

1 **The value of animal-sourced foods**

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8 **Under the current political and regulatory environment, animal-sourced foods will** 9 **remain part of the least-cost nutritious diet in the United States.**

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11 The consumption of animal-sourced foods (ASF) is controversial, drawing debate between defenders
12 and critics of livestock farming, and capturing public and media attention. This debate is important for
13 the pressing challenges that globalisation poses to our health and our planet. ASF are central
14 components of human diets, and therefore many regulatory bodies should employ clearer evidence of
15 the multiple impacts of different diets.

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17 Chungchunlam and colleagues developed an optimisation model that selects food items that meet the
18 nutrient requirements of a healthy adult in the USA. The model finds the minimum cost food pattern,
19 within constraints of certain nutrients and number of servings. This study tested whether the cheapest
20 diet would include ASF and how this diet would compare to plant-based diets. The least-cost food
21 pattern was found to contain a large amount of milk (703 g per day), a generous portion of legumes,
22 and carbohydrate-rich foods such as rice, tortillas, and bread. Given the current prices of cow's milk,
23 this product seems a good choice to save on food bills and to obtain protein and precious vitamins and
24 minerals. Because of the geographic focus of this study, the least-cost food pattern includes few food
25 types and a surplus of carbohydrates. ChooseMyPlate, the US government dietary guideline,
26 recommends consumers to fill half of their plates with vegetables and fruits; this recommendation was
27 not included in the analysis, and could have led to a different least-cost diet.

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29 The value of ASF is at the centre of this analysis and the debate. Value is a social construct that
30 reflects what is important and useful to society. The price of a product is the result of a market
31 environment with regulations and imperfect competition. Prices do not always reflect value. In many
32 high-income countries like the USA, the prices of ASF are influenced by government support² with
33 subsidies financing the production of grains – a substantial amount of which is fed to livestock³. If
34 society would decide to act upon climate change, the price of ASF should increase to reflect its high
35 environmental cost. Chungchunlam and colleagues call for an examination of environmental impact
36 against nutrient density and sociocultural value of ASF. Close scrutiny is indeed required to design
37 interventions that are also effective to mitigate climate change. Brambila-Macias et al.⁴ have showed

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38 that regulation of food advertisements and information campaigns to reduce unhealthy eating have
39 had meagre effects on dietary choices. Policies that target the market through fiscal measures or food
40 standards tend to be more effective, though disliked by the public⁵.

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42 Attaching the right value to ASF would imply recognising their nutritional properties and cultural
43 role, accounting for low environmental impact, and ensuring animal welfare. This value would be
44 reflected in a just price. Dairy farmers in many countries struggle to make ends meet, and without
45 financial support many would go bankrupt. In particular, the right value of milk is, arguably, that
46 associated with small herds of cows producing a high quality product while enjoying high levels of
47 wellbeing. This scenario would likely be valued by consumers, and would allow highly nutritious
48 plant-based products like soya to be consumed by humans and not animals. Increasing the quality of
49 plant-based alternatives to ASF can increase diet diversity and help moderate the consumption of
50 carbohydrates.

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52 From a health and environmental sustainability perspective, excluding ASF from people's diets may
53 not be needed, and there are co-benefits from livestock farming which include their positive effects on
54 plant diversity⁶ and on local economies⁷. Chungchunlam and colleagues show that small increases in
55 the prices of ASF might influence the choice of other food items, adding diversity and marginally
56 increasing the daily cost of food (from \$1.98 to 2.14 per adult). A drastic reduction of ASF in our
57 diets might lead to the purchase of more expensive food alternatives. This could change as innovation
58 in the agrifood industry leads to lower prices for plant-based products. The conclusions of the study
59 cannot be generalised as they apply to food prices in the USA in 2009-2010, with a large gap in price
60 between cow milk (about \$1.0 per litre) and soya milk (\$1.9 per litre). In the UK, for instance, this
61 gap is smaller, with cow milk (£0.48 per litre) and soya milk (£0.59 per litre) being traded at similar
62 prices in some supermarkets. Soya milk is an increasingly accepted alternative to cow milk as
63 continuous technological advances improve its sensory properties⁸. Soya milk has protein
64 concentrations similar to cow milk (3.5-3.7%) and is a more stable product than other plant-based
65 milks, which explains why soya-based products have been the most common substitutes⁹. Additional
66 small substitutions in diets could bring sizeable environmental benefits¹⁰.

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68 The debate between supporters and critics of livestock farming is likely to continue. Science has an
69 important role to play in assessing proposed solutions. Policies aimed at just prices must be aligned
70 with interventions to raise public awareness around the value of ASF as nutrient-dense foods to be
71 consumed with moderation. Further research on alternatives to feed the human population with lower
72 impacts is required. A just price will cover the costs and generate reasonably good returns, removing
73 the perception of low value that might influence consumption. These prices will reflect the high
74 nutritional value of ASF and embed some of the externalities resulting from their production¹⁰.

75 **References**

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88 Photograph caption: A small herd of grazing cows in a small farm of NW England. Credit:
89 Mariana Rufino