# How the G20 leaders could transform nutrition by updating and harmonizing food-based dietary guidelines

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## Abstract

The G20 is an intergovernmental and multilateral platform comprised of 19 countries and the European Union, which connects prosperous high-income and emerging middle-income countries worldwide. The G20 process could prioritize food systems to address climate change challenges. For this paper, the research team reviewed the G20 countries' recommendations in national food-based dietary guidelines (FBDGs) for red and processed meat (RPM) compared with available per capita consumption data and expert-recommended targets to promote healthy and sustainable food systems. The results reveal that Indonesia, India and Saudi Arabia have the least red meat available for consumption (less than 10 kilograms (kg) per person per year). Other G20 countries exceed the recommended red meat target of less than or equal to 26 kg per person per year. Sixteen G20 countries have translated their national guidelines into FBDG food graphics for the public. Twelve G20 countries recommend that people limit their RPM daily or weekly to reduce cancer and heart disease risks. Australia, France, Italy, Mexico and the United Kingdom of Great Britain and Northern Ireland align RPM targets with recommendations to limit cooked red meat intake to three or fewer servings (350-500 grams) a week. Six G20 countries (Brazil, Canada, Germany, India, Italy and the United Kingdom of Great Britain and Northern Ireland) recommend minimally processed, plant-rich food choices or environmentally sustainable dietary patterns. The G20 meetings in Indonesia (2022), India (2023) and Brazil (2024) should prioritize and harmonize healthy and sustainable food system policies with international trade policies to mitigate climate change effects and manage sustainability trade-offs.

*"The G20 are some of the biggest economies on the planet – what they do will make or break the world's ability to tackle the climate crisis. They must listen to the voices of their people, especially their future generations, who will inherit the consequences of actions – or inactions – of G20 leaders."*
*UNDP and Oxford University (2021b)*

## Introduction

Transforming food systems is a priority for the United Nations, as stated in the Decade of Action on Nutrition (2016–2025), 2015 Paris Agreement, Sustainable Development Goals (SDGs), 2030 Agenda and the 2022 United Nations Food System and Nutrition for Growth Summits (Loken and DeClerck, 2020; UNDESA, 2022). Expert reports have advised national governments to ensure that their citizens adopt healthy and sustainable dietary patterns comprising nutrient-dense, plant-based foods in order to feed 10 billion people worldwide by 2050 while mitigating climate change effects. However, the actions needed will differ by region and context (IPCC, 2022; Willett *et al*., 2019).

There are many co-benefits of adopting a sustainable dietary pattern (IPCC, 2022). Large-scale industrial beef production has a substantial environmental and climate footprint compared with plant-rich diets, as measured by greenhouse gas (GHG) emissions, which drive adverse climate change effects (Loken and DeClerck, 2020; Parlasca and Qaim, 2022; Swinburn *et al*., 2019; Willett *et al*., 2019). Restricting meat is controversial, and governments must balance many sustainability concerns (namely, environmental, economic, human health and animal welfare) with trade policies (Parlasca and Qaim, 2022).

The G20 is a multilateral platform, made up of 19 countries and the European Union, which connects the most prosperous high-income and emerging middle-income economies worldwide. The G20 members address global economic and security challenges by coordinating trade, health and climate action policies (G20 Indonesia 2022, 2022). The G20 countries account for more than 80 percent of the world's gross domestic product (GDP), 75 percent of international trade and 60 percent of the world's population (G20 Indonesia 2022, 2022). The G20 members also include the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom of Great Britain and Northern Ireland and the United States of America).

The G20 process and annual meetings are important international decision-making platforms for governments to promote sustainable and resilient food systems, including the harmonization of RPM reduction and replacement policies with FBDGs. National FBDGs are science-based messages about healthy eating to prevent all forms of malnutrition and keep people well-nourished and healthy (FAO, 2022). They establish a basis for developing food and nutrition, health and agricultural policies and nutrition education programmes to foster healthy eating habits. National FBDGs advise individuals and populations about foods, food groups and dietary patterns to provide the required nutrients to promote health to the general public and address each country's nutritional challenges, such as preventing undernutrition and diet-related chronic diseases (FAO, 2022). There is limited research comparing the G20 countries' RPM recommendations in national FBDGs and food graphics with expert-recommended targets.

## Purpose

For this paper, the research team conducted an evidence review of published and grey literature and analysed the G20 countries' national FBDGs and food graphics for RPM compared with expert-recommended targets to promote healthy and sustainable diets. We used a G20 lens to build upon the findings of recent published papers and reports that had examined the FBDGs and food system policies for the G20 countries. We also synthesized relevant evidence to suggest actions for the G20 leaders to prioritize healthy and sustainable diets and food system policies.

First, we describe the global expert recommendations for healthy and sustainable diets for people and planet. Second, we describe the results of an evidence review that includes: i) profiling the G20 countries' beef production for export revenue, domestic beef consumption and G20 support for a climate-smart pledge; ii) examining and synthesizing published evidence for the G20 countries' FBDGs and sustainable diets; iii) examining the Food and Agriculture Organization of the United Nations (FAO) database for the G20 countries' FBDG guidelines and food graphics for RPM reduction and sustainable diet recommendations compared with expert-recommended targets; and iv) analysing how the media frame RPM policies in selected G20 countries. We conclude with suggestions as to how the G20 leaders could prioritize and harmonize healthy and sustainable diet, food system and international trade policies to mitigate climate change effects.

## Global expert recommendations for a healthy and sustainable diet for people and planet

In 2015, the International Agency for Research on Cancer conducted a systematic review for the World Health Organization (WHO), concluding that red meat was a probable carcinogen and that processed meats were carcinogenic to humans (Bouvard *et al*., 2015). In 2018, the World Cancer Research Fund International (WCRFI) and the American Institute for Cancer Research (AICR) reported strong evidence that RPM intake caused colorectal cancer (WCRFI and AICR, 2018).

