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Animal and Plant Sourced Proteins as Part of a Balanced Human Diet

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Executive Summary

The global demand for food protein is rapidly evolving, driven by population growth, rising living standards, and changing dietary preferences. This issue paper explores the nutritional, environmental, and societal dimensions of global protein consumption, offering a up-to-date comprehensive analysis of protein sources, consumption patterns, and their implications for human health and well-being.

Currently, plant-based proteins — including grains, legumes, nuts, and seeds — account for approximately 60% of the total global protein supply, while animal-sourced proteins — such as meat, poultry, fish, dairy, and eggs — account for the remaining 40%. Protein intake varies significantly across regions, with high-income countries consuming large amounts of animal proteins and many low-income countries relying heavily on plant-based sources. Despite the overall global protein supply of roughly 85 g per capita per day, disparities persist, leaving populations in parts of Africa, South and Southeast Asia, and some South American countries — nearly 60% of the world population — at risk of protein deficiency and malnutrition.

Protein production carries significant environmental costs. Inefficiencies in feed conversion, nutrient losses, and incomplete recycling contribute to nitrogen emissions, water pollution, greenhouse gas emissions, land use pressure, and deforestation. Animal protein production, particularly from ruminants, is associated with higher methane emissions, while intensive plant protein production may involve intensive fertilizer use, water consumption, and monocropping issues.

Addressing global protein needs requires a multifaceted approach. Sustainable agricultural practices, precision diet formulation for livestock, reducing food and feed losses, increasing byproduct use, and promoting alternative protein sources for humans and livestock can help mitigate environmental impacts while ensuring an adequate protein supply. Emerging protein sources, including insects, algae, and cultured plant (or even animal) proteins, potentially offer sustainable production but require further evaluation regarding nutrient quality, environmental impact, and societal acceptance.

The nutritional quality of protein foods depends heavily on their amino acid **(AA)** composition and bioavailability. Animal proteins generally provide a more balanced essential amino acid **(EAA)** profile, higher digestibility, and some unique compounds (such as taurine and creatine). By contrast, plant proteins, while widely accessible and arguably more environmentally favorable, are limited in certain EAAs such as lysine, threonine, tryptophan, and sulfur-containing AAs. This paper emphasizes the importance of complementary protein strategies — combining different plant sources (e.g., beans with grains) or incorporating dairy and eggs — to achieve adequate EAA balance, particularly for vegetarians and vegans. Attention to micronutrients such as vitamin B12, iron, calcium, iodine, and omega-3 fatty acids is also essential when relying heavily on plant-based diets. For a rule of thumb, a complementary mix of animal and plant proteins is highly recommended to achieve optimal health and growth, with current evidence suggesting a rough ratio of 65–75% animal protein and 25–35% plant protein.

In conclusion, ensuring global food security and environmental sustainability does not depend on any rigid distinction between animal and plant proteins, but depends on optimizing the nutritional value (especially, the AA balance), accessibility, and ecological efficiency of all protein foods. Public education on protein quality, complementary protein strategies, and balanced nutrient intake tailored to individual health needs and regional availability is critical to prevent malnutrition and optimize health outcomes. A long-term solution does require coordinated efforts from policymakers, researchers, producers, and consumers to promote sustainable production and informed dietary choices.