



Food and Agriculture
Organization of the
United Nations



INTERNATIONAL YEAR OF
FRUITS AND VEGETABLES
2021



**Promoting safe and adequate
fruit and vegetable
consumption to improve health**



Promoting safe and adequate fruit and vegetable consumption to improve health

Published by
Food and Agriculture Organization of the United Nations
and
Ministry of Social Development and Family of Chile
Santiago de Chile, 2021



Required citation:

FAO and Ministry of Social Development and Family of Chile. 2021. *Promoting safe and adequate fruit and vegetable consumption to improve health*. Santiago de Chile. <https://doi.org/10.4060/cb7946en>

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) or The Ministry of Social Development and Family of Chile concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO or The Ministry of Social Development and Family of Chile in preference to others of a similar nature that are not mentioned.

ISBN 978-92-5-135511-4

© FAO, 2021



Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode>).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO or The Ministry of Social Development and Family of Chile endorses any specific organization, products or services. The use of the FAO and the logo of The Ministry of Social Development and Family of Chile is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons license. If a translation of this work is created, it must include the following disclaimer along with the required citation: "This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO and The Ministry of Social Development and Family of Chile are not responsible for the content or accuracy of this translation. The original English edition shall be the authoritative edition."

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization <http://www.wipo.int/amc/en/mediation/rules> and any arbitration will be in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL)

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holders. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

Cover photography: ©FAO



This policy brief series, funded by the **Government of Chile**, is an outcome of the **FAO/WHO International Workshop on Fruits and Vegetables 2020** and is designed to orient government policymakers to adopt the most effective and efficient policies that promote sustainable fruit and vegetable production, supply, consumption, and availability for human and planetary health. This brief is based primarily on Gomes *et al.*, 2021.



Contents

Acknowledgements	VI
Key messages	1
Scope of the problem	2
Evidence of actions to increase fruit and vegetable consumption	4
Policy recommendations	8
Conclusions	12
References	15



Acknowledgements

This document has been prepared by Rebecca Kanter in collaboration with Eve Crowley, Ruth Charrondière, Ornella Tiboni, Karla Santos, Daniela Santos with Eve Crowley, Ruth Charrondière, Ornella Tiboni, Karla Santos, Daniela Godoy, Francisca Perez, Pilar Santacoloma Godoy, Francisca Pérez, Pilar Santacoloma, Megan Harrison, Florence Tartanac, Ana Puhac and Makiko Taguchiac Tartanac, Ana Puhac and Makiko Taguchi.

In addition to the above experts, we express sincere appreciation to all the colleagues who reviewed different drafts of the publication, especially to the Sistema Elige Vivir Sano team, for their support in designing the document.

Key messages

As part of a healthy diet, FAO and the World Health Organization (WHO) recommend a daily fruit and vegetable (F&V) intake of at least 400 grams/adult.^[1]

However, low F&V intake has become a global public health problem. It is a leading global risk factor for non-communicable diseases (NCDs), including many types of cancer, heart disease, diabetes and other diseases.

The promotion of F&Vs in the International Year of Fruits and Vegetables emphasizes unprocessed or minimally processed.^[2] F&Vs, which are highly beneficial to health. Many processed F&V products lose at least part of their nutritional and health benefits. However, processing can improve food safety, especially from microbiological contamination, and reduce loss and waste.

Conversely, F&Vs which are highly processed through juicing, frying, or adding salt, sugar or fat can undermine the health benefits of F&V consumption. Moreover, consumption of highly processed F&Vs may displace the consumption of unprocessed or minimally processed F&Vs.

Highly processed food and beverage products are often misrepresented as nutritious products, just by adding the word “fruit” to the package label.

Health professionals can play an important role in promoting healthy diets and increasing F&V consumption, as well as generating educational material with nutrition advice on F&Vs to encourage F&V consumption and healthy diets among patients and their families.

[1] For the purpose of the International Year of Fruits and Vegetables, F&Vs are defined as “edible parts of plants (e.g. seed-bearing structures, flowers, buds, leaves, stems, shoots and roots), either cultivated or harvested wild, in their raw state or in a minimally processed form”. The definition excludes starchy roots and tubers, dry grain legumes, cereals, medicinal plants, stimulants (e.g. tea, coffee and cacao) and ultra-processed foods (FAO, 2021a).

[2] Minimally processed fruits and vegetables have undergone procedures such as washing, sorting, trimming, peeling, slicing or chopping that do not affect their fresh-like quality (Gil and Kader, 2008).