WCRFI and AICR (2018) define red meat as mammalian muscle meat (that is, beef, veal, pork, lamb, mutton, horse and goat), usually consumed cooked, and define processed meat as meat transformed by salting, curing, fermentation, smoking, drying and/or adding chemical preservatives (sodium and nitrates) to enhance flavour or improve preservation. Dietary RPM sources are high in saturated fat, sodium, heme and additives associated with increased risks of non-communicable diseases (NCDs), especially colorectal cancer and cardiovascular disease (WCRFI and AICR, 2018).

A 2021 systematic evidence review and meta-analysis of 13 cohort studies with more than 1.4 million people showed an 18 percent rise in the risk of heart disease for each 50 g per day increase in intake of processed meats and a 9 percent rise in heart disease risk for each 50 g per day increase in intake of unprocessed red meat (Papier *et al*., 2021). A large multi-ethnic prospective study conducted in 21 low-, middle- and high-income countries confirmed that processed meat was associated with cardiovascular mortality (Iqbal *et al*., 2021).

Figure 1 shows the global expert recommendations for eating RPM to support a healthy and sustainable diet based on the WCRFI and AICR (2018) and EAT-Lancet reports (Debries and Willett, 2021; EAT Forum, 2022a; Willett *et al*., 2019). Both reports encourage people to select daily meals that consist of minimally processed, nutrient-rich plant foods that include whole grains, vegetables, fruits and pulses or legumes (such as beans and lentils). The EAT Forum (2022a) recommends one serving of cooked lean red meat weekly. WCRFI and AICR (2018, p. 29) recommend that people "eat little, if any processed meats, and limit their intake of cooked red meat to a total of three servings (350-500 grams or 12-18 ounces) weekly", which translates into less than or equal to 26 kg, or less than 58 pounds, of red meat per person per year. Parlasca and Qaim (2022) suggest that high-income country populations should further reduce red meat to less than or equal to 20 kg per person per year.

The world faces a global syndemic, characterized by three concurrent pandemics of obesity, undernutrition and climate change, challenging the health of humans, the environment and the planet (Swinburn *et al*., 2019). The EAT-Lancet Commission (Willett *et al*., 2019) and the Lancet Commission on the Global Syndemic (Swinburn *et al*., 2019) inspired a new paradigm and language for policymakers, businesses and the public to adopt a planetary health diet to support sustainable food systems. The Global Syndemic Commission recommended that governments incorporate sustainability principles into national FBDGs and incentivize new business models that benefited the health of people while promoting economic prosperity (Swinburn *et al*., 2019). The EAT-Lancet Commission recommended that economically affluent countries adopt a planetary health diet (Loken and DeClerck, 2020; Willett *et al*., 2019).

A minimally processed diet includes fruits, vegetables, grains, legumes and meats modified by washing, cleaning and removing inedible or unwanted parts, grinding, refrigeration, pasteurization, fermentation, freezing, vacuum-packaging, baking and microwaving, either commercially or at home, to not substantially change the nutritional content (Harvard T.H. Chan School of Public Health, 2022).

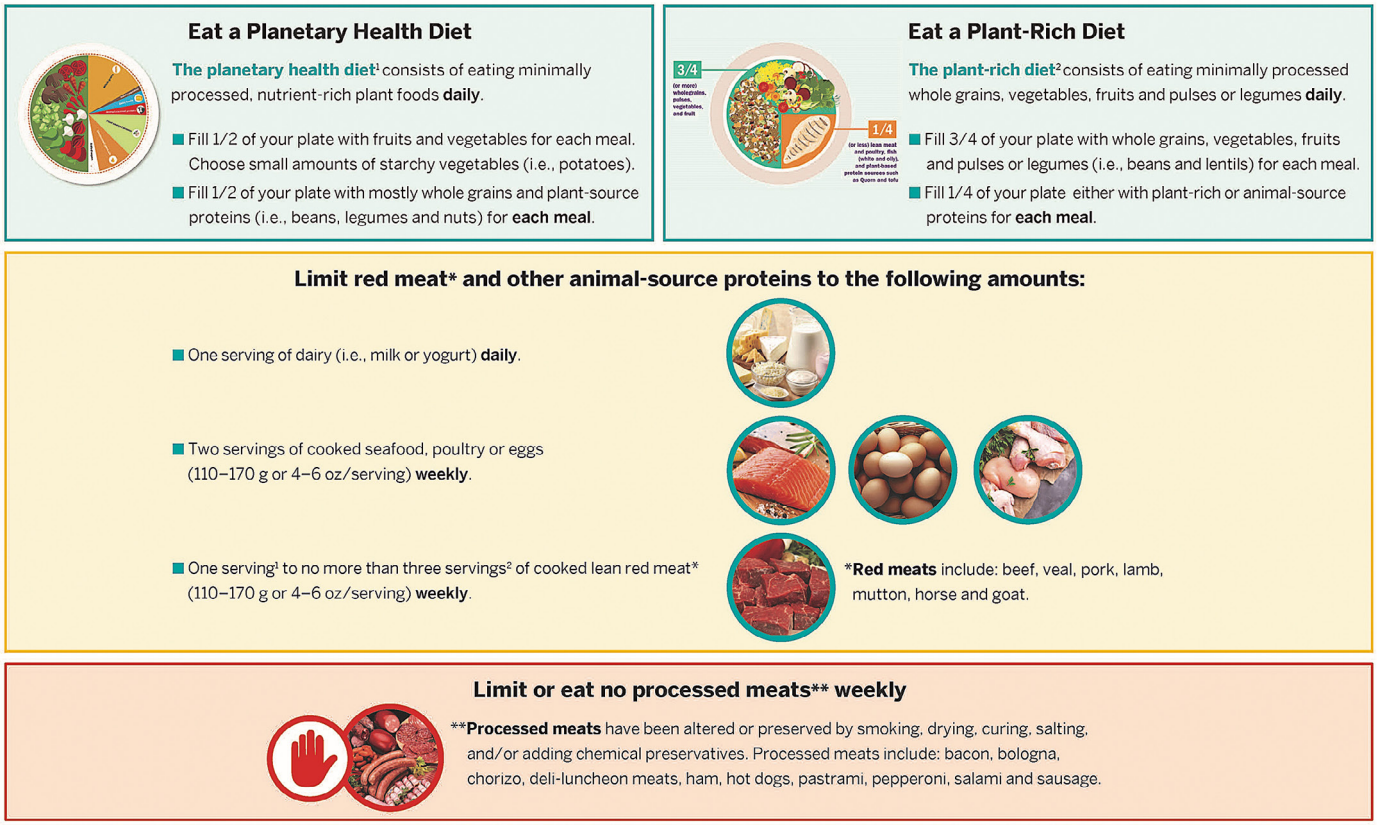
A planetary health diet recommends that people eat more minimally processed, plant-rich foods including whole grains, fruits and vegetables, legumes and nuts and fish, modest amounts of animal-source proteins, and limited amounts of unsaturated plant oils and added sugars (EAT Forum, 2022a). A planetary health diet recommends a dietary shift to reduce unhealthy foods, such as red meat, by at least 50 percent, with a recommended daily combined intake of 14 g (in a range that suggests total meat consumption of no more than 28 g per day), with variations according to region (Willett *et al*., 2019).

