic and Fairtrade ensure the product is sustainably produced. Be cautious of palm oil—see Chapter 8 for more information.
- **Butter has a much greater environmental impact than margarine.**
  - This is largely because cows produce large amounts of methane, a greenhouse gas. Dairy farming also contributes disproportionately to large land use, and to water and air pollution.[215]
- **Choose expeller or cold-pressed oils.**
  - Common oils are extracted from seed using solvent, notably n-hexane. Although this compound degrades rapidly and has low bioaccumulation potential, it can still pose a risk to the aquatic environment.[216]
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing packets of oil and butter, invest in large containers and refill containers placed for serving. This reduces the waste that you produce.
- **Prefer oil with unsaturated and monounsaturated fat content.**
  - Butter, coconut oil and palm oil contains high level of saturated fat. The EAT-Lancet commission suggests that, for a planetary healthy diet, each person's intake of unsaturated oils should be around 40 g per day and saturated oils around 12 g per day.

211 Ibid.
212 Schmidt, 2015.
213 Statistics Canada, 2017.
214 Canadian Oilseed Processors Association, n.d.
215 Nilsson et al., 2010.
216 Environment Canada & Health Canada, 2009.

CHOICE OF CONDIMENT, SEASONING, SWEETENER, AND FAT

5. Sauces

KETCHUP - MUSTARD - SOY - LIQUID AMINOS - TAMARI - TERIYAKI BARBECUE - HOT/SPICY - FISH

TIPS FOR CHOOSING

- **Avoid long ingredient lists with additives and preservatives.**
  - Additives and preservatives prolong ingredient lists to maintain shelf life. Look for healthier alternatives, such as condiments made out of whole foods.
- **Moderate salt and sugar intake.**
  - Salt is essential to the diet as an electrolyte in the body. However, overconsumption of salt can lead to increased incidence of cardiovascular problems; underconsumption can lead to the same effects.[217] Many sauces may also have high "hidden" sugar content to be considered when assessing their nutritional value.
- **Make your own or purchase local varieties.**
  - This allows you to control the sugar and salt content and retain fresh nutritional benefits not found in processed sauces.
  - Certain sauces can be made using ingredients you already have. For example, a BBQ sauce can be made using ketchup, brown sugar, and spices.
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing packets of ketchup or mustard, invest in a large bottle and refill regularly. This reduces the waste that you produce.

6. Pickled and fermented condiments

MISO - RELISH - KIMCHI - SAUERKRAUT - PICKLES - PICKLED - OLIVES - PICKLED ONIONS - PICKLED CABBAGE - PICKLED PEPPERS - PICKLED BEANS - PICKLED EGGPLANT - PICKLED BRUSSELS SPROUTS - PICKLED BEETS - PICKLED GINGER

See the appendix for fermented food benefits.

Pickled condiments are soaked in brine.

Fermented condiments are also soaked in brine but have the addition of probiotics which nourish your digestive system.

Miso, for example, is a fermented Japanese paste that can add lots of flavour to marinades, broths, and salad dressings—although it is recommended for use in cold rather than hot dishes to preserve the probiotic benefits.[218]

- **Avoid long ingredient lists with additives and preservatives.**
  - Additives and preservatives prolong ingredient lists to maintain shelf life. Look for healthier alternatives, such as condiments made out of whole foods. In addition, fermented products should be refrigerated to maintain the health of probiotics.
- **Make your own or purchase local varieties.**
  - This allows you to control the salt content. In addition, making your own significantly reduces the energy use for manufacturing and storage compared to mass-produced quantities.[219]
- **Buy in bulk and refill rather than purchasing individual plastic packets.**
  - Instead of purchasing jars or packets of condiments, invest in large containers and refill containers placed for serving. This reduces the waste that you produce.

217 O'Donnell et al., 2011.
218 Petre, 2017.
219 Rivera, 2014.

Learning about traditional Indigenous condiments, seasonings, sweeteners, and fats

The examples that follow may represent foods of a specific geographical location or Indigenous territory. Please be mindful of the Indigenous territory you are on: make connections, build relationships and learn what foods are original to this territory.

Indigenous people made wide use of natural plants, flowers, roots, and trees to enhance their meals. Tree sap was widely use as sweetener. For example, maple syrup was first discovered by the First Nations peoples, who passed this knowledge to European settlers.[220]

The following information is from *Traditional Plant Foods of Canadian Indigenous Peoples*:[221]

"Indigenous People took advantage of such delicacies as rose petals, fireweed flowers, and mariposa lily buds. Flowers are high moisture-containing foods, usually low in protein and fat, but some can be surprisingly rich in vitamin A as carotene or vitamin C. Licorice fern rhizomes, which grow on the bark of trees, were sometimes used by coastal peoples of British Columbia to give a sweet licorice taste. Some 'root' foods including camas, nodding onion, and balsamroot became very sweet when their inulin content was converted to fructose through storage and cooking processes."

A number of aromatic and otherwise strongly flavoured plants were used as condiments in cooking. Several species of the mint family were used as culinary herbs in soups and stews, as were some species of the celery family such as Indian celery greens and seeds. Some of these plants, as well as some aromatic plants in the aster family, also functioned as preservatives for meat and fish."

220 Peritz, 2017.
221 Kuhnlein & Turner, 1991.

Controlling condiment, seasoning, sweetener, and fat waste

Serve in bulk.

- Rather than putting out small plastic packages of salt, pepper, ketchup, etc., place large bottles or containers and refill often.
- The same can apply for packages of butter, margarine, or bottles of oil.

Serve with reusable tools.

- Avoid plastic straws; instead of plastic coffee stirrers, offer lengths of uncooked flat pasta such as fettucine to mix coffee.

Appendix

Fermented foods

Fermented foods are typically cultured using lactic acid bacteria. This has a number of potential benefits including digestive system health, enhancing the immune system, increasing the bioavailability of nutrients, and reducing the risk of certain cancers. Probiotics can play a key role in maintaining a healthy diet[222].

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able to domesticate plants into the fruits and vegetables we consume today.[223] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assess-

222 Parvez et al., 2006.
223 Gepts, 2001.

ment by Health Canada to ensure it is safe for human consumption.[224] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides).[225] GM crops are commonly genetically engineered to resist herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[226] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects[227] [228]. However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[229] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[230]

Micronutrient fortified condiments

Condiments fortified with micronutrients are an emerging technology, particularly in countries which suffer from micronutrient deficiencies. While iodized salt has been in use for many decades, other micronutrients such as iron have been successfully added to fish sauces particularly for iron-deficient populations in Asia.[231]

Sugar

Added sugar comes in many forms under a multitude of names: see the SugarScience resource from scientists at the University of California, San Francisco.

Salt extraction

It is difficult to determine the sustainability of salt extraction processes. All publicly accessible information is published by salt production companies and the life cycle analysis of salt is not well-documented. Solution mining is quite fossil-fuel intensive; solar processing can pose issues for wildlife; rock salt extraction is quite an intrusive process.

224 Health Canada, 2012.
225 Canadian Biotechnology Action Network (cban.ca)
226 Gilbert, 2013.
227 Dietitians of Canada, n.d.
228 Health Canada, 2018.
229 Healthcare Without Harm, n.d.
230 Dietitians of Canada, n.d.
231 Mejia et al., 2015.

Solution mining (table salt, kosher salt)

A well is dug into an underground salt deposit. Water is pumped in to create brine, which is then processed through evaporation to obtain salt. The process is quite fossil-fuel intensive, but there is no waste pile produced above ground. If managed incorrectly, there is a potential for ground collapse.[232]

Solar evaporation (table salt, sea salt, kosher salt)

Ponds of saltwater are left to evaporate naturally. The process is not fossil-fuel intensive but concerns for wildlife have been raised, particularly because waterfowl and shorebirds may use salt ponds for resting, foraging, and nesting.[233]

Shaft mining (rock salt, Himalayan pink salt, black salt)

Shaft mining takes place through vertical excavation, deep into the rock face. There are two main methods for extraction of rock salt: "cut and blast" mining, which uses explosives to crush rock salt in pieces, and "continuous mining" which bores into the salt and extracts lumps for further crushing.[234]

Sustainability methodology

- Salt and alternatives
  Ranking was primarily determined through energy input required to produce the food item.
- Sugar syrups
  Ranking was determined through an assessment of ingredient origin (regionality) and energy input required to produce the sugar syrup.
- Oils, butters, margarines
  Ranking was determined through a life cycle assessment of five vegetable oils: palm, soybean, canola, sunflower, and peanut.[235] Regionality was also taken into consideration; canola, sunflower, and soybean oils are commonly produced in

232 Warren, 2016.
233 San Joaquin Valley Drainage Implementation Program, 1999.
234 European Salt Producers' Association, n.d.
235 Schmidt, 2015.

Canada while olive, coconut, and palm oils are often imported.

Vegetable oil production

The main steps in vegetable oil processing are extraction, refinement, other modification, and deodorization. Consult the Environmental, health, and safety guidelines for Vegetable oil production and processing to learn more.