Scope of the problem

Despite the known health benefits of fruit and vegetable (F&V) consumption and the availability of recommendations to increase consumption (e.g. FAO and WHO, 2005), insufficient F&V consumption remains a global health problem. Historically, F&V availability has been consistently insufficient to meet the recommended consumption levels (Mason-D'Croz *et al.*, 2019). Two systematic reviews identified low F&V intake as a risk factor for early death (premature mortality), cancer, coronary heart disease, and type 2 diabetes (Aune *et al.*, 2017; Reynolds *et al.*, 2019). Low F&V consumption is related to a lower intake of the dietary fibre, micronutrients and bioactive compounds that are concentrated in raw F&Vs and beneficial for health. The long-term benefits to health continue with a daily F&V intake of up to 800 grams/adult, with no detrimental effects observed for an even higher F&V intake.

It is important to promote a greater consumption of unprocessed or minimally processed F&Vs because they retain most of their original properties despite minimal physical processing (Comes and Reynolds, 2021). **High total F&V intake, especially of**

colourful F&Vs – dark green leafy vegetables, dark-coloured berries, citrus fruits – is associated with mental health benefits, such as greater optimism, self-efficacy and resilience against depression (Wallace *et al.*, 2020).

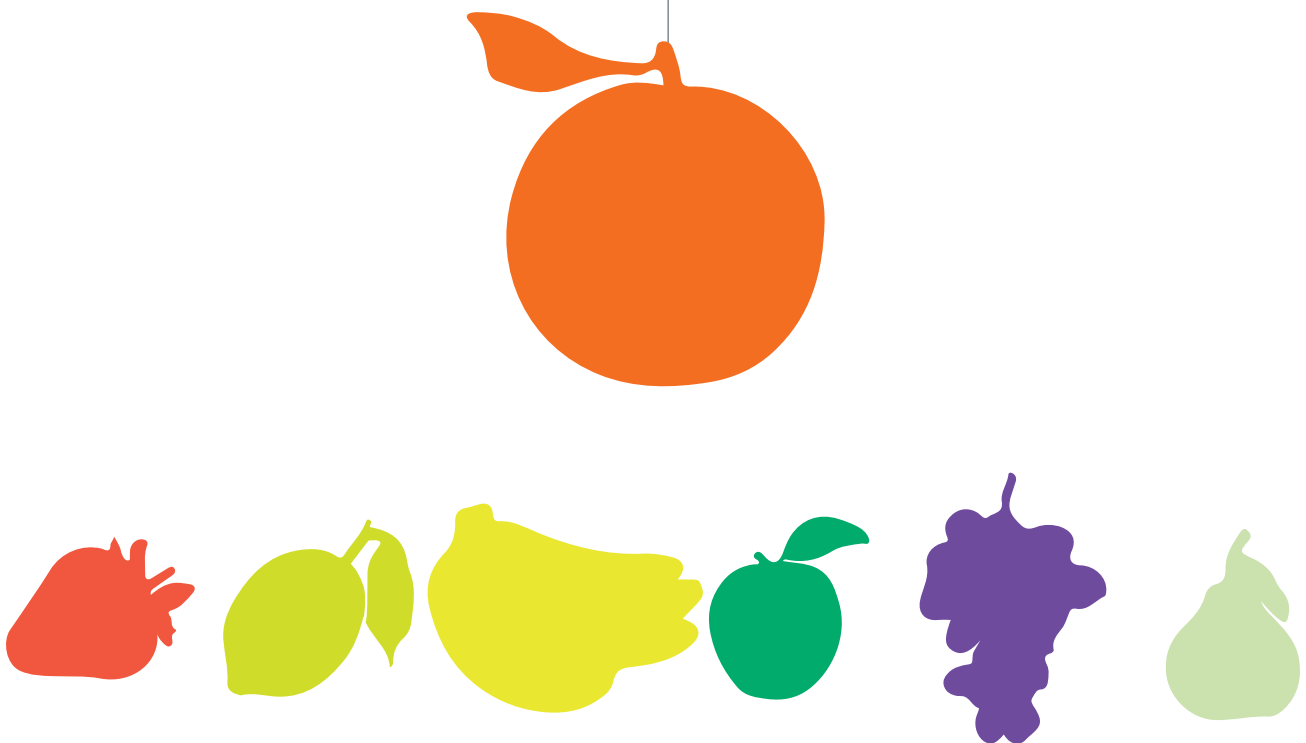
In many parts of the world, adhering to a more plant-based diet, including plenty of F&Vs, would not only improve many population health outcomes, but also many planetary health outcomes.^[3] Nelson *et al.* (2016) conclude that, in general, a dietary pattern that is higher in plant-based foods, such as vegetables, fruits, whole grains, legumes, nuts, and seeds, and lower in animal-based foods is more health-promoting and is associated with a smaller environmental impact (greenhouse gas [GHG] emissions and energy, land, and water use) than the current average “meat-based” diet. Another study found that when compared to animal-source food production, especially of large animals (e.g. cows), F&Vs produce few GHGs and utilize less water, resulting in fewer negative environmental impacts (Willet *et al.*, 2019). Therefore, greater F&V consumption as part