A plant-rich, healthy, flexitarian diet encourages people to reduce, not eliminate, red meat and other animal-source products. Governments can support people, farmers and businesses by promoting healthy flexitarian FBDG messages and creating market demand for smaller portion sizes of high-quality, sustainably produced livestock to achieve healthy people and planet (Hicks, Knowles and Farouk, 2018).

## Red meat production, export trade and red and processed meat intake for the G20 countries

Food production and food waste contribute about 20–30 percent of the GHG emissions that drive climate change (Willett *et al*., 2019). Large-scale animal agriculture for meat and dairy production is associated with inefficient resource use, adverse environmental impacts and biodiversity loss (Loken and DeClerck, 2020; Swinburn *et al*., 2019; Willett *et al*., 2019). In economically affluent and emerging economies, many people overconsume RPM, which increases NCD risks, produces methane and requires high land use (Binns *et al*., 2021; Loken and DeClerck, 2020; Swinburn *et al*., 2019). Table 1 summarizes the G20 countries' GDP (2020), red meat available for human consumption (kg per capita per year) (2018), bovine meat exports (2019) and support for the COP26 Methane Reduction Pledge (2021).

**Figure 1.** Global expert recommendations for RPM to support a healthy and sustainable diet




SOURCE: Debries, S. and Willett, W. 2021. *Sustainable Diets*. Deerfield, IL and Cambridge, MA, The Gaples Institute and Harvard T.H. Chan School of Public Health. Cited 18 July 2022. https://www.gaplesinstitute.org/sustainable-diets/
EAT Forum. 2022a. *The Planetary Health Diet*. Oslo. Cited 18 July 2022. https://eatforum.org/learn-and-discover/the-planetary-health-diet/
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WCRFI and AICR. 2018. *Continuous Update Project. Recommendations and public health and policy implications*. London. https://www.wcrf.org/wp-content/uploads/2021/01/Recommendations.pdf

**Table 1.** G20 country GDP, red meat available for human consumption, bovine meat exports and support for the COP26 Methane Reduction Pledge

| Country | GDP December 2020[1] USD billions | Red meat available for human consumption, 2018[2,3] (kg/person/year)*,** | Bovine meat exports (2019)[4] USD billions | G20 leader endorsed the COP26 Methane Reduction Pledge (2021)[5] |
|---|---|---|---|---|
| Argentina | 383 | 51.0 | 803 548 107 | Yes |
| Australia | 1 331 | 48.4 | 2 731 371 966 | No |
| Brazil | 1 445 | 38.5 | 915 089 684 | Yes |
| Canada | 1 644 | 36.4 | 1 770 889 434 | Yes |
| China | 14 723 | 37.4 | 189 003 | No |
| European Union | 15 276 | n/a | n/a | Yes |
| France | 2 630 | 54.6** | 961 899 524 | Yes |
| Germany | 3 846 | 57.4** | 1 128 804 904 | Yes |
| India | 2 623 | 1.1 | 62 265 540 | No |
| Indonesia | 1 058 | 3.4 | n/a | Yes |
| Italy | 1 886 | 54.3** | 434 854 407 | Yes |
| Japan | 4 975 | 23.6 | 131 483 290 | Yes |
| Republic of Korea | 1 631 | 41.7 | 2 625 950 | Yes |
| Mexico | 1 076 | 23.8 | 1 216 534 821 | Yes |
| Russian Federation | 1 484 | 31.3 | 4 003 126 | No |
| Saudi Arabia | 700 | 8.6 | 51 724 | Yes |
| South Africa | 302 | 18.1 | 66 134 956 | No |
| Spain*** | 1 281 | 45.2** | 684 014 417 | Yes |
| Türkiye | 720 | 14.1 | 1 048 615 | No |
| United Kingdom of Great Britain and Northern Ireland | 2 708 | 32.4 | 494 065 121 | Yes |
| United States of America | 20 937 | 50.1 | 3 493 416 197 | Yes |

* WCRFI and AICR recommendation is to limit intake of cooked red meat to three servings of 350-500 grams (g) weekly or 54 g daily or a maximum of 26 kg per person per year.
** Meat consumption data are for all meat, including chicken and other white meat sources. For all other countries includes only red meat sources (pork, beef and veal and sheep meat).
*** Spain is an invited permanent guest of the G20.

