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PROGRAMME COMMITTEE

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Contribution of terrestrial animal source food to healthy diets for improved nutrition

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EXECUTIVE SUMMARY

- Malnutrition, in all its forms, is a persistent and increasing global concern. Malnutrition is one of the largest contributors to human disease and premature death in the world. Animal source foods provide energy and many essential nutrients such as high-quality protein, fatty acids and micronutrients (vitamins and minerals).
- At its 27th Session in October 2020, the Committee on Agriculture (COAG) requested the Food and Agriculture Organization of the United Nations (FAO) “to produce a comprehensive, science and evidence-based global assessment of the contribution of livestock to food security, sustainable food systems, nutrition and healthy diets”¹ (referred to as the Assessment). The COAG Sub-Committee on Livestock oversees the development of the Assessment, and its First Session discussed and welcomed the proposed approach, scope, content, timeline, stakeholder involvement and required resources of the Assessment.
- To ensure a comprehensive analysis, the Assessment will develop four component documents covering all aspects impacting agrifood systems, including nutrition and health risks and benefits, consumption of terrestrial animal source foods (TASF), drivers of TASF supply and demand, and livestock production systems highlighting linkages, benefits, synergies and tradeoffs across social, economic and environmental dimensions of sustainability.
- This document presents Component Document 1 of the Assessment titled Contribution of terrestrial animal source food to healthy diets for improved².
- Key findings of Component Document 1 of the Assessment are summarized below:
 - i. The contribution of TASF to dietary patterns varies substantially across different agrifood systems and populations, with some populations showing very high intake and others very low intake.
 - ii. Current scientific evidence is mostly concentrated on the contribution of TASF to nutrition and health outcomes of women during pregnancy, children, adolescents and adults. There is a significant gap in the evidence for older adults, especially from low and middle-income countries.
 - iii. Most scientific evidence for nutrition and health outcomes relates to the contribution of milk and dairy products, followed by red meat (primarily beef) and eggs. There have been fewer studies on other TASF.

Most policy recommendations on the consumption of TASF are qualitative. They do not propose quantitative recommended consumption levels or address the health implications of consumption above or below any specific level.
- Food-based dietary guidelines may be leveraged to recommend TASF as part of healthy diets to ensure that health and nutritional risks and benefits are considered across a diversity of contexts. Targeted research is needed to fill the evidence gaps, especially in low-income countries.

¹ <https://www.fao.org/3/ne021en/ne021en.pdf>, para 14.

² FAO. 2023. Contribution of terrestrial animal source food to healthy diets for improved nutrition and health outcomes – An evidence and policy overview on the state of knowledge and gaps. Rome, FAO. <https://doi.org/10.4060/cc3912en>

GUIDANCE SOUGHT FROM THE PROGRAMME COMMITTEE

- The Programme Committee is invited to review the content of the document and provide guidance on this matter as deemed appropriate.

Draft Advice

The Committee:

- **welcomed Component Document 1 of the Assessment, entitled Contribution of terrestrial animal source foods (TASF) to food security, sustainable agrifood systems, nutrition and healthy diets;³ and**
- **recognized the gaps in evidence on the contribution of the wide range of TASF to healthy diets and encouraged FAO to work in partnership with national and international academic and research partners for evidence generation to fill critical gaps in evidence and knowledge.**

³ FAO. 2023. Contribution of terrestrial animal source food to healthy diets for improved nutrition and health outcomes – An evidence and policy overview on the state of knowledge and gaps. Rome, FAO. <https://doi.org/10.4060/cc3912en>

I. Background

1. Malnutrition takes many different forms, including undernutrition (i.e., child stunting and wasting, micronutrient deficiencies), overweight and obesity. Poor quality diets are the leading cause of disease and death and are responsible for 22 percent of premature deaths among adults worldwide.⁴