[3] For example, the Mediterranean Diet and the New Nordic Diet are plant-based diets, with little to moderate amounts of animal-sourced foods (FAO and WHO, 2019).

of a healthy diet may contribute indirectly to reducing the planetary impacts of food production. Additional health benefits can be achieved through the sustainable intensification of F&V production, which reduces the use of synthetic fertilizers and pesticides, while enhancing agrobiodiversity conservation, household incomes, poverty reduction and diversification of diets through a greater variety of F&Vs.^[4] Greater F&V crop variety is associated with a more diverse F&V intake, including **different coloured** F&Vs, and thus a higher variety of beneficial micronutrients and bioactive compounds, such as preformed Vitamin A.

Given the high perishability of F&Vs, nutrient loss due to certain types of processing (e.g. juicing, frying, adding salt, sugar or fat) should be carefully balanced with potential benefits (e.g. reduced food loss and waste and improved food safety). The most common food safety risks related to F&Vs throughout the value chain are **microbial contamination**, including non-typhoidal *Salmonella enterica* (NTS), and *Campylobacter* spp. (Hoffmann *et al.*, 2017), with an annual cost of more than 25 million Disability Adjusted Life Years (DALYs). Therefore, **cost-effective processing and preservation** methods for ensuring food safety while maintaining F&V nutrient quality are critical (FAO, 2021c).



[4] Specific programmatic examples come from Cambodia, such as: “Economic and Social Relaunch of North-West Provinces” (ECOSORN), “Enabling Households to Apply Necessary Cultivation for Economic Development” (ENHANCED), and “Improving Livelihood of Farmers in Tramkok” (ILFARM-Tramkok). Programmes supported by nongovernmental organizations in Cambodia generated greater household income to reduce poverty by promoting intensive and diversified farming systems that encouraged greater F&V production through crop rotation and other sustainable agriculture practices, including for human consumption (Vernooy, 2015).

Evidence of actions to increase fruit and vegetable consumption

Increasing sustainable production and consumption through multiple actions simultaneously

Evidence shows that single actions have more limited impacts than multiple actions in different sectors that simultaneously seek the same objective; in this case, improving human and planetary health through increased and more sustainable F&V production and consumption (FAO, 2021c). For instance, it is possible to target F&Vs and competing foods and beverages at the same time by providing subsidies for fresh F&V consumption by poor consumers (and therefore incentivizing production and local procurement) within national school feeding programmes, while increasing taxes on highly processed foods and beverages.

Supporting robust value chains for agricultural diversification of fruits and vegetables

The 2016 Report of the International Panel of Experts on Sustainable Food Systems entitled *From uniformity to diversity: A paradigm shift from industrial agriculture to diversified agroecological systems* provides a number of recommendations on how to improve technical support for greater agricultural diversification (IPES-Food, 2016).

These range from policy recommendations, such as the Brazilian National Plan for Agroecology and Organic Production, to programmatic recommendations, such as FAO's training courses on agroecology as part of its Farmer Field School system (FAO, 2021b).







Increasing fruit and vegetable consumption through food-based dietary guidelines

Food-based dietary guidelines (FBDGs) are short, science-based, practical and accessible messages to guide people on healthy eating and associated healthy lifestyles to keep them well-nourished and to help prevent malnutrition in all its forms. Globally, the most common messages are on reducing salt intake and increasing fruit and vegetable consumption (present in 96 percent and 94 percent of guidelines, respectively) (González and Garnett, 2016).