High per person red meat intake (2018) that exceeds the WCRFI and AICR recommended target of 26 kg per person per year. G20 leaders did not endorse the COP26 Methane Reduction Pledge (2021).

Low per person red meat intake (2018) below the WCRFI and AICR recommended target of 26 kg per person per year.

SOURCE: [1]Trading Economics. GDP: G20 [online database]. 2022. Cited 18 July 2022. https://tradingeconomics.com/country-list/gdp?continent=g20
[2] OECD (Organisation for Economic Cooperation and Development). 2021b. Meat Consumption [online]. Paris, OECD-FAO Agricultural Outlook. https://data.oecd.org/agroutput/meat-consumption.htm
[3] Statista Research Department. 2021. Per Capita Meat Consumption in European Countries 2015-2022 [online database]. New York. Cited 18 July 2022. https://www.statista.com/forecasts/679528/per-capita-meat-consumption-european-union-eu
[4] Observatory of Economic Complexity. Bovine Meat. Meat of bovine animals, fresh or chilled. 2019-2020. Cited 18 July 2022. https://oec.world/en/profile/hs/bovine-meat
[5] Climate & Clean Air Coalition. 2022. Global Methane Pledge: Fast action on methane to keep a 1.5° C future within reach. Washington, DC. Cited 18 July 2022 https:www.globalmethanepledge.org/

One study showed that the global increase in RPM trade contributed to an increase in diet-related NCDs, although the attributable burden of diet-related NCDs varied significantly from country to country (Chung, Li and Liu, 2021). The study also identified exporting countries responsible for increasing the diet-related NCD risks for importing countries.

Population and income growth are two important drivers of red meat consumption (Parlasca and Qaim, 2022). In 2018, the mean global intake of processed meat was 17 g per day, the mean global unprocessed red meat intake was 51 g per person per day, and a quarter of the world's population across 17 countries consumed at least one serving of red meat (100 g) daily (Miller *et al*., 2022). RPM intake was highest among affluent populations in several G20 countries (Russian Federation, Germany, Brazil, China, South Africa and the United Kingdom of Great Britain and Northern Ireland) (Miller *et al*., 2022).

Three G20 countries (Indonesia, India and Saudi Arabia) have the least red meat available for human consumption (less than 10 kilograms (kg) per person per year), while the other G20 countries have far more (on average 38.3 kg per capita per year) (Statista Research Department, 2021). This finding may be related to the sociocultural influences of national diets. In 2021, Brazil posted the largest export volume of beef cattle and veal in million tonnes; the United States of America, Australia and New Zealand ranked second, third and sixth, respectively (OECD, 2021a; 2021b). Argentina, the European Union (27 countries), Türkiye and the United States of America had the highest meat production in 2019 (OECD, 2021a). Brazil, China, the European Union and the United States of America are forecast to produce 60 percent of all global red meat by 2029 (OECD, 2021a; 2021b; 2021c).

Table 1 shows that six G20 members (Australia, China, India, Russian Federation, South Africa and Türkiye) have not yet endorsed the COP26 Global Methane Reduction Pledge to reduce GHG emissions associated with large-scale, industrialized beef and dairy production by 30 percent to decrease global warming to 1.5 to 2 degrees Celsius by 2030 (Climate & Clean Air Coalition, 2022). Australia has the highest red meat availability (48.4 kg per person per year) and has RPM reduction targets in its 2013 FBDG recommendations, but had not endorsed the COP26 Methane Reduction Pledge as of July 2022.

Based on an in-depth review of current evidence, most countries advise populations to reduce beef to expert-recommended targets. Most countries have also failed to encourage minimally processed, plant-based foods or dietary patterns aligned with the EAT-Lancet Commission report (Springmann *et al*. 2020). High-, middle- and low-income countries exceed the dietary recommendations in the 2019 EAT-Lancet Commission Report (Binns *et al*., 2021; Leme *et al*., 2021; Springmann *et al*., 2020). The reduction of RPM consumption in high-income countries could substantially promote human and planetary health (Sun *et al*., 2022). Kovacs *et al*. (2021) compared the national FBDG carbon footprints of seven countries and found that the United States of America's FBDGs had the highest, some 1.2 times greater than that of the Netherlands, 1.5 times that of Germany and 5.2 times that of India. If the global population followed current G20 consumption patterns, only India and Indonesia would have patterns aligned with planetary health boundaries (Loken and DeClerck, 2020).

## Analysis of the G20 countries' food-based dietary guidelines recommendations for red and processed meat reduction and sustainable diets

National government agencies and ministries in many countries have developed technical documents that describe FBDG recommendations for health professionals and policymakers that have been translated into FBDG food graphics for the public (Bechthold *et al*., 2018; Herforth, 2019). We analysed evidence of the G20 countries' national FBDGs for RPM compared with expert-recommended targets to promote healthy and sustainable diets and food systems. We reviewed the FAO database for the G20 countries and the primary references for each country's national FBDGs and graphic versions. We also analysed secondary evidentiary sources published in English and available on the FAO website (as of 2022). The FBDGs identified ranged from Japan (2000) to the United States of America (2020). The European Union was excluded, as only all-meat consumption data were available, except for three countries (France, Germany and Italy), which are G7 and G20 members.

Figure 2 shows the graphic FBDG versions for 16 G20 countries. Brazil, Italy and the European Union have no official food graphic versions. Figure 3 shows a global map of the G20 countries' FBDGs across the six FAO regions. Russian Federation is in the process of developing national dietary guidelines.

