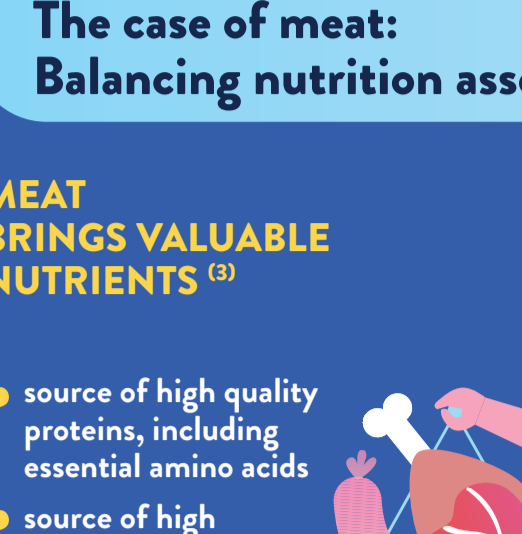


How to ensure nutritional adequacy while reducing meat intake?

- ✓ Studies by the EAT Lancet and the FAO recommend switching to more environment friendly diets ^(1,2).
- ✓ Finding the right dietary balance that promotes both planetary health and human health, so-called sustainable healthy diets, can be challenging and requires evidence-based guidelines.
- ✓ Scientific models presented here propose to examine the case of meat, a well known contributor to dietary environmental footprint.

The case of meat: balancing environmental impact & nutrition assets

Improving the food system for planetary and human health requires:



Improvements in production that include farming techniques aimed at biodiversity preservation, better freshwater resources and greenhouse gases emissions management (CO₂, methane, nitrous oxide) ⁽²⁾.

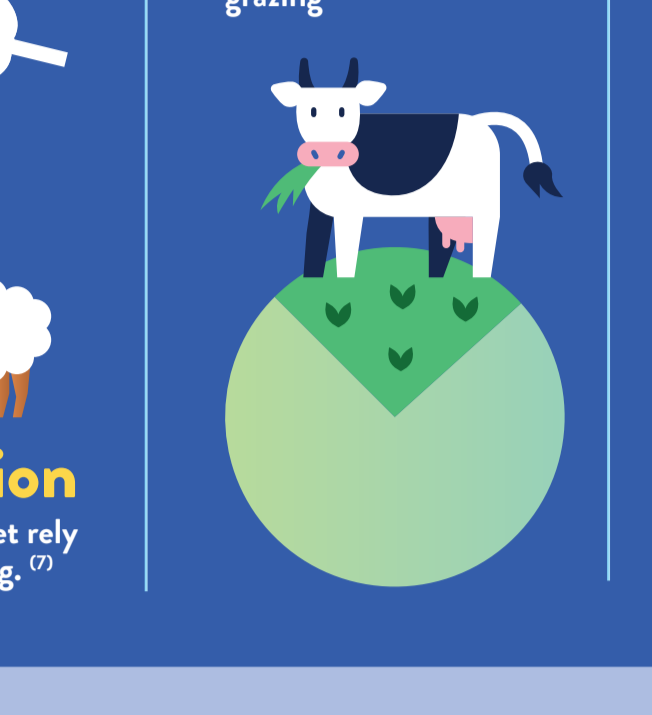


Improvements in consumption that include transitioning towards more sustainable healthy diets characterized by higher levels of plant-based foods and a reduction of animal-based foods, red meat in particular ⁽²⁾⁽⁴⁾.

The case of meat: Balancing nutrition assets & environmental footprint

MEAT BRINGS VALUABLE NUTRIENTS ⁽³⁾

- source of high quality proteins, including essential amino acids
- source of high bioavailability iron
- source of zinc
- source of selenium
- vitamins (especially A, B6 and B12)



... BUT POSES ENVIRONMENTAL CHALLENGES ⁽²⁾

On average, depending on the type of meat and production system, per unit of energy compared with plant-based foods:

- more water
- more land use
- more emissions
- more pollution
- contributes to deforestation and climate change