Increasing fruit and vegetable consumption through school meal programmes

Innovations in the Chilean National School Feeding Programme, “Cocina Escolar del Mundo” and “Cocina con raíces,” feature the incorporation of culinary preparations rich in F&Vs from countries with high levels of immigration to Chile (Haiti, Peru, Venezuela) and recipes from First Nations and indigenous cultures in Chile (Aymara, Rapa Nui, Mapuche) (Junaeb, 2018; Flores, 2019). Although these programmes have yet to be formally evaluated, they also potentially promote agrobiodiversity of F&Vs, while enhancing social inclusion among school children.

Consumer awareness building and marketing of fruits and vegetables

Marketing techniques using images of F&Vs on food products frequently lead consumers to misinterpret and overestimate the F&V content, quality and healthfulness. This is often used in the advertising and promotion of highly processed foods, while raw and minimally processed F&Vs are hardly ever advertised. **Product marketing influences taste preferences and thus favours the intake of highly processed foods and beverages, especially among children, which consequently decreases their desire for and consumption of raw and minimally processed F&Vs** (Sadeghirad *et al.*, 2016).



Policy recommendations

Enhance health systems and workplaces to encourage fruit and vegetable consumption

The curriculum of all health professionals should include dietary advice, and all health professionals should be encouraged to include recommendations for a healthy diet in their daily clinical practice. At the same time, the sale of highly processed foods should be limited or prohibited in hospitals, pharmacies, government agencies and workplaces, encouraging more nutritious food choices, including fresh and minimally processed F&Vs.

Build and develop food safety capacity

To address the most common microbiological risks related to F&Vs throughout the value chain, all actors in the food system, from farmers to consumers, should practice safe ways of growing, storing, processing and consuming F&Vs, following the World Health Organization's (WHO) illustrated food safety education and training document "Five keys to growing safer fruits and vegetables: promoting health by decreasing microbial contamination" (WHO, 2012). Furthermore, FAO recommends the appropriate use of F&V disinfectants, solar driers and fermentation for F&V preservation to reduce pathogens, and food-grade containers for transport (FAO, 2020). Both FAO (FAO, 2020) and the World Bank (Jaffee *et al.*, 2019) recommend enhancing national-level regulatory strategies to improve food safety standards and hygiene measures related to F&Vs, especially with respect to F&V handling in the informal sector, through actions such as 1) incorporating food safety into national agriculture, food and

nutrition strategies; and 2) establishing or enforcing legislative frameworks that delineate the roles and responsibilities of legal authorities related to food safety (e.g. Food and Drug Administration of the United States of America), in line with the Codex Alimentarius Commission.^[5]

Design and implement regulations to prevent misleading marketing of food products

The simultaneous regulation of packaging design, labelling and marketing of highly processed foods and beverages has the potential to have a greater impact on health, especially of children, than voluntary approaches to food labelling and marketing (Taillie *et al.*, 2019). One example is the Chilean Food Labelling and Advertising Law (Law 20.606) that regulates packaging design, labelling, sales and usage in schools, as well as the advertising of foods and beverages, particularly to children (under 14 years), if they contain high amounts of calories, added saturated fats, sodium and/or sugars.

Promote raw and minimally processed fruit and vegetable consumption and diverse culinary preparations

Evidence shows that raw and minimally processed F&Vs have greater positive impacts on human health and nutrition than F&Vs in liquid form. For this reason, the consumption of raw or minimally processed F&Vs alone or as part of diverse culinary preparations should be promoted through national FBDCs, as is currently done in Brazil and Uruguay (Ministry of Health of Brazil, 2015; Ministry of Public Health of Uruguay, 2016). Guidelines should



[5] For more guidance on these recommendations, please see FAO, 2020.





have clear links to food policies that are actually implemented, for instance, school and hospital meals, food aid, public procurement, advertising regulations and industry standards (González and Garnett, 2016). School feeding programmes are also an effective means to promote F&V consumption,^[6] and are often combined with education strategies, as in Brazil.