References

Ahuja, K. D., Pittaway, J. K., & Ball, M. J. (2006). Effects of olive oil and tomato lycopene combination on serum lycopene, lipid profile, and lipid oxidation. *Nutrition*, 22(3), 259-265. doi:10.1016/j.nut.2005.07.015

Alberta Sugar Beet Growers. (2017). 2017 Annual Report. Retrieved from http://www.albertasugarbeets.ca.previewmysite.com/docs/files/Annual%20Report%20Final%20Draft.pdf

An, V., Katrien, B. (2015). Life Cycle Assessment study of starch products for the European starch industry association (Starch Europe): sector study. *Vision on Technology*. Retrieved from https://www.starch.eu/wp-content/uploads/2015/05/LCA-study-summary-report-2015-update.pdf

Arnarson, A. (2017). Antioxidants Explained in Human Terms. Retrieved from https://www.healthline.com/nutrition/antioxidants-explained#section5

Bogdanov, S., Jurendic, T., Sieber, R., & Gallmann, P. (2008). Honey for Nutrition and Health: A Review. Journal of the American College of Nutrition, 27(6), 677-689. doi:10.1080/07315724.2008.10719745

Canadian Oilseed Processors Association. (n.d.). Canadian Oilseed Processing Industry. Retrieved from https://copacanada.com/at-a-glance/

Compass Minerals. (n.d.). Goderich, Ontario Mechanical Evaporation Underground Salt Mining. Retrieved from https://www.compassminerals.com/who-we-are/locations/goderich-ontario/

Corn Refiners Association. (2009). The Corn Refining Process. Retrieved from https://corn.org/wp-content/uploads/2009/11/CornRefiningProcess.pdf

CTVNews. (2016, March 20). Maple syrup could protect against Alzheimer's, research suggests. Retrieved from https://www.ctvnews.ca/health/maple-syrup-could-protect-against-alzheimer-s-research-suggests-1.2824329

Environment Canada & Health Canada. (2009). Screening Assessment for the Challenge Hexane. *Government of Canada*. Retrieved from https://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=BCBE839D-1#sec9

European Salt Producers' Association. (n.d.). Salt Production. Retrieved from https://eusalt.com/salt-production

Ford, J. (2015). Herbs. Retrieved from https://www.thecanadianencyclopedia.ca/en/article/herbs

Government of Saskatchewan. (n.d.). Nitrogen Fertilization in Crop Production. Retrieved from http://publications.gov.sk.ca/documents/20/84107-Nitrogen%20Fertilization%20in%20

Crop%20Production%20-%2002-17.pdf

Hamel, M. A., Dorff, E. (2015). Corn : Canada's third most valuable crop. *Statistics Canada*. Retrieved from https://www150.statcan.gc.ca/n1/pub/96-325-x/2014001/article/11913-eng.htm

Julson, E. (2017). Why Is Nutritional Yeast Good for You? Retrieved from https://www.healthline.com/nutrition/nutritional-yeast#section2

Kattel, E., Trapido, M., & Dulova, N. (2017). Oxidative degradation of emerging micropollutant acesulfame in aqueous matrices by UVA-induced H 2 O 2 /Fe 2 and S 2 O 8 2– /Fe 2 processes. Chemosphere, 171, 528-536. doi:10.1016/j.chemosphere.2016.12.104

Kuhnlein, H. V., & Turner, N. J. (1991). Traditional plant foods of Canadian Indigenous peoples: Nutrition, botany, and use. New York: Gordon and Breach.

Lustig, R. H., Schmidt, L. A., & Brindis, C. D. (2012). Public health: The toxic truth about sugar. Nature, 482(7383), 27-29. doi:10.1038/482027a

Mejia, E. G., Aguilera-Gutiérrez, Y., Martin-Cabrejas, M. A., & Mejia, L. A. (2015). Industrial processing of condiments and seasonings and its implications for micronutrient fortification. Annals of the New York Academy of Sciences, 1357(1), 8-28. doi:10.1111/nyas.12869

Mogea, J., Seibert, B., & Smits, W. (1991). Multipurpose palms: The sugar palm (Arenga pinnata (Wurmb) Merr.). *Agroforestry Systems*, 13(2), 111-129. doi:10.1007/bf00140236

American Chemical Society. (2017, April 2). No more 'superbugs'? Maple syrup extract enhances antibiotic action [Press release]. Retrieved from https://www.acs.org/content/acs/en/pressroom/newsreleases/2017/april/no-more-superbugs-maple-syrup-extract-enhances-antibiotic-action.html

Nilsson, K., Flysjö, A., Davis, J., Sim, S., Unger, N., & Bell, S. (2010). Comparative life cycle assessment of margarine and butter consumed in the UK, Germany and France. The International Journal of Life Cycle Assessment, 15(9), 916-926. doi:10.1007/s11367-010-0220-3

O'Donnell, M. J., Yusuf, S., Mente, A., Gao, P., Mann, J. F., Teo, K., . . . Schmieder, R. E. (2011). Urinary Sodium and Potassium Excretion and Risk of Cardiovascular Events. Jama, 306(20). doi:10.1001/jama.2011.1729

Opara, E., & Chohan, M. (2014). Culinary Herbs and Spices: Their Bioactive Properties, the Contribution of Polyphenols and the Challenges in Deducing Their True Health Benefits. *International Journal of Molecular Sciences*, 15(10), 19183-19202. doi:10.3390/ijms151019183

Parvez, S., Malik, K., Kang, S. A., & Kim, H. (2006). Probiotics and their fermented food products are beneficial for health. Journal of Applied Microbiology, 100(6), 1171-1185. doi:10.1111/j.1365-2672.2006.02963.x

Petre, A. (2017). Why Miso Is Incredibly Healthy. Retrieved from https://www.healthline.com/nutrition/why-miso-is-healthy

Peritz, I. (2017, November 12). Canada in a can: Maple syrup endures as a national symbol. *The Globe and Mail*. Retrieved from https://www.theglobeandmail.com/news/national/canada-150/canada-in-a-can-maple-syrup-endures-as-a-nationalsymbol/article34343711/

Rivera, X. (2014). A Sustainable Assessment in the Convenience Food Sector: Ready-made Meals. *The University of Manchester*. Retrieved from https://www.research.manchester.ac.uk/portal/files/54566950/FULL_TEXT.PDF

Schmidt, J. H. (2015). Life cycle assessment of five vegetable oils. Journal of Cleaner Production, 87, 130-138. doi:10.1016/j.jclepro.2014.10.011

Small, E. (2015). Condiment Crops. Retrieved from https://www.thecanadianencyclopedia.ca/en/article/condiment-crops

Statistics Canada. (2017). Seeding decisions harvest opportunities for Canadian farmers. *Government of Canada*. Retrieved from https://www150.statcan.gc.ca/n1/pub/95-640-x/2016001/article/14813-eng.htm

Statistics Canada. (2018). Let's Talk Honey. *Government of Canada*. Retrieved from https://www150.statcan.gc.ca/n1/pub/11-630-x/11-630-x2016004-eng.htm

Subedi, B., & Kannan, K. (2014). Fate of Artificial Sweeteners in Wastewater Treatment Plants in New York State, U.S.A. Environmental Science & Technology, 48(23), 13668-13674. doi:10.1021/es504769c

Tapsell, L. C., Hemphill, I., Cobiac, L., Sullivan, D. R., Fenech, M., Patch, C. S., Roodenrys, S., Keogh, J. B., Clifton, P. M., Williams, P. G., Fazio, V. A. & Inge, K. E. (2006). Health benefits of herbs and spices: the past, the present, the future. Medical Journal of Australia, 185 (4), S1-S24.

United States of America, San Joaquin Valley Drainage Implementation Program, Technical Committee on Evaporation Ponds. (1999). Evaporation ponds: Final report. Sacramento, CA: San Joaquin Valley Drainage Implementation Program.

Warren, J. K. (2016). Solution Mining and Salt Cavern Usage. Evaporites, 1303-1374. doi:10.1007/978-3-319-13512-0_13

Chapter 10

Choosing your sustainable beverages and snacks

1 Sustainable beverages and snacks

Why consume beverages and snacks?

Beverages and snacks can complete your clientele's nutritional needs for the day. They can be easy, accessible sources of nutrition to provide sustenance between meals.

Why is it important to choose sustainable beverages and snacks?

Snacks and beverages are often ultra-processed foods that contain many unsustainable ingredients (such as certain oils and additives). These foods provide little nutritional value and require a lot of energy to produce. In addition, they are often individually packaged in plastic, which is a large source of waste. Switching to more sustainable snacks and beverages that are sourced and served in bulk could not only allow for nutritional satiety but also reduce environmental impact.

How do sustainable beverages and snacks impact health?

The sustainable choice is often the healthy choice: for example, raw, seasonal fruits and vegetables have minimal packaging and provide good nutritional value. Ideally, a sustainable snack or beverage can be a source of protein along with fibre (if tolerated) to sustain clients until their next meal. It is easy to introduce new kinds of vegetable protein as snacks, which can help reduce the quantities of protein you need to provide in main meals.

2 What are my beverage and snack standards?

Before choosing the type of beverage and snack for a menu, standards must be written. Beverage and snack standards are guidelines that you must work with such as dietary restrictions, allergies, and patient preferences.

Below is an example of beverage and snack written by a food service manager for their institution. The last two columns indicate a clientele to which they may apply (examples might be the elderly, youth, acute care, etc.).