33% of croplands are used for livestock feed production ⁽²⁾

26% of the planet's ice-free land is used for livestock grazing ⁽²⁾

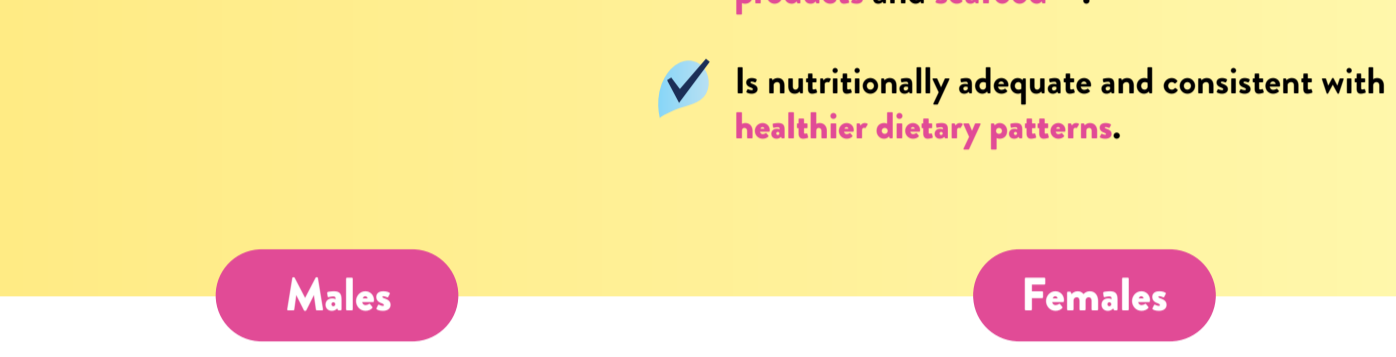
7% of the total greenhouse gas emissions through enteric fermentation and manure of livestock ⁽²⁾

500 million people on the planet rely on livestock herding. ⁽⁷⁾

Depending on the type of animals, duration, intensity, soil texture, and climate, light grazing may have limited impact on soil health. ⁽⁸⁾

Research suggests that it is possible to obtain a sufficient intake of these nutrients without eating meat - provided a variety of other foods is available and consumed, as is largely the case in Europe and Western diet countries. ⁽⁴⁾

Although reducing meat consumption is key in moving towards more sustainable healthy diets, a global standardized approach would dismiss that:



Food cultures are diverse across the world

Environmental pressure and impact differ across diets ⁽⁵⁾

Nutritional needs vary across populations (pregnant women, old people, children...) ⁽⁵⁾