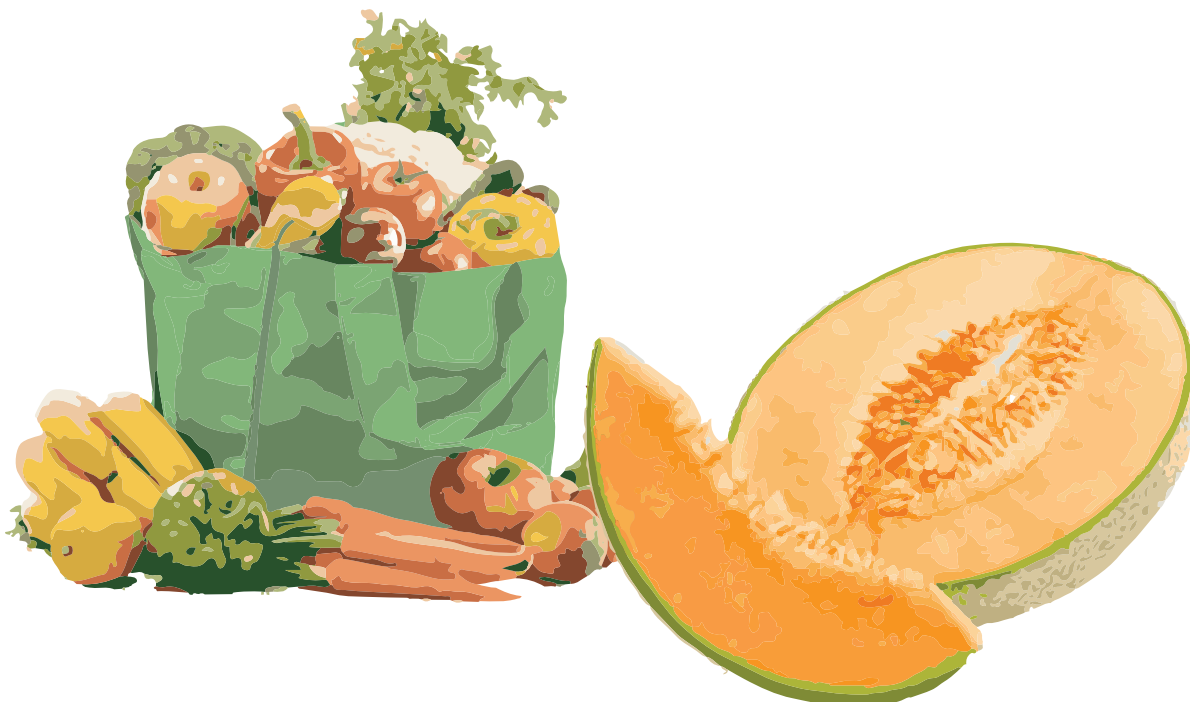
Ensure greater technical support for fruit and vegetable primary production, diversification and biodiversity conservation to enhance health

Improved health outcomes through increased F&V consumption cannot be achieved without sufficient, safe, sustainable and diverse F&V production and value chains. Increasing F&V production through sustainable intensification using agroecological principles, rather than

concentrating on a few high-yielding F&Vs grown as monocultures, and ensuring equitable farmer and retail prices are good options for agricultural policymakers concerned about both human and planetary health outcomes.

Incentives for private sector actors, including food processors and distributors, to invest in infrastructure and technology to preserve F&Vs, while improving their diversity and nutritional value, are important tools to promote the quality of F&Vs available for consumption. At the same time, seed systems, including for neglected and underutilized species (NUS), should be promoted, favouring varieties with high nutritional quality.

It is important that policies, laws and regulations include small farmers, and that extension systems and other institutions provide technical support and financing for agricultural practices to become more environmentally sustainable.



[6] For more policy recommendations, see FAO and Ministry of Social Development and Family of Chile, 2021.

Conclusions

Obtaining health for all should be at the centre of global and national policies and programmes. What is missing in many countries is the translation of research findings into policy actions. The International Year of Fruits and Vegetables is a call to action for policymakers and stakeholders involved in food systems to raise awareness of, and direct policy attention to, the nutritional and health benefits of F&V consumption. The differences between raw and minimally processed F&Vs versus highly processed F&Vs should be explicitly addressed in fiscal policies, laws, regulations and programmes.

Such policies should also aim to reverse insufficient global F&V supply and

consumption and their damaging consequences for health. Ideally, they should be designed and implemented using a holistic agriculture and food system approach. Such food system-based solutions could be coupled with diverse, seasonal, regional culinary preparations, nutrition education, and communication campaigns.

In doing so, they can help improve access to quality F&Vs that are raw or minimally processed and safe from foodborne disease risks. Support for such efforts can significantly improve F&V access, quality and consumption and thus generate positive impacts for both human and planetary health.