**Figure 2.** Graphic FBDGs for 16 of the G20 countries


SOURCE: Adapted from FAO. 2022. *Food-based dietary guidelines*. Cited 20 February 2022. Rome. https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/

**Figure 3.** Global map of the graphic FBDGs for the G20 countries


The G7 country members include: Canada, France, Germany, Italy, Japan, United Kingdom and the United Sates. The European Union is an additional participant.

**The G20 country members include:** Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, and the United States. Spain is invited as a permanent guest. The European Union is an additional participant.

Brazil, Italy, Russia and the European Union do not have official graphic FBDG for the public (FAO, 2022).

**The European Union** has 27 member countries including France, Germany and Italy that are also G7 and G20 members.

SOURCE: Adapted from FAO. 2022. *Food-based dietary guidelines*. Cited 20 February 2022. Rome. https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/

**G20 country recommendations to reduce RPM in diets**

Table 2 summarizes the findings with regard to G20 national FBDG recommendations to reduce or limit RPM intake and to adopt minimally processed dietary patterns. It shows that 12 G20 countries recommend limiting or avoiding processed meats and/or limiting meat intake daily or weekly. Five have RPM reduction targets aligned with the WCRFI and AICR 2018 recommendations to eat little, if any, processed meats and limit cooked red meat to three servings or less of 350–500 g weekly. China, Germany and South Africa recommended RPM reduction targets within 100 g of the recommended targets. Argentina, Indonesia, Japan, the Republic of Korea and the United States of America lack specific RPM reduction targets.

Seven G20 countries consumed less than 26 kg per person in 2018. Of the G20 members exceeding that amount, Argentina, the Republic of Korea and the United States of America lacked specific red meat reduction targets (Table 1). The United States of America and Australia recommend that people eat lean or low-fat meats rather than processed meats. The collective results from Tables 1 and 2 show that the top G20 bovine meat-exporting countries, apart from Mexico, lack strong RPM targets in their national FBDG recommendations.

**Table 2.** G20 national FBDGs – recommendations to reduce RPM intake and adopt a minimally processed, plant-rich dietary pattern

| Country | Most recent national FBDGs (year)<br><br>FBDG food graphic for the public (year) | Recommendations to reduce or replace RPM in dietary patterns (year)<br>Specific meat-related recommendations<br><br>WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day | Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns<br><br>Specific recommendations |
|---|---|---|---|
| **Argentina** | Guías alimentarias para la población Argentina (2016)<br><br>Gráfica de Alimentación Saludable (2016)<br><br>*Expected to be updated 2022–25* | None.<br>- Consume 130 g meat daily with a 7 percent fat content. | No explicit recommendation to limit other processed foods or to increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Australia** | Australian Dietary Guidelines (2013)<br><br>Aboriginal and Torres Strait Islander Guide to Healthy Eating (2015)<br><br>*Expected to be updated 2024–25* | Limit foods high in saturated fat, such as processed meats.<br>- A maximum of 455 g weekly (one 65 g serving per day) of lean meat is recommended for Australian adults.<br>- Processed and cured meats are high in salt and fat, not recommended as a substitute for unprocessed meat. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>Choose foods for health and sustainability and eat seasonally.<br>- Choose dietary patterns that align with the dietary guidelines to support health and reduce the environmental impact of food.<br>- Eat fruits and vegetables that are in-season to reduce environmental pressure on the food system.<br>- Alternatives to animal foods include nuts, seeds, legumes, beans and tofu. These foods increase dietary variety and can provide a valuable, affordable source of protein and other nutrients found in meats; and are important for those who follow vegetarian or vegan dietary patterns. |

| Country | Most recent national FBDGs (year)<br><br>FBDG food graphic for the public (year) | Recommendations to reduce or replace RPM in dietary patterns (year)<br>Specific meat-related recommendations<br><br>WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day | Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns<br><br>Specific recommendations |
|---|---|---|---|
| **Brazil** | Dietary Guidelines for the Brazilian Population (2015)<br><br>*No FBDG food graphic is available* | Limit the use of processed foods, including meat that is salted, smoked or cured.<br>- Avoid ultra-processed foods, including pre-prepared meat dishes and products derived from meat and animal fat.<br>- Restrict red meat to one-third of your meals and give priority to lean cuts and grilled or roasted preparation. | Make natural or minimally processed foods the basis of your diet.<br>- Natural or minimally processed foods, in great variety, and mainly of plant origin, are the basis for diets that are nutritionally balanced, delicious, culturally appropriate and supportive of socially and environmentally sustainable food systems.<br>- Limit consumption of processed foods and avoid ultra-processed food consumption. |
| **Canada** | Canada's Dietary Guidelines (2019)<br><br>Eat Well. Live Well Plate Model (2019) | Highly processed products, including processed meats, should not be consumed regularly. | Among protein foods, consume plant-based more often, in addition to regular consumption of vegetables, fruits and whole grains.<br>- Eating patterns that incorporate animal-based foods should emphasize more plant-based foods and utilize animal-based foods that are low in saturated fat, such as lean red meat and low-fat yogurts.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **China** | Chinese Dietary Guidelines (2016)<br><br>Chinese Food Guide Plate (2016)<br><br>Chinese Food Guide Pagoda (2016)<br><br>Chinese Food Guide Abacus (2016) | Smoked and cured meats should be avoided.<br>- Lean meats should be chosen over fatty meats.<br>- Weekly intake target for poultry and red meat: 280-525 g (40-75 g per day). | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **European Union*** | Not applicable | Not applicable. | Not applicable. |