Modeling the reduction of meat consumption to achieve more sustainable diets

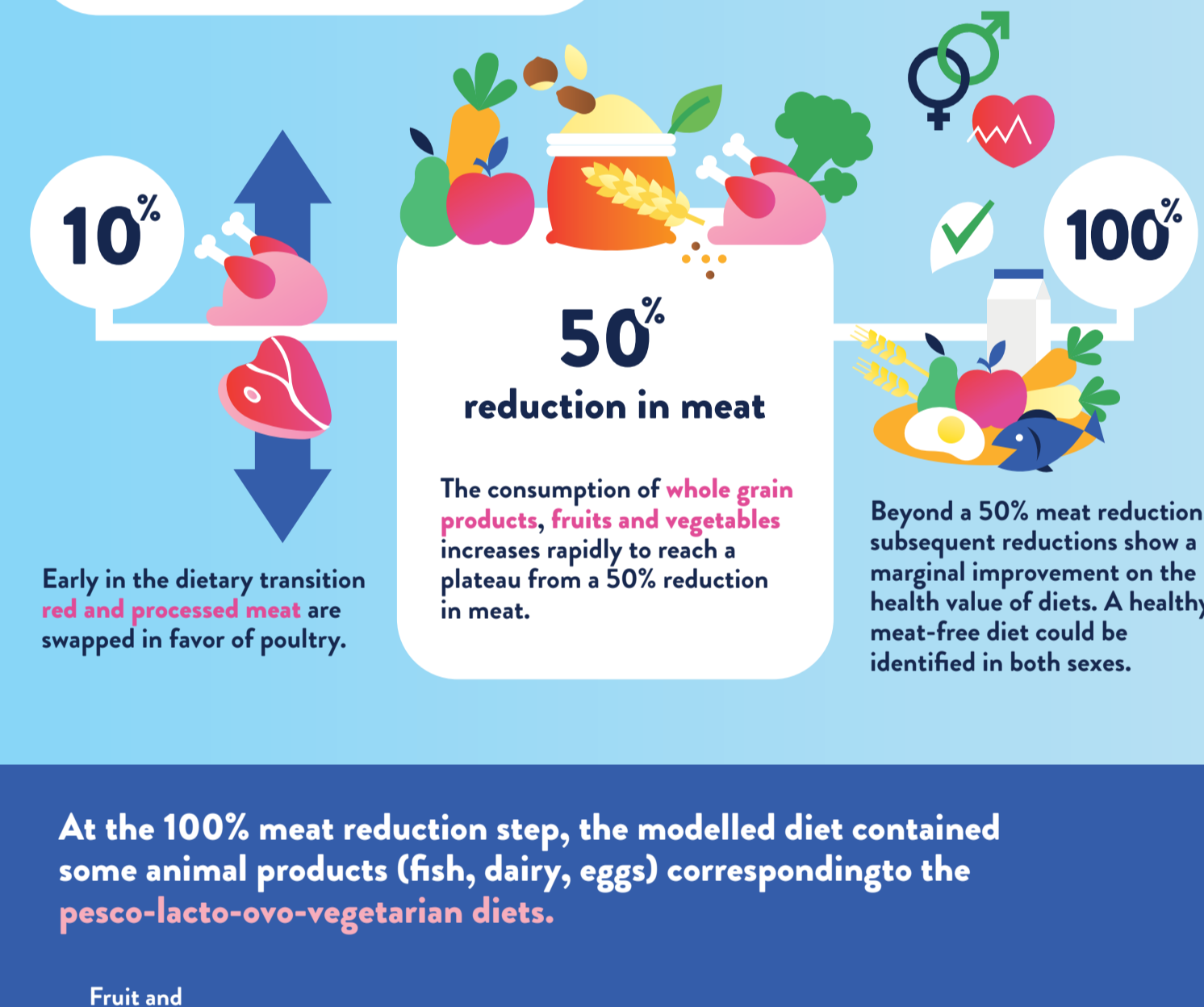
Based on the INCA3 study by ANSES, an extensive database informing observed dietary habits among French adults, researchers outlined different scenarios of meat reduction. In this approach, reduction is modeled by steps of 10%. For each step, researchers identified the best diet for health, relying on food groups other than meat, while ensuring nutritional adequacy. Ultimately the study provides a reduction plan for meat consumption, which takes into account observed dietary habits of the French population, in order to achieve acceptable dietary options at each step.

An optimized reduction in meat consumption:

- ✓ Restructures the diet based on food groups other than meat, while ensuring the coverage of nutritional needs ⁽³⁾.
- ✓ Includes fruits and vegetables, whole grain products and seafood ⁽³⁾.
- ✓ Is nutritionally adequate and consistent with healthier dietary patterns.

Males

Females



CONSTRAINED GRADUAL MEAT REDUCTION

- Added fats
- Potatoes and Starch-based products
- Legumes and Nuts
- Eggs
- Soft Drinks
- Dairy Products
- Seafood
- Whole Grain Product
- Refined Grain Products
- Fruit and Vegetables
- Processed Meat
- Red Meat
- Poultry

Stages of the sequential meat reduction transition:

Males

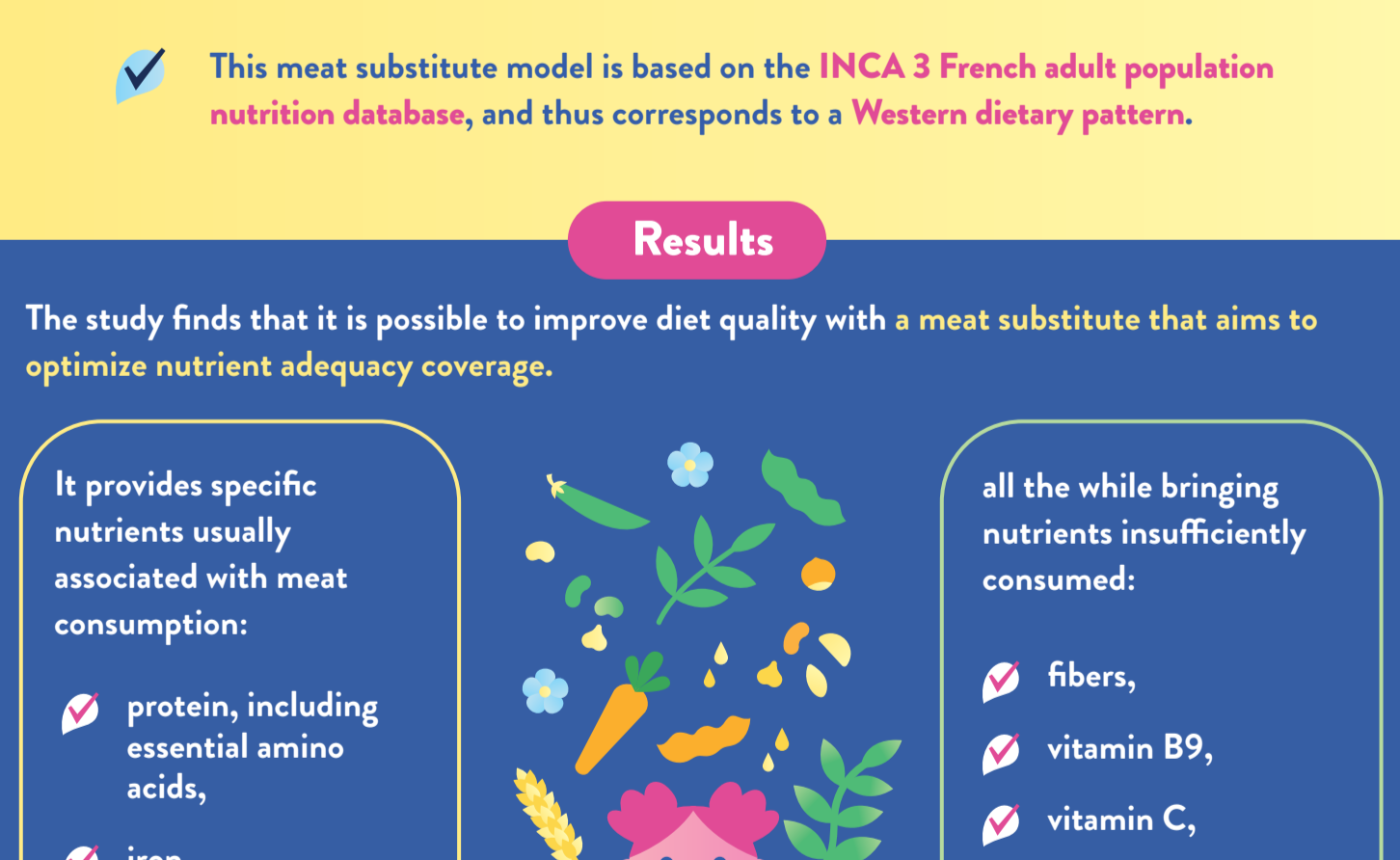
Females



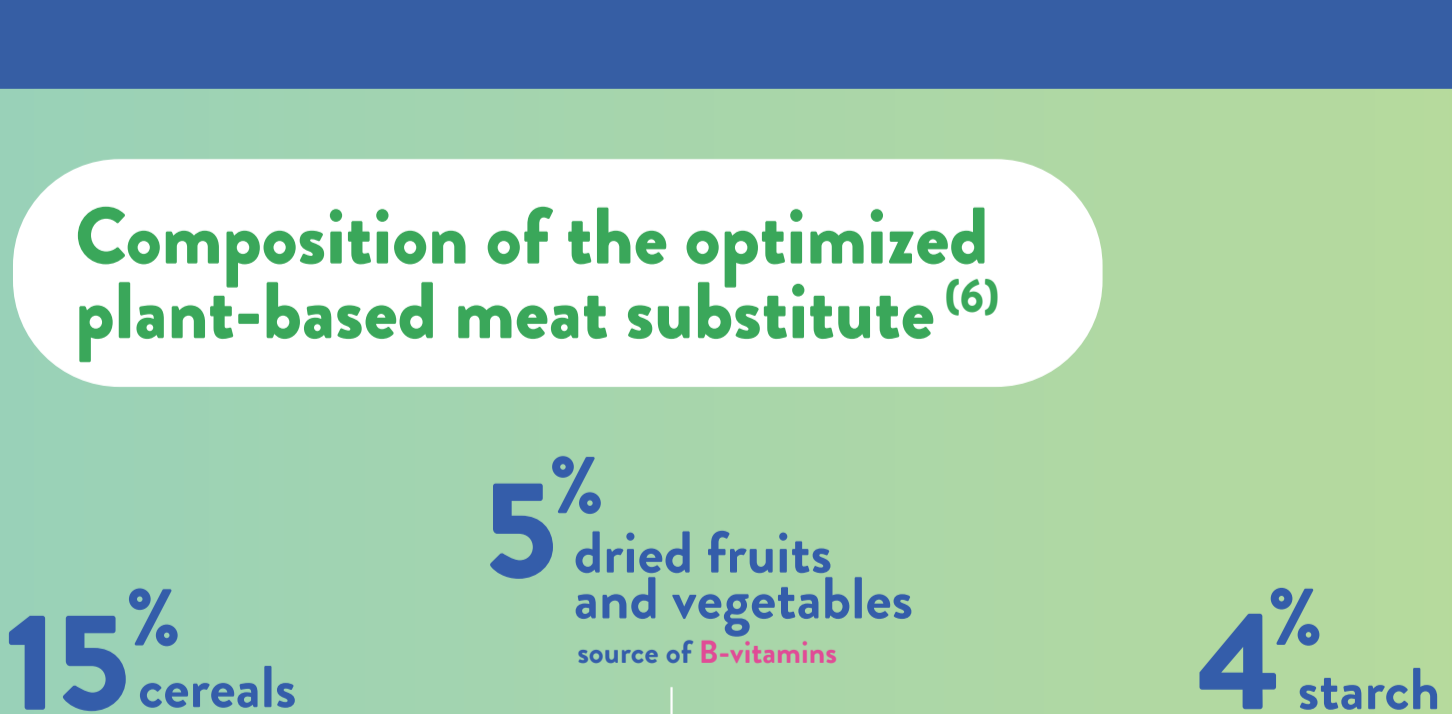
CONSTRAINED GRADUAL MEAT REDUCTION

- Poultry
- Beef and veal
- Offal
- Pork and other meats
- Processed Meat

The significance of the 50% meat reduction step



At the 100% meat reduction step, the modelled diet contained some animal products (fish, dairy, eggs) corresponding to the pescio-lacto-ovo-vegetarian diets.



Reducing or removing the share of meat in the diet does not jeopardize nutrient security provided that diets are properly structured in this population ⁽⁵⁾.

Practical steps towards healthy meat reduction:

1

- Swap red and processed meats for poultry
- Swap refined grain products for wholegrain
- Reduce soft drinks ⁽³⁾

2

- Gradually reduce poultry, substituting seafood, eggs, and dairy products
- Eat more fruits, vegetables, and wholegrains ⁽³⁾

3

- Remove meat altogether
- Maintain high intake of fruits, vegetables and wholegrain
- Include some dairy products, seafood and eggs ⁽³⁾

Developing a nutritionally optimized meat substitute

- ✓ With the meat reduction model in mind, researchers wanted to develop an optimal meat substitute. Meat substitutes may provide a solution to remove meat consumption, while ensuring full nutritional adequacy on a global level ⁽⁶⁾.