Beverage standards	Clientele a	Clientele b
Tap or filtered water is accessible at all time on the units	X	X
Only 100% juice is offered at patient's request	X	X
Hot beverages are available 3 times a day (hot water, tea, coffee, caffeine-free substitute)	X	X
One kind of protein-rich plant-based beverage (e.g. soy) and 2% milk are always available	X	X

Snack standards	Clientele a	Clientele b
A limited stock of bulk snacks are available on each unit	Hypoglycemia kit	X
Two personalized snacks (diet, texture, consistence) are given every day (morning and evening)	X	X
A variety of snacks are offered in a menu cycle		
A list of snacks is always available on demand in the kitchen for clients who do not enjoy the options being served	X	X
PM and after-supper snacks are offered	If needed	X
A substitution tool is provided to assist nursing staff in choosing alternative snacks for clients who do not enjoy the options being served		

High level of sustainability Medium level of sustainability Low level of sustainability Not sustainable

3 Making sustainable beverage choices

CHOICE OF BEVERAGE (most to least sustainable unless indicated)

1. Water

TIPS FOR CHOOSING

Make water the drink of choice.

- **Avoid bottled water.**
  - Bottling water consumes energy, water, and results in large amounts of plastic waste. Packaging, transportation, and other supply chain methods could result in an overall water use six or seven times greater than what is actually bottled.[236]
- **Drink tap water.**
  - Tap water is the cheapest, most sustainable source of water. It is strictly regulated by the Canadian Drinking Water Guidelines.[237]

TIPS FOR SERVING

- **Serve bulk.**
  - Instead of serving plastic bottles, fill a pitcher or dispenser with tap water.
- **Offer the possibility of homemade flavoured water.**
  - Simply cut up local fruits or vegetables such as strawberries, watermelons, cucumbers and place in a large water dispenser. Sliced oranges, lemons and limes are another good option.

See Chapter 8 for sustainable fruit choices.

See Chapter 6 for sustainable vegetable choices.

2. Plant-based water

MAPLE - COCONUT

- Tree sap[238] and coconut water[239] are electrolyte-rich and may also be a good source of antioxidants.
- **Choose regional suppliers from nearby provinces and states.**
  - Canada is the world's largest producer of maple sap, with 80% of the world's production![240]
- **Choose organic.**
  - Look for labels such as Canada Organic or USDA organic, which guarantee that the product is sustainably produced.

- **Look for recyclable packaging.**
  - Consider cardboard or aluminum packaging which is recyclable. Or use reusable glass bottles.

236 Gustafson, 2013.
237 Health Canada, 2017.
238 Yuan et al., 2013.
239 Yong et al., 2009.
240 Peritz, 2017.

CHOICE OF BEVERAGE (most to least sustainable unless indicated)

3. Juice

HOMEMADE WITH FIBRE - 100% FRUIT AND/OR VEGETABLE, NO SUGAR ADDED

TIPS FOR CHOOSING

See Chapter8 for information on in-season fruits.

See Chapter 6 for information on in-season vegetables.

- **Prefer homemade juice**
  - Juices are a good way to use fruits that does not look appetizing.
- **Avoid added sugars.**
  - Juices contain free sugars and are associated with an increased risk of tooth sensitivity.[241] Beverages containing free sugars should not be consumed on a regular basis. However, sometimes they may be helpful for increasing caloric intake when clients have a low overall intake.
- **Choose organic.**
  - Look for labels such as Canada Organic or USDA organic which ensure the product is sustainably produced.

TIPS FOR SERVING

- **Serve bulk.**
  - Instead of purchasing pre-packaged juice boxes, fill a pitcher or dispenser with juice.

4. Smoothie

100% FRUIT AND VEGETABLES, NO SUGAR ADDED - WITH PLANT-BASED PROTEIN - WITH ANIMAL PROTEIN (EGGS, DAIRY)

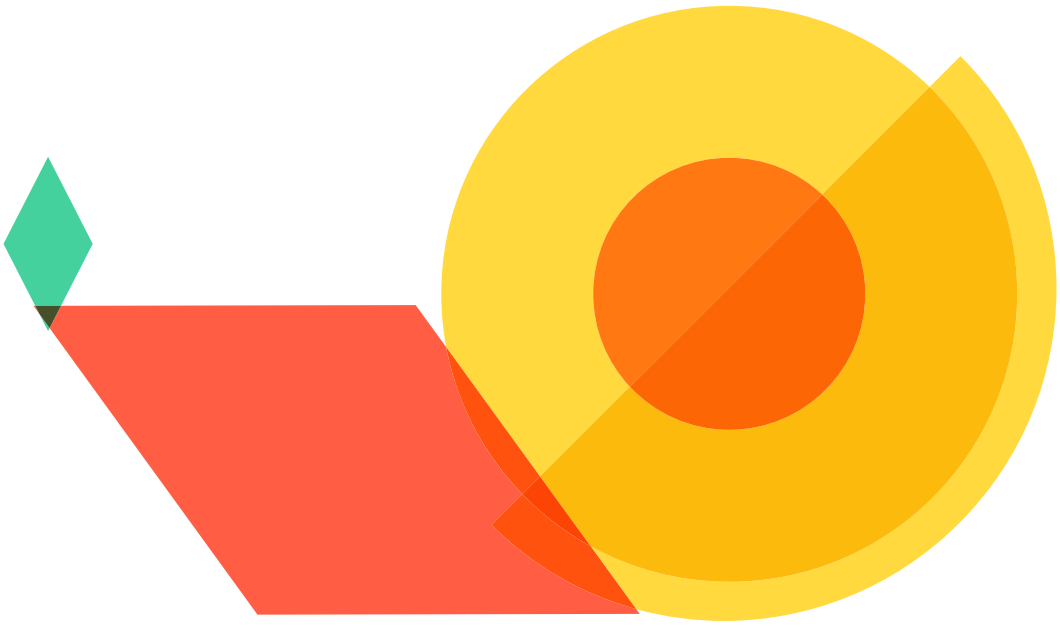
See Chapter8 for information on in-season fruits.

See Chapter 6 for information on in-season vegetables.

- **Add protein to increase the nutritional value.**
  - Prioritize plant-based sources of protein, such as soy powder, nuts and seeds. This will sustain your clientele until their next meal.

See Chapter 4 for sustainable choices.

- **Serve bulk.**
  - Instead of serving or purchasing individual smoothie bottles, fill a pitcher or dispenser and position reusable cups alongside.



241 British Columbia Dental Association, n.d.

CHOICE OF BEVERAGE (most to least sustainable unless indicated)

5. Tea

HERBAL - LABRADOR TEA - GREEN - PU'ER - WHITE - OOLONG - BLACK (ORANGE PEKOE)

TIPS FOR CHOOSING

Tea contains many compounds called flavonoids that may promote health or help prevent chronic disease.[242] Numerous studies on both rat and human models using these specific compounds have demonstrated improvements in cancer and cardiovascular disease.[243] However, there is still a need for more research.

- **Choose regional suppliers from nearby provinces and states.**
  - Consider local teas made from regional plants and herbs, for example, Indigenous owned companies creating herbal teas sourced locally, e.g. juniper, crowberry, and cloudberry. Labrador tea has particular health benefits, with recent research showing its promise to control sugar levels in diabetic patients.[244]
- **Look for certifications and labelling, particularly with imported products.**
  - Labels such as Canada Organic, Fairtrade, and Rainforest Alliance Certified guarantee that the product is sustainably produced.

See the appendix for more information on sustainable tea practices.

6. Fermented drinks

KVASS - KOMBUCHA - WATER KEFIR - PLANT-BASED MILK KEFIR DAIRY KEFIR

Fermented drinks are a great source of probiotics, which help maintain a healthy gut.[245]

Kvass is a fermented cereal beverage, often made with rye. It is typically sweetened with fruits and herbs (strawberry, mint).

Kombucha is a type of sweetened fermented tea. The tea flavonoids are enhanced through the fermentation process.[246]

Kefir is made by adding kefir grains to milk, which is left to ferment.[247] Kefir can also be made using sugar water and plant-based milks such as coconut milk.

- **Avoid added sugars.**
  - Fermented beverages have a naturally acidic taste and can be high in added sugar to counter this taste. Consider fermented drinks which use fruits to sweeten rather than added sugars.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Consider buying bulk tea leaves rather than prepackaged tea sachets. If this is not possible, consider tea sachets made from biodegradable, compostable materials (some contain plastic, e.g. polypropylene).
- **Serve bulk.**
  - Fill a hot water dispenser or large teapot with tea to serve.
- **Serve with sustainable milk.**

See below for sustainable milk choices.

- **Serve with sustainable sugar.**

See Chapter 9 for sustainable choices.

242 Higdon & Frei, 2003.
243 Khan & Mukhtar, 2007.
244 Radio Canada, 2011.
245 Hemarajata & Versalovic, 2012.
246 Chakravorty et al., 2016.
247 Dlusskaya et al., 2007.

CHOICE OF BEVERAGE (most to least sustainable unless indicated)

7. Coffee

REGULAR - DECAFFEINATED

TIPS FOR CHOOSING

- **Avoid decaffeinated coffee.**
  - Caffeine is removed from coffee beans through a number of solvent-based processes, which may use water, methylene chloride, and carbon dioxide.[248] There is limited research on the sustainability of these processes.
- **Look for certifications and labelling.**
  - Labels such as Certified Organic, Fairtrade, Ecologo, Bird-friendly and Rainforest Alliance Certified certify social or environmental production methods.