| Country | Most recent national FBDGs (year)<br><br>FBDG food graphic for the public (year) | Recommendations to reduce or replace RPM in dietary patterns (year)<br>Specific meat-related recommendations<br><br>WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day | Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns<br><br>Specific recommendations |
|---|---|---|---|
| **France** | The French National Nutrition and Health Programme's Dietary Guidelines (2019)<br><br>For a More Balanced Lifestyle, Start With … (2019) | Limit the consumption of meats, while favouring poultry and limiting red meats (pork, beef, veal, mutton, lamb and offal) to 500 g per week. Limit processed meat consumption to 150 g per week. | Limit the consumption of sweetened beverages, fatty, sweet, salty and ultra-processed foods and the consumption of products with a Nutri-Score of D or E.<br><br>For a balanced lifestyle, start with more fruits and vegetables and pulses and fewer RPMs.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Germany** | Ten Guidelines of the German Nutrition Society for a Wholesome Diet (2017)<br><br>Nutrition Circle from the German Nutrition Society (2017)<br><br>*Expected to be updated 2023–25* | None.<br>- If you eat meat, you should not consume more than 300 to 600 g per week. | Choose mainly plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **India** | Dietary Guidelines for Indians - A Manual (2011)<br><br>Food Guide Pyramid (2011) | Moderate the use of animal foods.<br>- Moderate the use of animal foods containing high fat, saturated fatty acids and cholesterol.<br>- Limit/avoid organ meats. | Minimize the use of processed foods rich in salt, sugar and fats.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns.<br>- Eat fish more frequently, prefer it to meat and poultry; and limit or avoid organ meats. |
| **Indonesia** | Balanced Nutrition Guidelines (2014)<br><br>Healthy Eating Plate (2014)<br>*Piring Makanku, Porsi Sekali Makan*<br><br>Balanced Nutrition Rounded Pyramid (2014)<br>*Tumpeng Gizi Seimbang* | Eat high-protein foods (animal or vegetable sources). | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Italy** | Dietary Guidelines for Healthy Eating – Revision (2018)<br><br>Linee Guida per una Sana Alimentazione (2018)<br><br>*No FBDG food graphic is available* | Select poultry or legumes over red meat.<br>- 1–3 servings lean meat per week (1 serving = 100 g).<br>- 1 serving red meat per week recommended. | Eat more fruits and vegetables, whole grains and legumes<br>- Increase consumption of plant foods while avoiding those with a large environmental impact for growth (such as those grown overseas).<br><br>Select a sustainable diet.<br>- Avoid processed meat and limit red meat consumption, opting for poultry, plant proteins or sustainably sourced fish instead. |

| Country | Most recent national FBDGs (year)<br><br>FBDG food graphic for the public (year) | Recommendations to reduce or replace RPM in dietary patterns (year)<br>Specific meat-related recommendations<br><br>WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day | Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns<br><br>Specific recommendations |
|---|---|---|---|
| **Japan** | Dietary Guidelines for Japanese (2000)<br><br>Food Guide Spinning Top (2010) | None<br>- Eat 3-5 servings of meat and fish dishes per day. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Republic of Korea** | General Dietary Guidelines for Koreans (2015)<br><br>Korean Food Balance Wheels (2015) | None. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Mexico** | Dietary and Physical Activity Guidelines in the Context of Overweight and Obesity in the Mexican Population (2015)<br><br>El Plato del Bien Comer (2019) | Limit red meat intake to 500 g per person per week (< 300 g per person per week is even better) and, of this, as little as possible in processed form, such as salted or cured sausages.<br>- Red meat contains saturated fat and, therefore, recommended to frequently choose foods with low saturated fat content, such as lean meat, and avoid consumption of fatty meat cuts (such as ground beef, ribs, chorizo, bacon and sausages). | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Russian Federation** | No national FBDG is available**<br><br>*No FBDG food graphic is available* | Not available | Not available |
| **Saudi Arabia** | Dietary Guidelines for Saudis (2012)<br><br>The Healthy Food Palm (2012) | None.<br>- Have lean meats and meat alternatives, such as lentils, beans, chickpeas and fava beans.<br>- Eat 2–3 servings of meat per day (1 serving = 60–90 g red meat, chicken or fish; ½ cup cooked legumes). | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |

| Country | Most recent national FBDGs (year)<br><br>FBDG food graphic for the public (year) | Recommendations to reduce or replace RPM in dietary patterns (year)<br>Specific meat-related recommendations<br><br>WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day | Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns<br><br>Specific recommendations |
|---|---|---|---|
| **South Africa** | FBDGs for South Africa (2013)<br><br>The South African Food Guide (2013) | Choose lean cuts of meats rather than sausages and processed meats.<br>- Polonies, viennas, sausage meat, frankfurters, salami and bacon are high in fat and salt, so they should not be eaten too often.<br>- Trimming excess fat and reducing fat used during preparation recommended to reduce fat intake from meat.<br>- Maximum of 560 g per week (80-90g per day) of red meat should be consumed. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **Türkiye** | Turkey Dietary Guidelines (2016)<br><br>Eat Healthy, Move for Health Plate Model (2016) | Consumption of processed meats should be limited due to high saturated fat content.<br>- Recommend that half to a third of 60 g per day of total meat and poultry intake for adults come from red meat. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **United Kingdom of Great Britain and Northern Ireland** | Public Health England: Government Dietary Recommendations (2016)<br><br>Eatwell Guide (2016) | Eat less RPM.<br>- Reduce intake of RPM to ≤ 70 g per day or ≤ 490 g weekly. | Eat more beans and pulses and two sources of sustainably sourced fish weekly (one of which is oily). Eat less RPM.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |
| **United States of America** | Dietary Guidelines for Americans 2020–2025 (2020)<br><br>MyPlate (2020) | Most intake of meats and poultry should be lean or low-fat in fresh, canned or frozen form versus processed meats (such as hot dogs, ham, sausages and luncheon meats).<br>- For a 2,000-calorie diet, meat, poultry and egg intake is 26-ounce equivalents (737 g) per week.<br>- Vary your protein routine. | No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods.<br><br>No explicit recommendation to adopt environmentally sustainable dietary patterns. |