- ✓ Nutrient adequacy, convenience, organoleptic properties and proximity with current food habits are key in developing an optimized meat substitute. Here, researchers worked under self-imposed constraints for 12 critical nutrients and technical requirements for preparation ⁽⁶⁾.
- ✓ This meat substitute model is based on the INCA 3 French adult population nutrition database, and thus corresponds to a Western dietary pattern.

Results

The study finds that it is possible to improve diet quality with a meat substitute that aims to optimize nutrient adequacy coverage.

- It provides specific nutrients usually associated with meat consumption:
 - protein, including essential amino acids,
 - iron,
 - zinc,
 - potassium,
 - vitamin B6,
- all the while bringing nutrients insufficiently consumed:
 - fibers,
 - vitamin B9,
 - vitamin C,
 - some essential fatty acids,
- and allowing to reduce consumption of saturated fatty acids.

Composition of the optimized plant-based meat substitute ⁽⁶⁾

Conclusion

The optimized meat substitute scores the PANDiet* score increased by 5.7 points above its initial value ⁽⁶⁾.

Choosing the correct ingredients can result in a nutritionally adequate meat substitute that could compensate for reductions in many nutrients supplied by meat while providing 22 key nutrients that are currently insufficiently consumed in the French population ⁽⁶⁾.

*PANDiet is a 100-point probabilistic score evaluating adequate overall nutrient intake