  See the appendix for more information on sustainable coffee.

  See Conservation International's Sustainable Coffee Challenge

TIPS FOR SERVING

- **Avoid single-use plastic.**
  - Buy bulk ground coffee rather than single-use coffee pods.
- **Serve bulk.**
  - Fill a hot beverage dispenser with coffee for service.
- **Serve with sustainable milk.**

  See below for sustainable milk choices.
- **Serve with sustainable sugar.**

  See condiments, seasonings, sweeteners, fats chapter for sustainable choices.

8. Beverage / Milk

PLANT-BASED MILKS - SOY - OAT - RICE - ALMOND/CASHEW DAIRY MILK

TIPS FOR CHOOSING

- **Choose high-protein, fortified plant-based milk.**
  - Soy milk is the plant-based milk with the greatest protein content and lowest environmental impact.[249] Although there are other plant-based milk options, be conscious of the nutritional values to ensure that they meet all requirements for your clientele.[250]
- **Avoid sweetened plant-based milk.**
  - Choose plain, original, unsweetened plant-based milks. Many plant-based milks often have sugar as the second ingredient.[251]
- **Choose organic plant-based milk.**
  - Look for labels such as Canada Organic or USDA organic which guarantee that the product is sustainably produced.
- **Choose sustainable dairy milk.**
  - This includes grass-fed, pasture raised and organic dairy.

  See Chapter 4 for more information.

TIPS FOR SERVING

- **Serve bulk.**
  - Instead of purchasing individual cartons of milk, purchase large cartons or jugs and serve with reusable cups instead.

AVOID: Flavoured/sugar sweetened beverages

POP/SODA - ENERGY DRINKS - HOT CHOCOLATE - FLAVOURED COFFEE AND TEA - FLAVOURED MILKS - JUICE BLENDS

- **Avoid artificial flavours.**
  - Consider beverages that use whole ingredients instead.

  See the appendix for list of additives and preservatives and more information on artificial flavours.
- **Avoid high sugar or sodium content.**
  - Sugar should not be the main ingredient, and salt should not be among the main ingredients. Products with a high sugar content can increase the risk of obesity and tooth sensitivity and decay.[252]
- **Limit saturated fats.**
  - There should be less than 3 g of saturated fat in every 30 g of food.

248 Farah, 2009.
249 Poore & Nemecek, 2018.
250 McVean & Lee, 2017.
251 Canadian Press, 2017.
252 British Columbia Dental Association, n.d.

4 Making sustainable snack choices

CHOICE OF SNACK
(most to least sustainable unless indicated)

1. Fruit

RAW (SLICED) **- BLENDED** (SMOOTHIE) **- FROZEN - DRIED**

TIPS FOR CHOOSING

See Chapter 8 for sustainable fruit choices.

- **Avoid high-sugar and processed options.**
  - Try to choose whole ingredients without added sugar, including dried fruits with no additives. Sliced fruits such as apples or pears, berries, and cherries are great options.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives, few whole ingredients and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

2. Vegetable and dip

HUMMUS - NUT BUTTERS - BABA GHANOUSH (EGGPLANT DIP)
YOGURT WITH DILL - LABNEH - CHEESE CUBES, CREAM CHEESE

See Chapter 6 for sustainable vegetable choices.

- **Avoid high sodium and sugar in dips.**
  - Processed dips may include high amounts of sodium and sugar.
- **Avoid additives in dips.**
  - Choose dips with flavours coming from whole ingredients such as herbs and spices.

  See the appendix for a list of additives and preservatives.
- **Choose plant-based dips.**
  - Hummus and peanut butter are great sources of protein.

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives, few whole ingredients and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.
- **Serve homemade dip.**
  - Dips are relatively simple to make: this allows you to control the nutritional content and reduce waste.

CHOICE OF SNACK
(most to least sustainable unless indicated)

3. Popcorn

UNSEASONED (PLAIN) **- SEASONED** (BUTTER, HERBS, SPICES)

TIPS FOR CHOOSING

- **Avoid high sodium and additives.**
  - Try to choose plain popcorn or popcorn seasoned with herbs and spices rather than high amounts of sodium.
- **Make your own popcorn using bulk popcorn kernels.**
  - Instead of buying processed, popped, and seasoned popcorn, try popping your own and adding herbs and spices.

  See Chapter 9 for herb and spice ideas.
- **Choose regional corn suppliers who use organic and/ or sustainable production methods.**
  - Corn in Canada is a genetically modified (GM) crop.

  See the appendix for more information on GM crops.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives, few whole ingredients and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

4. Crackers

UNSEASONED (PLAIN) **- SEASONED** (BUTTER, HERBS, SPICES)

- **Avoid high sodium, additives, and added sugars.**
  - Try to choose products made with whole ingredients, such as crackers seasoned with herbs and spices.
- **Avoid crackers that contain unsustainable oils.**
  - Palm oil is particularly damaging for the environment.

  See Chapter 9 for more information.
- **Choose high-quality fibre content.**
  - Consider ancient and/or whole grains such as kamut or sorghum.

  See Chapter 5 Chapter 5 for sustainable choices.
- **Choose high-quality protein content.**
  - Crackers with plant-based protein such as nuts and seeds can keep your clientele full until the next meal.

  See Chapter 4 for sustainable choices.

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

CHOICE OF SNACK
(most to least sustainable unless indicated)

5. Dried/roasted beans

ROASTED CHICKPEAS - EDAMAME - FAVA BEANS
NOT LISTED IN ORDER OF SUSTAINABILITY

TIPS FOR CHOOSING

- **Avoid high sodium and additives.**
  - Try to choose whole ingredients that use minimal salt, such as beans seasoned with herbs and spices.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

6. Nuts

CASHEWS - ALMONDS - WALNUTS - PECANS - PISTACHIOS
BRAZIL NUTS - NUT BUTTERS
See Chapter 4 for more information.

- **Avoid high sodium, sugar, and highly processed options.**
  - Try to choose raw nuts or seasoned nuts with minimal salt, such as nuts seasoned with herbs and spices.
- **Choose natural nut butters.**
  - These nut butters come from whole ingredients, typically only nuts and salt and/or sugar. Natural nut butter should be kept in the refrigerator because aflatoxins produced by moulds may develop in warm, humid conditions.[253]

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

253 Krampner, 2014.

CHOICE OF SNACK
(most to least sustainable unless indicated)

7. Pudding and yogurt

PLANT-BASED (SOY, ALMOND, CASHEW, COCONUT) **PUDDING - PLANT-BASED** (SOY, ALMOND, CASHEW, COCONUT) **YOGURT - NATURAL, PLAIN YOGURT - YOGURT MIXED WITH FRESH FRUIT OR LOW-SUGAR JAM - WITH GRANOLA OR CEREAL**

TIPS FOR CHOOSING

- **Avoid long ingredient lists with additives and preservatives.**
  - Additives and preservatives prolong ingredient lists to maintain shelf life. Look for whole foods.
- **Avoid high amounts of sugar and artificial sweeteners.**
  - Artificial sweeteners are often used in reduced-calorie products. However, because artificial sweeteners have no nutritional value, it is unclear whether they are particularly helpful or harmful in maintaining overall energy balance.

  See the appendix for a complete list of artificial sweeteners.
- **Avoid 0% fat products.**
  - Fat-reduced products usually contain additives such as thickening agents (which increase the carbohydrate content of the product)[254], artificial sweeteners, and high amounts of salt and sugar to enhance flavor.
- **Choose organic soy pudding and yogurt.**
  - Organic soy is upheld to USDA and/or Canada Organic standards, which ensures that farming practices consider and practise environmental sustainability. Organic soybean has also been found to have a better nutritional profile than conventional soybean.[255]
- **Choose organic dairy pudding and yogurt.**
  - Organic dairy comes from cows which are fed with feed free of synthetic pesticides, herbicides, and fungicides. Organic dairy cows also have more access to pasture.[256]

  See Chapter 4 for more information.
- **Choose whole grain granola or cereal if serving alongside.**

  See Chapter 5 for sustainable choices.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

8. Hard-boiled eggs

All Canadian eggs are antibiotic and growth hormone-free.

- **Choose free-run or free-range eggs.**
  - Free-run hens have freedom to roam within an enclosed barn, while free-range hens have access to the outdoors, in contrast to conventional hens which remain in battery cages.[257]
- **Choose organic eggs.**
  - Canadian organic poultry is fed with no animal by-products or antibiotics.

  See Chapter 4 for more information.

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

254 BC Provincial Cook Articulation Committee, & Go2HR, 2012.
255 Bohn et al., 2014.
256 Laanela, 2016.
257 Chicken Farmers of Canada, n.d.

CHOICE OF SNACK
(most to least sustainable unless indicated)

9. Cheese slices or cubes

COTTAGE CHEESE - FETA - CHEDDAR - MOZZARELLA - HAVARTI - EDAM - GOUDA - SWISS - GRUYERE - ASIAGO - PEPPER JACK
NOT LISTED IN ORDER OF SUSTAINABILITY

TIPS FOR CHOOSING

All Canadian dairy products are antibiotic and growth-hormone free.