NOTE: *A review conducted by the European Food Safety Authority (2010) found that, given the differences in dietary habits, traditions, nutrient imbalances and diet-related public health challenges between European Union countries, it was not feasible to create one set of FBDGs for the entire bloc (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2010). Instead, they should be developed and implemented by country or region. The New Nordic Nutrition Guidelines (Bechthold et al., 2018) are collective dietary guidelines for the five countries in the Nordic region (Denmark, Finland, Iceland, Norway and Sweden). These guidelines encourage more calories from plant foods and fewer from meat; more foods from the sea and lakes; and more foods from the wild countryside. These countries have more recently issued specific FBDGs with environmental sustainability targets (WHO Regional Office for Europe, 2021a).

** National FBDGs for Russian Federation are being developed (E.A. Smirnova, personal communication, 2022). For a full list of the G20 countries' FBDGs, please see Annex 1.

**G20 country recommendations for minimally processed, plant-rich, sustainable diets**

Table 2 shows that six G20 countries (Brazil, Canada, Germany, India, Italy and the United Kingdom of Great Britain and Northern Ireland) recommend minimally processed, plant-rich food choices or environmentally sustainable dietary patterns. India's FBDGs recommend limiting processed foods, Germany's advocate increasing plant-based foods, Italy's recommend eating a more sustainable diet and the UK's Eatwell Guide advises eating more beans and pulses and two sources of sustainably sourced fish weekly. Brazil and Canada provide comprehensive recommendations on adopting minimally processed, plant-rich dietary patterns to improve health and environmental sustainability. These findings concur with other analyses showing that Brazil, Canada, Germany and several non-G20 European countries provide climate-smart FBDG recommendations (Bechthold *et al*., 2018; Brink *et al*., 2019; Clifford Astbury *et al*., 2021; Herforth *et al*., 2019; Loken and DeClerck, 2020).

## Media framing of G20 red and processed meat policies

There is evidence to suggest that many factors predict consumers' RPM and unprocessed ruminant meat preferences, including higher incomes, urbanization, economic and social globalization, culture, meal attractiveness and affordability (Milford *et al*., 2019). The mass media also influence policies by framing politically viable and feasible issues that will be accepted by food producers, retailers, policymakers and the public (Henderson and Hilton, 2018).

Clare, Maani and Milner (2022) examined how RPM messages were framed by six organizations representing the UK meat industry, identifying four distinct frames: "still open for debate", "most people have no need to worry", "keep eating meat to be healthy" and "no need to cut down to be green". Sievert *et al*. (2022) described the media framing messages for RPM policies in Australia, New Zealand, the United Kingdom of Great Britain and Northern Ireland and the United States of America and found a highly polarized debate between pro- and anti-meat reduction food system actors. Sievert *et al*. (2022) recommended more nuanced and context-dependent messages to address the health and environmental harms of RPM in diets. Yet, nuanced messages are unlikely to change how the public and policymakers view RPM reduction policies or to challenge the policy inertia brought about by a powerful global coalition of meat industry stakeholders that collectively perpetuate high domestic and international market supply and demand for beef products (Howard *et al*., 2021; Lazarus, McDermid and Jacquet, 2021).

The current media landscape that reports on RPM reduction and replacement policies, including strategies to promote plant-based alternative protein products, presents many challenges. RPM and animal livestock producers face a competitive marketplace with plant-based animal product manufacturers that promote thousands of highly processed, plant-based and future cell-cultured or lab-grown meat, chicken and seafood products, many containing excessive sugars, sodium and fats that are not aligned with national FBDG recommendations (Kraak, 2022).

Many alternative protein products are engineered by wealthy Silicon Valley investors (Sexton, 2020) and leading manufacturers and marketed through a web of transnational "protein industry" actors that dominate the global marketplace (Howard *et al*., 2021). Traditional meat manufacturers and retailers are also marketing alternative plant-based protein products in high- and middle-income country markets (Howard *et al*., 2021; Kraak, 2022; Sexton, 2020). There are currently no expert recommendations for the safe and healthy intake of highly processed plant-based meat analogues that may contribute to obesity and diet-related NCD risks (WHO Regional Office for Europe, 2021b). Governments must update national dietary guidelines to develop recommendations and ensure that industry meets healthy reformulation targets for these novel products (Kraak, 2022; WHO Regional Office for Europe, 2021b).

## Red and processed reduction or replacement strategies to support healthy diets and sustainable food systems

RPM reduction and replacement policies should address the production, processing, marketing and consumption of minimally processed plant-rich dietary patterns that emphasize high-quality animal and plant foods and healthy alternative protein products made from plant sources or cell-cultured meat products in place of traditional meat products. These policies have been opposed by powerful industry actors that market RPM products widely to consumers and lobby policymakers to support their interests (Sievert *et al*., 2021; Swinburn *et al*., 2019). Developing and implementing coordinated RPM reduction and replacement policies will address policy inertia to reverse the obesity and diet-related NCD burden in countries in the context of the global syndemic (Swinburn *et al*., 2019).