References

Aune D., Giovannucci E., Boffetta P., Fadnes L.T., Keum N., Norat T., Greenwood D.C., Riboli E., Vatten L.J. & Tonstad S. 2017. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality – a systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, 46(3): 1029–1056 [online]. [Cited 24 April 2021]. <https://doi.org/10.1093/ije/dyw319>

FAO. 2020. *Strengthening sector policies for better food security and nutrition results – Food safety*. Policy Guidance Note 14. Rome. 40 pp. (also available at www.fao.org/3/ca9476en/ca9476en.pdf).

FAO. 2021a. International Year of Fruits and Vegetables 2021. In: *Food and Agriculture Organization of the United Nations* [online]. Rome. [Cited 24 April 2021]. www.fao.org/fruits-vegetables-2021/en/

FAO. 2021b. Global Farmer Field School Platform [online]. In: *Food and Agriculture Organization of the United Nations*. Rome. [Cited 24 April 2021]. www.fao.org/farmer-field-schools/overview/en/

FAO. 2021c. *FAO/WHO International Workshop on Fruits and Vegetables in preparation for the International Year of Fruits and Vegetables 2021*. Roma. (also available at <http://www.fao.org/documents/card/en/c/cb6234en>).

FAO and Ministry of Social Development and Family of Chile. 2021. *Promoting fruit and vegetable consumption*. Santiago de Chile.

FAO & WHO. 2005. *Fruit and vegetables for health: report of a Joint FAO/WHO Workshop on Fruit and Vegetables for Health, 1–3 September 2004, Kobe, Japan*. WHO, Geneva, Switzerland. (also available at <https://apps.who.int/iris/handle/10665/43143>).

FAO & WHO. 2019. *Sustainable healthy diets – Guiding principles*. Rome, FAO. 44 pp. (also available at www.fao.org/3/ca6640en/ca6640en.pdf).

Flores, J. 2019. “Cocina con raíces”: Recetas Aymara, Rapa Nui y Mapuche se sumarán al almuerzo escolar Junaeb. *Radio Bío Bío*, 27 August 2019. (also available at www.biobiochile.cl/noticias/nacional/chile/2019/08/27/cocina-con-raices-recetas-aymara-rapa-nui-y-mapuche-se-sumaran-al-almuerzo-escolar-junaeb.shtml).

Gil, M.I. & Kader, A.A. 2008. The nutritional quality of particular fruit and vegetable products. Fresh-cut fruit and vegetable products. In T.A. Tomas-Barberosa & M.I. Gil, eds. *Improving the Health-Promoting Properties of Fruit and Vegetable Products*, pp. 475–496. Cambridge, UK, Woodhead Publishing.

Gomes, F.S. and Reynolds, A.N. 2021. *Effects of fruits and vegetables intakes on direct and indirect health outcomes – Background paper for the FAO/WHO International Workshop on fruits and vegetables 2020*. Rome, FAO and PAHO. (also available at <https://doi.org/10.4060/cb5727en>).

González, C. & Garnett, T. 2016. Influencing food environments for healthy diets through food-based dietary guidelines. In *Influencing food environments for healthy diets*, pp. 107–135. Rome, FAO. (also available at www.fao.org/3/i6484e/i6484e.pdf).

Hoffmann, S., Devleeschauwer, B., Aspinall, W., Cooke, R., Corrigan, T., Havelaar, A., Angulo, F. et al. 2017. Attribution of global foodborne disease to specific foods: Findings from a World Health Organization structured expert elicitation. *PLoS One*, 12(9), e0183641 [online]. [Cited on 24 April 2021]. (also available at <https://doi.org/10.1371/journal.pone.0183641>).

International Panel of Experts on Sustainable Food Systems (IPES-Food). 2016. *From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems*. Brussels. (also available at www.ipes-food.org/_img/upload/files/UniformityToDiversity_FULLL.pdf).