- **Avoid flavoured, processed cheese.**
  - Flavoured cheeses, such as smoked cheese, can contain more sodium.
- **Avoid high saturated fat.**
  - Most cheese is high in saturated fat. Ensure that portions are given as appropriate.
- **Choose organic dairy.**
  - Organic dairy comes from cows which are fed with feed free of synthetic pesticides, herbicides, and fungicides. Organic dairy cows also have more access to pasture.[258]

  See Chapter 4 for more information.
- **Choose dairy from grass-fed and pasture-raised animals.**
  - Look for certification or language such as "100% grassfed and finished".

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

10. Homemade sweets

PUDDING (MILK OR MILK ALTERNATIVES) **- COOKIES - MUFFINS**
NOT LISTED IN ORDER OF SUSTAINABILITY

See Chapter 8 for sustainable choices.

- **Limit sugar content.**
  - Consider using other sources of sugar such as honey or maple syrup, which can be sourced locally and sustainably.

  See Chapter 9 for more sustainable sugar choices.
- **Choose sustainable, high-quality flours and grains.**
  - These will add more nutritional value and help keep your clientele full until the next meal.

  See Chapter 5 for sustainable choices.

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives, few whole ingredients and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

258 Laanela, 2016.

CHOICE OF SNACK
(most to least sustainable unless indicated)

11. Protein sandwich

PLANT-BASED SUBSTITUTES - CHEESE - EGGS - SEAFOOD AND FISH - POULTRY

TIPS FOR CHOOSING

- **Choose sustainable, high-quality plant-based proteins.**
  - Although tofu, tempeh, and seitan are traditional foods in many cultures, meat substitutes can also have long ingredient lists with salt, sugar, fillers, and additives.[259]
  - Try a tofu spread with spices and mayonnaise, or a nut butter sandwich.
  - Refer to the nutritional guidelines for information on sodium content.
- **Choose sustainable, high-quality animal proteins.**
  - Consider organic, grass-fed, and free-run options.

  See Chapter 4 for sustainable choices.
- **Choose high-quality bread.**

  See Chapter 5 for sustainable bread choices.
- **Add vegetables.**
  - Include sliced options for sandwiches such as lettuce, tomato, and cucumber.

  See vegetable table for sustainable vegetable choices.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives, few whole ingredients and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

12. Outsourced sweets & salty snacks

SWEET: **COOKIES - MUFFINS - PUDDING - SORBETS, ICE CREAM - POPSICLES**
SALTY SNACKS: **CRACKERS - CHIPS**

- There is a wide range of manufacturing processes that contribute to the sustainability of outsourced sweets, ranging from small-scale artisan companies to large-scale factories.
- **Avoid long ingredient lists with additives and preservatives and artificial flavors.**
  - Additives and preservatives prolong ingredient lists to maintain shelf life. Look for whole foods.
  - Consider flavours that come from whole ingredients instead.

  See the appendix for list of additives and preservatives.
- **Avoid palm oil.**
  - Palm oil is extremely destructive for the environment, wildlife, and human health. Seek sustainable production practices or limit consumption.

  See the appendix of Chapter 8.
- **Avoid trans fats.**
  - Small amounts of trans fats occur naturally in food. The addition of industrial trans fats, in the form of hydrogenated oils, has been banned in Canada since September 17, 2018, but companies have two years to change their products.[260]
- **Avoid high sugar or sodium content.**
  - Sugar should not be the main ingredient, and salt should not be among the main ingredients.
- **Limit saturated fats.**
  - There should be less than 3 g of saturated fat in every 30 g of food.
- **Choose whole grains.**

  See starches table for sustainable choices.

TIPS FOR SERVING

- **Avoid single-use packaging.**
  - Single-serve snacks typically contain many preservatives and few whole ingredients, and produce a lot of waste.
- **Serve bulk.**
  - When possible, buy in large quantities and serve in smaller portions on serving trays.

259 Health Care Without Harm, 2017.
260 Ubelacker, 2018.

5 Learning about traditional Indigenous beverages and snacks

These food examples may represent food of a specific geographical location / indigenous territory. Please be mindful to become aware of the indigenous territory you are on, make connections, build relationships and learn what food is original to this territory.

Indigenous people have traditionally used locally accessible trees, plants, and herbs to make various beverages. For example, mint, wild bergamot, spruce, cedar, raspberry and blueberry leaves were used for herbal teas and the fruits of these plants were often consumed raw as snacks, or dried and preserved for storage.[261]

One common example is Labrador tea, a plant widely used. The following comes from Agriculture and Agri-Food Canada[262] :

Labrador tea

Labrador tea (*Rhododendron groenlandicum*) is a wetland plant that grows wild in most regions of Canada and the northern United States. Its highly aromatic leaves can be used to brew a tasty herbal tea. A number of Indigenous peoples used Labrador tea as infusions to treat inflammatory conditions, such as burns, rheumatism, arthritis, and asthma. An industry partner is now working with Agriculture and Agri-Food Canada (AAFC) scientists to develop an extract of Labrador tea to be used in a variety of products.

Indigenous snacks made use of seasonal animals and plants. Otherwise, they would be preserved for consumption later in the year, particularly during the winter when resources were scarce. Common snacks include wild berries, nuts, and smoked meats and fish.[263]

261 Kuhnlein & Turner, 1991.
262 Agriculture & Agri-Food Canada, 2017.
263 First Nations Health Authority, 2014.

Appendix

Additives

See Health Canada's complete list of approved additives.

ARTIFICIAL FLAVOURINGS

The chemical composition of artificial flavours and natural flavours are the same. The only difference is the source of the chemicals: synthesized from numerous chemicals in the former or derived from numerous chemicals found in plants and/or foods in the latter.[264] Natural does not necessarily mean "good" or "safe" and neither does artificial. Ultimately, dosage dictates toxicity: flavourings are safe for consumption in appropriate amounts.

ARTIFICIAL COLOURING, ARTIFICIAL FOOD COLOURANTS (AFCS)

Most of the controversy surrounding artificial food colourants (AFCs) involve links between its consumption and children's behaviour, and attention deficit disorder in particular. It is statistically challenging to come to a hard conclusion of the effect of one variable on the other because of the variance in data collection and methodologies over the past 35 years.[265] Ultimately, the United States Food and Drug Administration along with the European Food Safety Authority have concluded that there is no substantial link between the tested colourants and behavioural effects.[266] Again, dosage dictates toxicity: artificial colourants are safe for consumption in appropriate amounts.

ARTIFICIAL SWEETENERS

Artificial sweeteners are a sugar substitute which can either come in low-calorie or zero-calorie forms. They are commonly used by diabetic patients and those looking to lose weight.[267] However, few studies support their efficacy: most provide evidence of their contribution to high blood sugar and obesity as a result of altering the gut microbiota.[268] [269]

264 Bloom, 2017.
265 Nigg et al., 2012.
266 International Food Information Council (IFIC) & U.S. Food and Drug Administration (FDA), 2010.
267 Dietitians of Canada, 2018.
268 Suez et al., 2014.
269 Feehley & Nagler, 2014.

Coffee

Many of the world's coffee-growing regions are around the equator in the Southern Hemisphere, in Central/South America, Africa, and Southeast Asia. Coffee is a crop that is sensitive to a changing climate, due particularly to its biophysical needs but also to its vital economic importance to growers around the world. In Central America, smallholder farmers are dependent on coffee as an export crop that contributes significantly to the economy, through GDP and employment.[270] In Africa, agroforestry practices that ensure crop diversity are typical, but most coffee farmers are poor smallholder farmers who receive minimal benefits from the market.[271]

Certified coffee schemes such as Rainforest Alliance[272], which promotes producer sustainability and welfare, have been found to increase the net income of participating producers.

Tea

Tea is native to the mountains of Asia but is also grown in small areas of Southeast Africa.[273] Tea is an extremely labour-intensive crop, produced on estate plantations or by smallholder farmers. In the former, tea workers do not generally own the land they farm on, and safety and health issues are widely ignored, raising ethical concerns.[274] In Kenya, Rainforest Alliance certification was found to improve work conditions and natural resource conservation to a limited extent, although no difference was found between these certified farms and regular farms in terms of living conditions and health benefits.[275]

Determining the sustainability of coffee and tea is complex, with many factors coming into play. However, there are a number of certifications to guide your choices:

The fair trade system guarantees that farmers are rightfully paid, work under safe conditions, and employ environmental sustainability.[276]

Organic certification upholds the principles of health, ecology, and care in agriculture to ensure soil fertility, animal welfare, and conscious use and recycling of natural resources.[277]

270 Mendez et al., 2010.
271 Kufa, 2010.
272 Barham & Weber, 2010.
273 Kato & Shibamoto, 2010.
274 Ahmmed & Hossain, 2016.
275 Postles, 2018.
276 Fairtrade Canada, n.d.
277 Canadian General Standards Board, 2015.