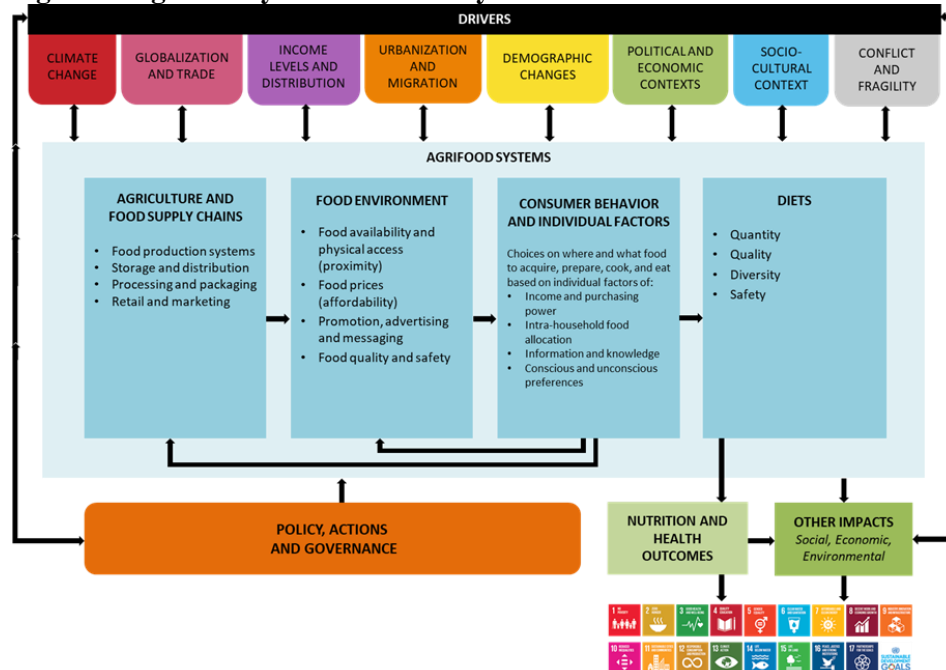
2. Humans have specific nutrient demands at critical stages of their life course. For example, infants, children and adolescents have higher demands for some of the essential nutrients, such as high-quality proteins, important fatty acids, vitamin B12, calcium, iron and zinc, important for growth and cognitive development.

3. TASF contribute 34 percent of protein, importantly high-quality proteins, 17 percent of calories available for consumption,⁵ and essential fatty acids and various vitamins and minerals including iron, zinc, selenium, Vitamin B12, choline and calcium, among others. However, this contribution is not equally distributed among regions, gender and income levels.

4. At its 27th Session in October 2020, the Committee on Agriculture (COAG) requested the Food and Agriculture Organization of the United Nations (FAO) “to produce a comprehensive, science and evidence-based global assessment of the contribution of livestock to food security, sustainable food systems, nutrition and healthy diets”.⁶ The first session of the COAG Sub-Committee on Livestock discussed and welcomed the proposed approach, scope, content, timeline, stakeholder involvement and required resources of the Assessment.⁷

5. The Assessment applies an agrifood systems approach (see Figure 1) and a One Health perspective. This is intended to provide balanced and holistic guidance to support the sustainable transformation of the livestock sector to best contribute to the 2030 Agenda for Sustainable Development.

Figure 1. Agrifood systems for healthy diets⁸



⁴ Afshin, A., Sur, P.J., Fay, K.A., Cornaby, L., Ferrara, G., Salama, J.S., Mullany, E.C., *et al.* 2019. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184): 1958–1972. [https://doi.org/10.1016/S0140-6736\(19\)30041-8](https://doi.org/10.1016/S0140-6736(19)30041-8)

⁵ FAO. 2018. *World Livestock: Transforming the livestock sector through the Sustainable Development Goals*. Rome, FAO. 220 pp. (also available at <https://doi.org/10.4060/ca1201en>).

⁶ COAG 27 Report <https://www.fao.org/3/ne021en/ne021en.pdf>, para 14

⁷ <https://www.fao.org/3/ni005en/ni005en.pdf>

⁸ FAO. 2021. Vision and Strategy for FAO’s Work in Nutrition. PC 130/5 Rev.1.

II. Methodological approach

6. Component Document 1 of the Assessment focuses on the contribution of TASF to healthy diets for improved nutrition and health, highlighting the state of knowledge and gaps. By TASF, FAO refers to all food products derived from livestock production systems of any scale and from wild animals. The document is organized around five sections:

- a. Section A presents the world nutrition situation and trends in TASF supply and TASF consumption among children from 6-23 months, highlighting evident disparities across countries as well as income population groups.
- b. Section B presents the nutrient composition and value of a great variety of TASF and describes if and how the nutritional quality can be influenced by (in order of priority) animal species and feeding systems, breed and production environment.
- c. Section C presents the evidence on the effects of TASF on health and nutrition over the life course of people and provides an overview of policy recommendations on TASF consumption, mostly based on national Food Based Dietary Guidelines.
- d. Section D presents the evidence on food safety and food borne diseases and highlights existing gaps.
- e. Section E provides an overview of emerging topics of interest related to TASF.