Examples of RPM reduction and replacement policies include: i) updating national FBDGs to align with RPM targets; ii) reducing RPM products served in public institutions that align with revised school meal standards for children; iii)

taxing RPM products and redirecting red meat subsidies to increase the production of fruits and vegetables, legumes, nuts and healthy alternative protein products; and iv) implementing media campaigns that promote healthy and sustainable diets (Wilde *et al*., 2019; WHO Regional Office for Europe, 2021a). Many current strategies used in different settings include reducing portions to standard serving sizes of sustainably produced meats, redesigning menus and recipes with plant-rich, alternative proteins, menu labelling and point-of-sale prompting to communicate the benefits of plant-rich products (Bianchi *et al*., 2018; Blondin *et al*., 2022; Stiles, Collins and Beck, 2022).

The G20 leaders could prioritize policies across the food, agriculture, nutrition, public health, land-use and international trade sectors to reduce the exportation, marketing and consumption of RPM to protect the health of people and the planet (Chung, Li and Liu, 2021; Kim *et al*., 2020; Sun *et al*., 2022). This recommendation aligns with the sixth IPCC (2022) summary report, which encouraged policymakers to promote demand-side strategies to shift to balanced, sustainable healthy diets.

Many G20 countries face geopolitical challenges and lack adequate resources to update national FBDGs on a frequent basis with the best available evidence. The G20 is an opportunity to address human and planetary health and to effectively manage the sustainability trade-offs associated with meat production and consumption (Parlasca and Qaim, 2022). The national academies of the G7 and G20 countries could publish joint statements to advise leaders to update national FBDGs to reflect expert recommendations for healthy and sustainable dietary patterns and assess the trade-offs for harmonizing complex international trade and food system policies to mitigate climate change (German National Academy of Sciences, 2022).

The G20 process and meeting in Indonesia (2022) will address COVID-19 mitigation through the global health architecture, sustainable energy transition and digital transformation (G20 Indonesia 2022, 2022). Despite competing geopolitical issues, the G20 process and meetings scheduled in India (2023) and Brazil (2024) could prioritize healthy and sustainable food systems that align with the 2015 Paris Agreement and 2030 Agenda.

The 2024 G20 meeting in Brazil could prioritize harmonizing RPM reduction policies with international trade, human health, protecting ecosystems and promoting sustainable food systems. Brazil is the world's largest beef cattle exporter, to 152 importing countries, earning more than USD 5.4 billion dollars annually, with 70-80 percent of Amazon deforestation attributable to beef production (Zu Ermgassen *et al*., 2020). The United States of America is the second-largest importer of Brazilian beef, making its government and American consumers complicit in the destruction of Brazil's rainforest due to lucrative cattle ranching (McCoy and Ledur, 2022). Brazil's export policies do not align with the domestic FBDG recommendation of minimally processed, plant-rich dietary patterns. While it is a politically sensitive issue, the global trade of live cattle and red meat could be framed as a deforestation commodity produced by a large-scale network of beef stakeholders that has detrimental impacts on the environment and health of importing countries (Chung, Li and Liu, 2021; McCoy and Ledur, 2022; Zu Ermgassen *et al*., 2020).

Municipal actions may influence national policies. Several cities in eight G20 countries (Seoul, Tokyo, Paris, Milan, London, Guadalajara, Toronto, New York City and Los Angeles) have pledged to align their food procurement policies with the planetary health diet and shift municipal food systems away from unsustainable practices by 2030 (EAT Forum, 2022b). Public support for diverse coalitions could persuade the G20 leaders to harmonize national FBDGs with RPM policies to address undernutrition, diet-related NCDs and climate action. Mobilizing youth to use media advocacy and digital activism (de Moor *et al*., 2021) could encourage the six G20 members that have not endorsed the 2021 Global Methane Reduction Pledge (Table 1).

Agrifood and beverage industry businesses should substantially improve their GHG emissions reporting, corporate protein disclosures and climate mitigation commitments to support the 2015 Paris Commitment and 2030 Agenda (Lazarus, McDermid and Jacquet, 2021; World Wildlife Fund, 2022). Food service providers could use marketing-mix and choice-architecture strategies to promote affordable, convenient and minimally processed plant-rich, nutrient-dense, ready-to-eat meals that support a healthy flexitarian dietary pattern (Culinary Institute of America and Harvard T.H. Chan School of Public Health, 2021; Stiles, Collins and Beck, 2022). Future research could examine multi-setting, multi-sector strategies to promote healthy, equitable and sustainable diets and food systems. Lastly, the United Nations Development Programme (UNDP) and Oxford University could include RPM reduction and replacement policies in future Climate Vote Surveys to inform climate-smart actions (UNDP and Oxford University, 2021a; 2021b).

## Conclusions

The G20 leaders have an opportunity to transform nutrition by updating and harmonizing national FBDGs with

comprehensive RPM reduction and replacement policies to support climate-smart sustainable food systems. The G20 process could mitigate the health and environmental effects of climate change and reduce NCD risks while managing sustainability trade-offs. This paper shows that many G20 countries have recommended that people limit or avoid eating RPM or limit total red meat intake through national FBDGs.

This paper further finds that five countries have RPM targets aligned with global expert recommendations. Brazil and Canada have national FBDGs that explicitly recommend adopting minimally processed, plant-rich dietary patterns to promote health and environmental sustainability. While it examined RPM recommendations within the context of healthy and sustainable diets, future research should carefully consider each country's food system opportunities and challenges to achieve healthy and sustainable dietary targets. The G20 process and meetings in Indonesia (2022), India (2023) and Brazil (2024) could assist by prioritizing and harmonizing sustainable food system policies with international trade policies to mitigate climate change while managing sustainability trade-offs.

## ANNEX 1: G20 NATIONAL FOOD-BASED DIETARY GUIDELINES

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**CHINA**

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**RUSSIAN FEDERATION**

There are currently no official national FBDGs or graphic versions. National FBDGs are being developed.

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*Three countries are members of the G7, G20 and European Union: France, Germany and Italy.*
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