Rainforest Alliance audits farms to assess the conservation of biodiversity, ethical labour, natural resource conservation, and proper farm planning and management.[278]

The University of Saskatchewan has a Sustainable Purchasing Guide for coffee and tea: https://sustainability.usask.ca/documents/commodity-protocols/Coffee%20and%20tea.pdf

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able to domesticate plants into the fruits and vegetables we consume today.[279] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assessment by Health Canada to ensure it is safe for human consumption.[280] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides)[281]. GM crops are commonly genetically engineered to resist herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[282] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects[283] [284]. However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[285] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[286]

278 Rainforest Alliance, 2018.
279 Gepts, 2001.
280 Health Canada, 2012.
281 Canadian Biotechnology Action Network (cban.ca)
282 Gilbert, 2013.
283 Dietitians of Canada, n.d.
284 Health Canada, 2018.
285 Healthcare Without Harm, n.d.
286 Dietitians of Canada, n.d.

References

Agriculture & Agri-Food Canada. (2017, September 15). Labrador tea. Retrieved from http://www.agr.gc.ca/eng/science-and-innovation/agriculture-and-agri-food-research-centres-and-collections/quebec/saint-hyacinthe-research-and-development-centre/labrador-tea/?id=1505392547608

Ahmmed, F., & Hossain, I. (2016). A Study Report on Working Conditions of Tea Plantation Workers in Bangladesh. *International Labour Organization*. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-dhaka/documents/publication/wcms_563692.pdf

Barham, B. L., & Weber, J. G. (2012). The Economic Sustainability of Certified Coffee: Recent Evidence from Mexico and Peru. World Development, 40(6), 1269-1279. doi:10.1016/j.worlddev.2011.11.005

Bøhn, T., Cuhra, M., Traavik, T., Sanden, M., Fagan, J., & Primicerio, R. (2014). Compositional differences in soybeans on the market: Glyphosate accumulates in Roundup Ready GM soybeans. Food Chemistry, 153, 207-215. doi:10.1016/j.foodchem.2013.12.054

British Columbia Dental Association. (n.d.). Sugar and Acid. Retrieved from https://www.bcdental.org/energydrinks/

BC Provincial Cook Articulation Committee, & Go2HR. (2012). Understanding Ingredients for the Canadian Baker: Types of Thickening Agents. Retrieved from https://opentextbc.ca/ingredients/chapter/types-of-thickening-agents/

Bloom, J. (2017). Natural and Artificial Flavours: What's the Difference? *American Council on Science and Health*. Retrieved from https://www.acsh.org/sites/default/files/Natural-and-Artificial-Flavors-What-s-the-Difference.pdf

Canadian General Standards Board. (2015, March). Organic Production Systems : General principles and management standards. Retrieved from http://publications.gc.ca/collections/collection_2018/ongc-cgsb/P29-32-310-2018-eng.pdf

Canadian Press. (2017, November 08). Plant-based milks shouldn't be main beverage for young children, health experts say | CBC News. Retrieved from https://www.cbc.ca/news/health/plant-based-milks-for-kids-pediatricians-dietitians-1.4392857

Chakravorty, S., Bhattacharya, S., Chatzinotas, A., Chakraborty, W., Bhattacharya, D., & Gachhui, R. (2016). Kombucha tea fermentation: Microbial and biochemical dynamics. International Journal of Food Microbiology, 220, 63-72. doi:10.1016/j.ijfoodmicro.2015.12.015

Chicken Farmers of Canada. (n.d.). The Wheel of Chicken - Understanding Your Choices. Retrieved from https://www.chickenfarmers.ca/the-wheel-of-chicken-understanding-your-choices/

Dale, P. J., Clarke, B., & Fontes, E. M. (2002). Potential for the environmental impact of transgenic crops. *Nature Biotechnology*,20(6), 567-574. doi:10.1038/nbt0602-567

Dietitians of Canada. (n.d.). Understanding Genetically Modified Foods. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Understanding-Genetically-Modified-Foods.aspx

Dietitians of Canada. (2018). Facts on Artificial Sweeteners. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Facts-on-Artificial-Sweeteners.aspx

Dlusskaya, E., Jänsch, A., Schwab, C., & Gänzle, M. G. (2007). Microbial and chemical analysis of a kvass fermentation. European Food Research and Technology, 227(1), 261-266. doi:10.1007/s00217-007-0719-4

Fairtrade Canada. (n.d.). What is Fairtrade? Retrieved from http://fairtrade.ca/en-CA/What-is-Fairtrade

Farah, A. (2009). Coffee as a speciality and functional beverage. Functional and Speciality Beverage Technology, 370-395. doi:10.1533/9781845695569.3.370

Feehley, T., & Nagler, C. R. (2014). The weighty costs of non-caloric sweeteners. *Nature*, 514(7521), 176-177. doi:10.1038/nature13752

First Nations Health Authority. (2014, August 26). First Nations Traditional Foods Fact Sheets. Retrieved July 4, 2018, from http://www.fnha.ca/Documents/Traditional_Food_Fact_Sheets.pdf

Gilbert, H. (2013). A Hard Look at GM Crops. *Nature*, 497, 24-26. Retrieved from https://www.nature.com/polopoly_fs/1.12907!/menu/main/topColumns/topLeftColumn/pdf/497024a.pdf?origin=ppub

Gustafson, T. A. (2013, October 30). How Much Water Actually Goes Into Making A Bottle Of Water? Retrieved from https://www.npr.org/sections/thesalt/2013/10/28/241419373/how-much-water-actually-goes-into-making-a-bottle-of-water

Gepts, P. 2001. Origins of plant agriculture and major crop plants. p. 629–637. In M. Tolba (ed.) Our fragile world: Challenges and opportunities for sustainable development. EOLSS Publishers, Oxford, UK.

Health Canada. (2018, February 27). Frequently Asked Questions - Biotechnology and Genetically Modified Foods. Retrieved from https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods/factsheets-frequently-asked-questions/part-1-regulation-novel-foods.html#b8

Health Canada. (2017). Guidelines for Canadian drinking water quality (Canada, Health Canada, Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment). Ottawa: Government of Canada.

Health Canada. (2012, December 12). The Regulation of Genetically Modified Food. Retrieved from https://www.canada.ca/en/health-canada/services/science-research/reports-publications/biotechnology/regulation-genetically-modified-foods.html

Healthcare Without Harm, n.d. Position Statement on Genetically Modified Foods. Retrieved from https://noharm.org/sites/default/files/lib/downloads/food/Genetic_Engineered_Food_Stmnt.pdf

Health Care Without Harm. (2017). Redefining Protein: Adjusting Diets to Protect Public Health and Conserve Resources. Retrieved from https://noharm-uscanada.org/sites/default/files/documents-files/4679/Redefining%20Protein%20Report_4-13-17.pdf

Hemarajata, P., & Versalovic, J. (2012). Effects of probiotics on gut microbiota: Mechanisms of intestinal immunomodulation and neuromodulation. Therapeutic Advances in Gastroenterology, 6(1), 39-51. doi:10.1177/1756283x12459294

Higdon, J. V., & Frei, B. (2003). Tea Catechins and Polyphenols: Health Effects, Metabolism, and Antioxidant Functions. Critical Reviews in Food Science and Nutrition, 43(1), 89-143. doi:10.1080/10408690390826464

International Food Information Council (IFIC) and U.S. Food and Drug Administration (FDA). (2010). Food Additives & Ingredients - Overview of Food Ingredients, Additives & Colors. Retrieved from https://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm094211.htm#qa

Kato, M., & Shibamoto, T. (2001). Variation of major volatile constituents in various green teas from Southeast Asia. Journal of agricultural and food chemistry, 49(3), 1394-1396.

Khan, N., & Mukhtar, H. (2007). Tea polyphenols for health promotion. Life Sciences, 81(7), 519-533. doi:10.1016/j.lfs.2007.06.011

Krampner, J. (2014). Creamy and crunchy: An informal history of peanut butter, the all-American food. New York, NY: Columbia University Press.

Kufa, T. (2010). Environmental Sustainability and Coffee Diversity in Africa. Retrieved from https://www.researchgate.net/publication/228672549_Environmental_Sustainability_and_Coffee_Diversity_in_Africa

Kuhnlein, H. V., & Turner, N. J. (1991). Traditional plant foods of Canadian Indigenous peoples: Nutrition, botany, and use. New York: Gordon and Breach.

Méndez, V. E., Bacon, C. M., Olson, M., Petchers, S., Herrador, D., Carranza, C., . . . Mendoza, A. (2010). Effects of Fair Trade and organic certifications on small-scale coffee farmer

households in Central America and Mexico. Renewable Agriculture and Food Systems, 25(03), 236-251. doi:10.1017/s1742170510000268

McVean, A., & Lee, C. (2017, November 16). Battle of the Milks: Are plant-based milks appropriate for children? Retrieved from https://www.mcgill.ca/oss/article/health-and-nutrition/battle-milks-are-plant-based-milks-appropriate-children

Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-Analysis of Attention-Deficit/Hyperactivity Disorder or Attention-Deficit/Hyperactivity Disorder Symptoms, Restriction Diet, and Synthetic Food Color Additives. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(1). doi:10.1016/j.jaac.2011.10.015

Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*,360(6392), 987-992. doi:10.1126/science.aaq0216

Postles, H. (2018, May 31). Labour exploitation is endemic in global tea and cocoa industries, international study finds. Retrieved from https://phys.org/news/2018-05-labour-exploitation-endemic-global-tea.html

Radio Canada. (2011). Des plantes pour soigner le diabète. Retrieved from https://ici.radio-canada.ca/nouvelle/502259/diabete-cris-the

Rainforest Alliance. (2018, September 25). What Does Rainforest Alliance Certified™ Mean? Retrieved from https://www.rainforest-alliance.org/faqs/what-does-rainforest-alliance-certified-mean

Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., . . . Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. Nature, 514(7521), 181-186. doi:10.1038/nature13793

Ubelacker, S. (2018, September 17). Canada bans use of trans fats in food products. Retrieved from https://www.theglobeandmail.com/life/health-and-fitness/article-canada-bans-use-of-trans-fats-in-food-products/

Yong, J. W., Ge, L., Ng, Y. F., & Tan, S. N. (2009). The chemical composition and biological properties of coconut (Cocos nucifera L.) water. Molecules, 14(12), 5144-5164.