7. Methods for assessing the effects of TASF in terms of health benefits and risks followed PRISMA⁹ guidelines for conducting systematic reviews. Using the Population Intervention/Exposure Comparator Outcome framework, the inclusion criteria were: population (apparently healthy populations falling into the respective life course phases); intervention/exposure (consumption of TASF, mostly unprocessed); comparator (usual diet, TASF at different levels, other foods); outcome (nutrition and health outcomes including anthropometry and growth, biomarkers of nutrient and/or health status, neurological function and development, morbidities, sensitivities and allergies, all-cause and cause-specific mortality). Studies included systematic reviews, meta-analyses, experimental and quasi-experimental trials, and observational studies. Studies of high-quality evidence were identified applying the GRADE¹⁰ domains of risk of bias, imprecision, indirectness and publication bias.

8. A desk review was undertaken of 123 food-based dietary guidelines (FBDGs) from 94 countries, 79 policy documents from 60 countries relating to non-communicable diseases (NCDs) and legislation, policies and programmes related to both food and agriculture and nutrition (35 documents). Documents were considered in all languages as published and categorized by country, region, quantitative/qualitative status, target group within the life cycle and document type. Moreover, documents were screened on the mentioning of recommendations linked to human micronutrient needs, overweight, obesity and diet related NCDs, environmental sustainability considerations (for example, if recommended serving sizes are based on environmental considerations), a life course approach (with a focus on meeting the needs of nutritionally vulnerable individuals). In addition, the review made note of references to an emerging topic of concern - animal welfare.

III. Key Findings

9. This section presents the main findings from the literature review conducted for Component Document 1 of the Assessment, starting with the nutrient and bioactive content of TASF:

- a) TASF provide high-quality proteins compared with other foods. Specific amino acids and bioactive factors with roles in human health may only be found in TASF (i.e., carnitine, creatine, taurine, hydroxyproline and anserine). Long-chain fatty acids and the ratios of essential fatty acids found in TASF are important for cognition, particularly across the human life course.

⁹ PRISMA stands for: Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

¹⁰ GRADE stands for: Grading of Recommendations, Assessment, Development, and Evaluations

- b) Iron and zinc are more easily absorbed (“bioavailable”) from TASF than from plant-based foods. Milk is well recognized for its concentration and bioavailability of calcium among other nutrients. Eggs have high concentrations of essential nutrients such as choline and some long-chain fatty acids. Generally, TASF are also a rich source of selenium, vitamin B12 and choline. Consumption of TASF has been shown to counteract effects of anti-nutrients (i.e., factors that limit the absorption of nutrient, for example phytate) which are commonly found in some plant-based foods.
10. Effects of TASF on nutrition and health across the human life course:
- a) Dietary intakes of TASF can affect nutrition (nutrient status, anthropometry), health (infectious disease, chronic disease, bone health) and cognition (development, neuroprotection, neurological disease prevention) but many factors influence these effects including type of TASF, life stage, among others.
- b) Across all life course phases – which include women during pregnancy and when breastfeeding, infants and young children, school-age children and adolescents, adults and older adults – the majority of evidence comes from trials assessing milk and dairy products on a variety of outcomes. Beef and eggs follow in terms of availability of evidence, with fewer studies available on pig and poultry meat, meat from wild animals, insects and meat from other less common species.

Studies exploring health benefits

- c) *Milk and milk products*: evidence is available from milk and dairy (yoghurt and low-fat dairy particularly) consumption showing positive nutrition and health outcomes among pregnant women (on birth weights of infants), school age children and adolescents (on increased height and reduced adiposity), adults (reduced risks for all-cause mortality, hypertension, stroke, obesity, type 2 diabetes, colorectal and breast cancers, osteoporosis and fractures) and older adults (on mitigating sarcopenia, fractures, frailty, dementia and Alzheimer’s disease).
- d) *Red meat and eggs*: a fairly strong evidence-base from high-income countries shows positive effects of lean red meat consumption on muscle mass health of older adults. Robust evidence shows that the intake of muscle meat is positively associated with the iron status in adults. Evidence suggests that, among all women of reproductive age in any context, two eggs per day can provide high proportions of recommended nutrient intakes, particularly for choline, selenium and Vitamin B12.
- e) *Studies with mixed TASF types*: systematic reviews point to some benefits of TASF intake among infants and young children in terms of increased height/length and weight. However, the mixed results from studies in different countries highlight the importance of considering the overall child diet and other contextual factors that affect child growth and development when assessing the relationships between TASF and child nutritional outcomes.
- f) *Studies among older adults*: significant gaps remain in the evidence base for the older adults. Preliminary evidence, however, suggests the potential for milk and dairy products and possibly other TASF in mitigating impacts on sarcopenia, fractures, frailty, dementia and Alzheimer’s disease.