- Jaffee, S., Henson, S., Unnevehr, L., Grace, D. & Cassou, E.** 2019. *The Safe Food Imperative: Accelerating Progress in Low and Middle-Income Countries*. Agriculture and Food Series. Washington, DC, World Bank. (also available at <https://openknowledge.worldbank.org/bitstream/handle/10986/30568/9781464813450.pdf?sequence=6&isAllowed=y>).
- Junta Nacional de Auxilio Escolar y Becas (Junaeb).** 2018. La Cocina del Mundo llega a las bandejas de Junaeb. In: *Junta Nacional de Auxilio Escolar y Becas, Ministerio de Educación* [online]. Santiago. [Cited 24 April 2021]. www.junaeb.cl/archivos/36538
- Mason-D’Croz, D., Bogard, J.R., Sulser, T.B., Cenacchi, N., Dunston, S., Herrero, M. & Wiebe, K.** 2019. Gaps between fruit and vegetable production, demand, and recommended consumption at global and national levels: an integrated modelling study. *The Lancet Planetary Health*, 3(7): e318–e329 [online]. [Cited 24 April 2021]. [https://doi.org/10.1016/S2542-5196\(19\)30095-6](https://doi.org/10.1016/S2542-5196(19)30095-6)
- Ministry of Health of Brazil.** 2015. *Dietary Guidelines for the Brazilian Population*. Brasilia. (also available at https://bvsms.saude.gov.br/bvs/publicacoes/dietary_guidelines_brazilian_population.pdf).
- Ministry of Public Health of Uruguay.** 2016. *Guía alimentaria para la población uruguaya. Para una alimentación saludable, compartida y placentera*. Montevideo. (also available at <https://www.gub.uy/ministerio-salud-publica/comunicacion/publicaciones/guia-para-una-alimentacion-saludable-compartida-y-placentera>).
- Nelson, M.E., Hamm, M.W., Hu, F.B., Abrams, S.A., & Griffin, T.S.** 2016. Alignment of healthy dietary patterns and environmental sustainability: A systematic review. *Advances in Nutrition*, 7(6): 1005–1025 [online]. [Cited 24 April 2021]. <https://doi.org/10.3945/an.116.012567>
- Reynolds, A., Mann, J., Cummings, J., Winter, N., Mete, E. & Te Morenga, L.** 2019. Carbohydrate quality and human health: a series of systematic reviews and meta-analyses. *The Lancet*, 393(10170): 434–445 [online]. [Cited 24 April 2021]. [https://doi.org/10.1016/S0140-6736\(18\)31809-9](https://doi.org/10.1016/S0140-6736(18)31809-9)
- Sadeghirad, B., Duhaney, T., Motaghipisheh, S., Campbell, N.R.C. & Johnston, B.C.** 2016. Influence of unhealthy food and beverage marketing on children’s dietary intake and preference: a systematic review and meta-analysis of randomized trials. *Obesity Reviews*, [https://doi.org/10.1016/S0140-6736\(18\)31809-9](https://doi.org/10.1016/S0140-6736(18)31809-9)
- Taillie, L.S., Busey, E., Mediano, F. & Carpentier, F.R.D.** 2019. Governmental policies to reduce unhealthy food marketing to children. *Nutrition Reviews*, 77(11): 787–816 [online]. [Cited 24 April 2021]. (also available at <https://doi.org/10.1093/nutrit/nuz021>).
- Vernooy, R.** 2015. *Effective implementation of crop diversification strategies for Cambodia, Lao PDR and Vietnam: Insights from past experiences and ideas for new research*. Rome, Bioversity International. (also available at www.bioversityinternational.org/e-library/publications/detail/effective-implementation-of-crop-diversification-strategies-for-cambodia-lao-pdr-and-vietnam-insig/).
- Wallace, T.C., Bailey, R.L., Blumberg, J.B., Burton-Freeman, B., Chen, C.O., Crowe-White, K.M., Drewnowski, A. et al.** 2020. *Fruits, vegetables, and health: A comprehensive narrative, umbrella review of the science and recommendations for enhanced public policy to improve intake*. *Critical reviews in food science and nutrition*, 60(13): 2174–2211 [online]. [Cited 24 April 2021]. <https://doi.org/10.1080/10408398.2019.1632258>
- Willet, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., et al.** 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492 [online]. [Cited 24 April 2021]. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)
- World Health Organization (WHO).** 2012. *Five keys to growing safer fruits and vegetables: promoting health by decreasing microbial contamination*. Geneva, Switzerland. (also available at <https://apps.who.int/iris/handle/10665/75196>).



FAO and the World Health Organization (WHO) recommend a daily fruit and vegetable (F&V) intake of at least 400 grams/adult. However, low F&V intake has become a global public health problem. The promotion of F&Vs in the International Year of Fruits and Vegetables emphasizes unprocessed or minimally processed F&Vs, which are highly beneficial to health. However, processing can improve food safety, especially from microbiological contamination, and reduce loss and waste. Conversely, F&Vs which are highly processed can undermine the health benefits of F&V consumption.