Yuan, T., Li, L., Zhang, Y., & Seeram, N. P. (2013). Pasteurized and sterilized maple sap as functional beverages: Chemical composition and antioxidant activities. *Journal of Functional Foods*, 5(4), 1582-1590.

Chapter 11

Choosing your sustainable supplements

1 Sustainable supplements

Why consume supplements?

Supplements are used in special situations where clients cannot consume the quantity or type of food needed to provide sufficient calories or sufficient quantities of a particular nutrient (for example, liquid-only diets or malnourished clientele).

What are sustainable supplements?

Supplements are never the most sustainable choice. Homemade enrichment in normal food is the most sustainable option to choose. However, when commercial supplements are needed, their sustainability can be determined from the ingredients and packaging. Sustainable supplements contain ingredients which are environmentally friendly and ethically produced.

What is the impact of sustainable supplements on health?

Ideally, supplements are unnecessary, with complete nutrition being obtained from the consumption of whole foods. However, sustainable supplements fulfill nutritional needs as necessary.

2 Making sustainable supplement choices

Create homemade supplementation

Making your own supplements is easy and cost-effective and is the most sustainable option. If a client is eating food but needs supplementation because the quality or the quantity is not enough, here are some tips to increase nutritional value.

Type of food	Type of enrichment	Examples
• **Soups (broth, cream)** See Chapter 7 for sustainable choices. • **Pureed starches, vegetables, or fruits** See the Chapter 5 for sustainable choices. See Chapter 6 for sustainable choices. See Chapter 8 for sustainable choices. • **Homemade baked goods (bread, muffin, cookies)** See the Chapter 5 for sustainable choices. See Chapter 8 for sustainable choices. • **Hot cereals** See the Chapter 5 for sustainable choices. • **Hot beverages** See the Chapter 10 for sustainable choices. • **Smoothies and juice** See the Chapter 10 for sustainable choices. • **Sauces** See Chapter 9 for sustainable choices.	See the appendix for more information on each ingredient. • **Vitamins and minerals** · Nutritional yeast · Miso • **Protein** · Cricket flour · Legume flour · Soy protein isolate · Whey powder · Skim milk powder • **Fat** · Nut butter · Oils · Margarine · Butter • **Sweetener** · Sugar syrup (honey, agave) · White sugar · Brown sugar	• **Vitamins and minerals** · Sprinkle nutritional yeast on foods as you would sprinkle salt. – Use 1 tbsp nutritional yeast for 3 cups of popcorn – Use 2-3 tbsp nutritional yeast to sprinkle on 5 cups of roasted vegetables • **Soups, broths, and sauces can be made with miso paste.** · Add miso (around 1 teaspoon per portion) to your soup, broth, or sauces at the end of the cooking (probiotics in miso would be killed by boiling water). • **Protein** · Cream soups can be enhanced with whey or skim milk powder. · Baked goods, such as cookies, muffins, and bread, can be enhanced with cricket or legume flour. – Use half regular flour and half insect or legume flour in your recipes. · Oatmeal can be enriched with skim milk powder. • **Fat** · Puree fruit with nut butters and oils. · Oatmeal can be flavoured with nut butter. • **Sweetener** · Oatmeal can be flavoured with honey.

Choose commercial supplements

There are different type of supplements to choose from once an evaluation of needs has been completed by a professional dietitian. Supplementation can be used to manage various health conditions such as diabetes or renal disease, to increase nutrient intake or as part of hydration. Here are some concepts that can contribute to making sustainable supplement choices.

Tips for choosing ingredients

Choose organic.

Organic ingredients are produced without the use of synthetic pesticides.

- **When possible, choose the source of protein according to its sustainability ranking**

  (See Chapter 4 for the sustainability ranking and more information)

  · learn about the following possible sources that are often used in commercial supplements (not listed in order of sustainability).

- **Soy protein isolate is produced by extracting and heating soybeans to produce a protein isolate powder.**

  · Heating is a particularly energy-intensive step of this process and can lead to an environmental impact greater than or equal to that of animal protein equivalents.[287]

  · Technology such as waste-heat recovery[288] can reduce the energy, cost, and environmental impact.

  · According to the AFSSA, the overconsumption of soy protein isolate (isoflavone) may have a negative estrogenic interaction particularly for pregnant women and children before 3 years old who should avoid those product.

- **Soy lecithin is a by-product of soybean oil production. It is often used in nutritional supplements because of its rich unsaturated fatty acid content and phosphorus, as well as emulsifying and antioxidant properties.[289]**

  · The process of making lecithin from oil is called degumming. Citric and phosphoric acid must be used and may leach into wastewater, although new technology using enzymes is emerging to prevent the production of harmful effluent.[290]

- **Whey, whey protein isolate, and whey protein concentrate are by-products of cheese production.**

  · They were highly polluting waste products[291] until it was realized that they could provide a good source of protein. However, post-treatment, condensate of whey (also known as COW water) is still a pollutant, since it contains over 75% lactose.[292] Technology is slowly advancing to transform this waste into potable water[293] and to produce lactose-free whey.[294]

- **Milk protein, milk protein concentrate, milk protein isolate are made from concentrating liquid milk. They are similar in nutritional protein profile to whey, except that whey does not contain casein.[295]**
- **Partially hydrolyzed milk protein, protein hydrolysate, often found in baby formulas, have been subjected to hydrolysis, a process that increases digestibility by breaking down the protein.296**
- **When possible, choose sweeteners in accordance with the information on sustainable sweeteners in Chapter 9.**

  · **Artificial sweeteners** may not be fully metabolized by the body and leach into the environment through wastewater.

  · **Corn syrup solids and maltodextrin, fructose**, dextrose are all sugars made from corn.

  · Corn syrup production is energy-intensive. In contrast, other sweeteners have nutritional benefits and less of an environmental impact.

- **When possible, choose oils in accordance with the information on sustainable oils in Chapter 9.**

  · Canola, soybean and sunflower oils can be sustainable; palm oil should be avoided.

- **Be conscious of natural and artificial colours and flavours.**

  See the appendix for more information on additives.

Tips for choosing packaging

Choose bulk.

This reduces the use of paper and/or plastic packaging.

If possible, choose paper packaging.

In a preliminary study of egg carton packaging, polystyrene (plastic) packaging was found to have a higher environmental impact than recycled paper and produced up to 16 times more greenhouse gases; however, paper packaging was found to produce more heavy metals[297].

In a study of baby food packaging, when assessed over the same distance of transportation, plastic packaging was found to have a smaller environmental impact than glass packaging, although the difference is minimal.[298]

287 Berardy et al., 2013.
288 US Department of Energy, 2008.
289 Wendel, 2000.
290 World Bank Group, 2015.
291 Smithers, 2008.
292 Smithers, 2008.
293 Meneses & Flores, 2016.
294 Durham & Sleigh, 2004.
295 Burrington, 2017.
296 Graveland-Bikker & Kruif, 2006.
297 Zabaniotou & Kassidi, 2003.
298 Humbert et al., 2009.

Appendix

Homemade supplements

Making your own supplements is easy and cost-effective. Below is information about some key ingredients.

VITAMINS AND MINERALS

Nutritional yeast

Nutritional yeast is a species of yeast grown for its nutty, cheesy taste. When fortified, it is a great source of protein, B vitamins, and trace minerals. It is often found in vegan recipes as a healthy, sustainable substitute for cheese and salt.[299]

Miso

This is a fermented soybean paste with vitamin and minerals such as manganese, copper, and B vitamins. It is also a good source of probiotics. However, it is also high in sodium.[300]

PROTEIN

Cricket flour

Cricket flour is very high in protein, vitamins, and minerals, particularly iron and B-12.[301] It is gluten free so cannot completely substitute for flour in recipes, but is a good supplement.

Legume flour

Chickpeas, mung beans, and lentils are all legumes and their flours contain high amounts of protein.[302] They are all gluten free so cannot completely substitute for flour—but chickpea flour is said to make the best-tasting cookies![303]

Soy protein isolate

This is a plant-based protein powder derived from soybean.

Whey powder, skim milk powder

These are animal-based protein powders derived from dairy, typically made from by-products of milk production.

299 Julson, 2017.
300 Berkeley Wellness, 2016.
301 Hartwick, 2017.
302 Du et al., 2014.
303 Thongram et al., 2016,

FATS

Nut butter

Peanut, almond, cashew—these are all nuts with high amounts of protein and unsaturated fats. Be aware that they are all quite calorie-dense.[304]

Oils

Certain vegetable oils such as olive and avocado can add unsaturated fats to the diet.[305] Coconut oil is a high source of saturated fat.