Studies exploring health risks.

- g) *Milk and milk products*: evidence on the association between milk consumption and coronary heart diseases is inconclusive.
- h) *Eggs and poultry meat*: evidence of consumption of eggs on blood cholesterol in association with coronary heart disease, stroke and hypertension in healthy adults, is not significant. Evidence on consumption of poultry meat in association with stroke is not significant.
- i) *Red meat*: synthesized findings from risk analyses show that consumption of modest amounts of unprocessed red meat (ranging from 9 to 71 g/d) has minimal health risk. For processed red meat, however, very low levels of consumption can elevate risk of mortality and chronic disease outcomes, including cardiovascular disease and colorectal cancer.

- j) *Potential allergens*: cow's milk, and poultry eggs are among the eight food groups that pose allergenic risks, but there is no evidence that avoiding such foods during infancy can delay or prevent hypersensitivity or allergic reactions.
11. Food safety and food-borne disease issues of TASF
- a) One third of the food-borne disease burden is associated with the consumption of contaminated ASF, mainly linked with bacterial causes and diarrhoea. While evidence on food-borne disease hazards and health outcomes as well as risk analysis methods are well documented, knowledge of the national burden (incidence and severity) is lacking. For example, main transmission routes along the value chain are crucial to target national policies but are not well understood.
- b) Changing agricultural practices, especially related to the intensification of livestock production and inputs use, lengthening, and broadening of value chains and shifts towards consumption of processed food, contribute to increasing exposure to food-borne disease hazards. Antimicrobial resistance presents additional challenges.
12. Recommendations on TASF consumption as part of policy and related documents:
- a) Most recommendations mention TASF in general, while others include specific types of TASF, most commonly meat, milk and dairy products and eggs. Few recommendations cover other TASF such as offal, poultry, pig meat, meat from wild animals and insects.
- b) Most recommendations on TASF consumption are linked to human micronutrient needs and prevention of NCDs and are targeted to the entire population. Micronutrient-related recommendations tend to be more detailed compared with NCD-related recommendations, providing recommended quantities for daily or weekly TASF intake.
- c) The majority of recommendations (282 of 378 identified) on TASF consumption were included in food based dietary guidelines (FBDGs). Recommendations in FBDGs were either qualitative or quantitative, but recommendations in FBDGs of high-income countries were more detailed.
- d) Environmental sustainability of TASF consumption was only included in documents from eight middle-high-income countries and mostly provided qualitative recommendations. Animal welfare was only mentioned in two FBDGs.
13. Emerging topics related to TASF consumption:
- a) *Microbiome*: gut microorganisms can mediate effects of diet on human health whereby high intakes of red meat and processed meat may increase inflammation, while fermented dairy products may reduce inflammation.
- b) *Insects*: can be sources of many essential nutrients (e.g., iron and zinc) and could be an environmentally sustainable option. More research is needed for food safety and overcoming cultural barriers.
- c) *Plant-based and cell-cultured "meat" alternatives*: evidence suggests that some plant-based "meat" alternatives may be deficient in some essential nutrients while being high in fat, sodium, and sugar. More research is needed to understand environmental impacts and food safety.
- d) Going beyond the usual outcomes studied in relation to TASF consumption, nutrigenomics offers insights into nutritional quality and safety. Targeted metabolomics studies in Ecuador and Malawi showed impacts of eggs on important biomarkers in child plasma.

IV. Dissemination efforts and products

14. Component Document 1¹¹, launched in April 2023, has received a high overall attention¹², especially from social media and news outlets and with the highest coverage in the United States of America, followed by Latin America, Europe, parts of South Asia and East Asia and some countries in Africa. The launch was accompanied by a FAO press release in the languages of the Organization.¹³

15. Seven infographics¹⁴ were developed based on Component Document 1 and are used for communication purposes during global campaigns like the World Milk Day and FAO Livestock Twitter channel¹⁵. The communication activities resulted in more than 400 news articles.