Margarine, butter

Margarine and butter are spreads which can be good sources of fat, but may also contain saturated and trans fats.[306]

Additives

See Health Canada's complete list of approved additives.

ARTIFICIAL FLAVOURINGS

The chemical composition of artificial flavours and natural flavours are the same. The only difference is the source of the chemicals: synthesized from numerous chemicals in the former or derived from numerous chemicals found in plants and/or foods in the latter.[307] Natural does not necessarily mean "good" or "safe" and neither does artificial. Ultimately, dosage dictates toxicity: flavourings are safe for consumption in appropriate amounts.

ARTIFICIAL COLOURING, ARTIFICIAL FOOD COLOURANTS (AFCS)

Most of the controversy surrounding artificial food colourants (AFCs) involve links between its consumption and children's behaviour, and attention deficit disorder in particular. It is statistically challenging to come to a hard conclusion of the effect of one variable on the other because of the variance in data collection and methodologies over the past 35 years.[308] Ultimately, the United States Food and Drug Administration along with the European Food Safety Authority have concluded that there is no substantial link between the tested colourants and behavioural effects.[309] Again, dosage dictates toxicity: artificial colourants are safe for consumption in appropriate amounts.

304 Ilton, 2018.
305 Beck, 2016.
306 Blonz, 2013.
307 Bloom, 2017.
308 Nigg et al., 2012.
309 International Food Information Council (IFIC) & U.S. Food and Drug Administration (FDA), 2010.

ARTIFICIAL SWEETENERS

Artificial sweeteners are a sugar substitute which can either come in low-calorie or zero-calorie forms. They are commonly used by diabetic patients and those looking to lose weight.[310] However, few studies support their efficacy: most provide evidence of their contribution to high blood sugar and obesity as a result of altering the gut microbiota.[311] [312]

Genetically modified organisms (GMOs), genetic engineering (GE), genetically modified (GM)

Crops have been genetically modified for thousands of years. Through plant breeding and artificial selection, we have been able to domesticate plants into the fruits and vegetables we consume today.[313] Genetic engineering is a new technology for genetically modifying crops. Before a genetically engineered crop is approved for growth and sale in Canada it must undergo a rigorous assessment by Health Canada to ensure it is safe for human consumption.[314] Genetic engineering is used in several different forms of pesticides (a term that includes herbicides, insecticides and fungicides)[315]. GM crops are commonly genetically engineered to resist herbicides that may be used to control weeds. However, the use of these crops prompts the proliferation of herbicide-resistant weeds, increasing farmers' reliance on chemical herbicides and allowing herbicide-resistant weeds to proliferate.[316] The chief concerns with GM crops arise from the uncertainty related to the long-term health effects of both consumption and the associated increased use of herbicides and pesticides. Dietitians of Canada and Health Canada state that there are no such effects[317] [318]. However, Health Care Without Harm encourages healthcare facilities to refrain from purchasing genetically engineered foods due to evidence of risks worldwide.[319] In Canada, four GM crops are currently grown: corn, soybean, canola, and sugar beet.[320]

310 Dietitians of Canada, 2018.
311 Suez et al., 2014.
312 Feehley & Nagler, 2014.
313 Gepts, 2001.
314 Health Canada, 2012.
315 Canadian Biotechnology Action Network (cban.ca)
316 Gilbert, 2013.
317 Dietitians of Canada, n.d.
318 Health Canada, 2018.
319 Healthcare Without Harm, n.d.
320 Dietitians of Canada, n.d.

References

Beck, J. (2016, April 14). Is Vegetable Oil Really Better for Your Heart? Retrieved from https://www.theatlantic.com/health/archive/2016/04/is-vegetable-oil-really-better-healthier-for-your-heart-lower-cholesterol/478113/

Berkeley Wellness. (2016). Miso: Nutrition and Health Benefits. Retrieved from http://www.berkeleywellness.com/healthy-eating/food/article/magic-miso

Bloom, J. (2017). Natural and Artificial Flavours: What's the Difference? American Council on Science and Health. Retrieved from https://www.acsh.org/sites/default/files/Natural-and-Artificial-Flavors-What-s-the-Difference.pdf

Blonz, E. (2013). How to Buy Spreads. Retrieved from http://www.berkeleywellness.com/healthy-eating/food/article/how-buy-spreads

Braun, M., Munoz, I., Schmidt, J. H., Thrane, M. (2016). Sustainability of Soy Protein from Life Cycle Assessment. Federation of American Societies for Experimental Biology, 30(1). Retrieved from https://publications.csiro.au/rpr/pub?list=BRO&pid=procite:a2a701e7-dcb8-4ee2-9d63-dc2d9afb59b3

Burrington, K. (2017). Differences between milk protein and whey protein ingredients. American Dairy Products Institute, 5(8). Retrieved from https://www.adpi.org/Portals/0/Academy/Intel%20and%20Commentaries/Differences%20Between%20Milk%20Protein%20and%20Whey%20Protein%20Ingredients%20Vol%20V%20Issue%208.pdf

Desilva, K., Stockmann, R., Smithers, G. W. (2003). Isolation procedures for functional dairy components—novel approaches to meeting the challenges. Australian Journal of Dairy Technology, 58(2), 148-152.

Dietitians of Canada. (2018). Facts on Artificial Sweeteners. Retrieved from http://www.unlockfood.ca/en/Articles/Food-technology/Facts-on-Artificial-Sweeteners.aspx

Du, S., Jiang, H., Yu, X., & Jane, J. (2014). Physicochemical and functional properties of whole legume flour. LWT - Food Science and Technology, 55(1), 308-313. doi:10.1016/j.lwt.2013.06.001

Environmental, health, and safety guidelines for Vegetable oil production and processing. (2015). World Bank Group. Retrieved from https://www.ifc.org/wps/wcm/connect/1e6d9780474b-37b89a2bfe57143498e5/FINAL_Feb+2015_Vegetable+Oil+Processing+EHS+Guideline.pdf?-MOD=AJPERES

Feehley, T., & Nagler, C. R. (2014). The weighty costs of non-caloric sweeteners. Nature, 514(7521), 176-177. doi:10.1038/nature13752

Graveland-Bikker, J., & Kruif, C. D. (2006). Unique milk protein based nanotubes: Food and nanotechnology meet. Trends in Food Science & Technology, 17(5), 196-203. doi:10.1016/j.tifs.2005.12.009

Hartwick, P. (2017). Cricket Flour: Protein Count, Nutrients, Taste, and Recipes. Retrieved from https://www.healthline.com/health/food-nutrition/cricket-flour-nutrition#recipes

Humbert, S., Rossi, V., Margni, M., Jolliet, O., & Loerincik, Y. (2009). Life cycle assessment of two baby food packaging alternatives: Glass jars vs. plastic pots. The International Journal of Life Cycle Assessment, 14(2), 95-106. doi:10.1007/s11367-008-0052-6

Ilton, E. (2018). 10 Questions About Nut Butters. Retrieved from http://www.berkeleywellness.com/healthy-eating/food/article/10-questions-about-nut-butters

International Food Information Council (IFIC) and U.S. Food and Drug Administration (FDA). (2010). Food Additives & Ingredients - Overview of Food Ingredients, Additives & Colors. Retrieved from https://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm094211.htm#qa

Julson, E. (2017). Why Is Nutritional Yeast Good for You? Retrieved from https://www.healthline.com/nutrition/nutritional-yeast#section2

Life Cycle Assessment of Soy Protein Isolate Proc. ISSST, Andrew Berardy, Christine Costello and Thomas Seager. http://dx.doi.org/10.6084/m9.figshare.1517821 v3 (2015)

Meneses, Y. E., & Flores, R. A. (2016). Feasibility, safety, and economic implications of whey-recovered water in cleaning-in-place systems: A case study on water conservation for the dairy industry. Journal of Dairy Science, 99(5), 3396-3407. doi:10.3168/jds.2015-10306

Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-Analysis of Attention-Deficit/Hyperactivity Disorder or Attention-Deficit/Hyperactivity Disorder Symptoms, Restriction Diet, and Synthetic Food Color Additives. Journal of the American Academy of Child & Adolescent Psychiatry, 51(1). doi:10.1016/j.jaac.2011.10.015

Smithers, G. W. (2008). Whey and whey proteins—From 'gutter-to-gold'. International Dairy Journal, 18(7), 695-704. doi:10.1016/j.idairyj.2008.03.008

Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., . . . Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. Nature, 514(7521), 181-186. doi:10.1038/nature13793

Thongram, S., Tanwar, B., Chauhan, A., & Kumar, V. (2016). Physicochemical and organoleptic properties of cookies incorporated with legume flours. Cogent Food & Agriculture, 2(1). doi :10.1080/23311932.2016.1172389

US Department of Energy. (2008). Waste Heat Recovery: Technology Opportunities in the US Industry. Retrieved from http://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf

Wendel, A. (2000). Lecithin. Kirk-Othmer Encyclopedia of Chemical Technology. doi:10.1002 /0471238961.1205030923051404.a01

Zabaniotou, A., & Kassidi, E. (2003). Life cycle assessment applied to egg packaging made from polystyrene and recycled paper. Journal of Cleaner Production, 11(5), 549-559. doi:10.1016/s0959-6526(02)00076-8

GUIDE TO
SUSTAINABLE
MENUS