16. Findings of Component Document 1 of the Assessment were discussed at a COAG 28 side event titled “Policies shaping consumption of terrestrial animal source food in the context of healthy diets” on 20 July 2022¹⁶. For this occasion, key messages were published in a brochure.¹⁷ Component Document 1 was launched at a side event entitled “Contribution of Terrestrial Animal Source Food to Healthy Diets for Improved Nutrition and Health Outcomes – An Evidence and Policy Overview on the State of Knowledge and Gaps” on 25 April 2023¹⁸ on the margins of the 172nd Session of the Council. Findings from Component Document 1 were presented at the FAO Global Conference on Sustainable Livestock Transformation scheduled from 25-27 September 2023¹⁹.

III. Conclusions and recommendations

17. The COAG Sub-Committee on Livestock at its First Session recommended COAG to encourage Members to consider the impact of livestock policies, programmes and legislative frameworks on nutrition outcomes and to update national FBDGs so that they adequately consider TASF and specific nutrient requirements during the life course of humans.²⁰ This recommendation was endorsed by the 28th Session of COAG²¹.

18. Component Document 1 provides an objective and thorough review of the evidence of the benefits and risks for human health associated with TASF intake.

19. The findings reveal some gaps in the evidence and in the recommendations in policy documents, as summarized below:

¹¹ <https://www.fao.org/documents/card/en/c/cc3912en>

¹² The Altmetric systems tracks media attention to a publication. On 5 September 2023, Component Document 1 was mentioned by 1395 sources, implying substantial interest in a variety of outlets (please see visualization and categories by media type here <https://fao.altmetric.com/details/146511665>)

¹³ <https://www.fao.org/newsroom/detail/meat-eggs-and-milk-essential-source-of-nutrients-new-fao-report-says-250423/en>

¹⁴ [Milk supplies essential micronutrients and contributes to healthy diets](#)

[Eggs supply essential nutrients and contribute to healthy diets](#)

[Animal source foods are rich in iron, a micronutrient essential to life](#)

[Animal source foods contribute to healthy diets](#)

Animal source foods contribute to healthy diets over the life course:

[Pregnant and lactating women & infants and younger children](#)

[School-age children and adolescent](#)

[Adults and older adults](#)

¹⁵ <https://twitter.com/faolivestock?lang=en>

¹⁶ <https://www.fao.org/coag/coag-28/side-events/en/>

Wednesday 20 July, 12:15-13:45 CEST; Policies shaping consumption of terrestrial animal source food in the context of healthy diets; [Webcast](#) | [Agenda](#): [AR](#) [CH](#) [EN](#) [ES](#) [FR](#) [RU](#) | [Brochure](#)

¹⁷ <https://www.fao.org/documents/card/en/c/cc0946en>

¹⁸ <https://www.fao.org/about/meetings/council/cl172/side-events/en/>

¹⁹ <https://www.fao.org/events/detail/fao-global-conference-on-sustainable-livestock-transformation/en>

²⁰ <https://www.fao.org/3/ni966en/ni966en.pdf>, para 14

²¹ <https://www.fao.org/3/nj925en/nj925en.pdf>, para 10

- a) A deeper understanding is required of the interactions of TASF nutrients and bioactive compounds in dietary patterns to further characterize the role of TASF in terms of nutrition, health and cognitive outcomes over the life course.
- b) There is still a gap in the literature on the frequency and quantity of TASF in healthy diets for several life course phases. It appears that a significant part of the current evidence was generated in response to questions largely focused on the potential of TASF, especially red meat, milk and dairy products, to increase the risk of NCDs. There are significantly less studies on the effects (risk or benefit) of meat from pigs, poultry, goats, sheep, wild animals and from insects.
- c) National FBDGs should be updated to adequately consider TASF and specific nutrient requirements during the life course, where not yet considered. Recommendations should consider the implications of consuming TASF below or above recommended intakes given the coexistence of micronutrient deficiencies and NCDs.
- d) With such quantitative intake recommendations included, national FBDGs could be used to better inform livestock policies and programmes to prioritize and enhance the availability of recommended foods with potential to benefit nutrition outcomes.

20. There is ever increasing attention being given in the public domain to how TASF may affect health and contribute to environmental impacts arising from livestock production. In this context, Component Document 1 provides an objective and thorough review of the evidence of the benefits and risks for human health associated with TASF intake, which will be complemented by the forthcoming three component documents which will examine the factors determining demand for, and supply and consumption of, TASF (Document 2); livestock-sector benefits, trade-offs and synergies with respect to food security and sustainable agrifood systems (Document 3); and opportunities for transforming the livestock sector sustainably to optimize food security and nutrition (Document 4). Ultimately, all four documents will be combined into a high-level synthesis document on the contribution of livestock to healthy diets, nutrition and sustainable agrifood systems.