Direct emissions by sector (59 GtCO₂-eq) Agriculture, forestry and **Buildings Transport** Industry Other energy Electricity+heat 5.6% 15% other land use (AFOLU) 22% 24% 10% 23% Electricity+heat by sector Energy systems 8.5% - Industry 43.0% - AFOLU 0.0% - Transport 1.6% - Buildings 46.9% Direct+indirect emissions by sector (59 GtCO₂-eq) irect Indirect Indirect Direct Direct Direct **Buildings** Agriculture, forestry and Other energy **Transport** ndustry other land use (AFOLU) 22% 16% 15% **34**% 12% Non-CO₂ (all buildings) Inland shipping 0.3% Biomass burning Cement (process only) 2.6% Petroleum 0.1% - Rail 0.4% (CO₂, CH₄) 0.1% Waste 3.9% refining 1.1% Non-residential 5.9% Domestic aviation 0.7% Synthetic fertiliser Chemicals 6.3% - Coal mining fugitive - Residential 11% Other (transport) 0.9% application (N₂O) **0.75**% Metals **7.8**% emissions 2.2% International aviation Other (industry) 13% - Oil and gas fugitive Manure management

Figure TS.6 | Total anthropogenic direct and indirect GHG emissions for the year 2019 (in GtCO₂-eq) by sector and subsector. Direct emissions estimates assign emissions to the sector in which they arise (scope 1 reporting). Indirect emissions – as used here – refer to the reallocation of emissions from electricity and heat to the sector of final use (scope 2 reporting). Note that cement refers to process emissions only, as a lack of data prevents the full reallocation of indirect emissions to this sector. More comprehensive conceptualisations of indirect emissions including all products and services (scope 3 reporting) are discussed in Section 2.3. Emissions are converted into CO₂-equivalents based on global warming potentials with a 100-year time horizon (GWP100) from the IPCC Sixth Assessment Report. Percentages may not add up to 100 across categories due to rounding at the second significant digit. {Figure 2.12, 2.3}

emissions 4.4%

4.7%

→次のスライドで説明

Other (energy systems)

(N₂O, CH₄) 0.7%

 (CO_2, N_2O) 2.5%

- LULUCF CO2 11%

Rice cultivation (CH₄) 1.7%

Managed soils and pasture

- Enteric fermentation (CH₄) 5%

Source: IPCC (2022) Six Assessment Report WG3

1.1%

1.3%

- Road 10%

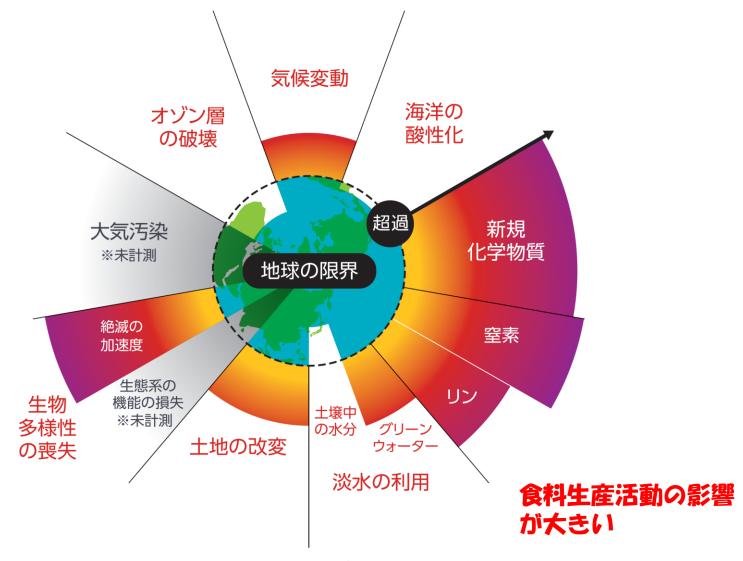
International shipping

農業・森林・土地利用関連のGHG排出量

農業・森林・土地利用(AFOLU) 22% 13 Gt-CO2

- バイオマス燃焼[CO2, CH4] 0.1%(1%)
- 合成肥料施用[N2O] 0.75%(3%)
- 家畜排せつ物管理[N2O, CH4] 0.7%(3%)
- 稲作[CH4] 1,7%(8%)
- 土壌・牧草地管理[CO2, N2O] 2.5%(II%)
- 腸管内発酵[CH4] 5%(23%)
- LULUCF(土地利用・土地利用変化・森林) [CO2] 11%(51%)

地球の限界(プラネタリー・バウンダリー)



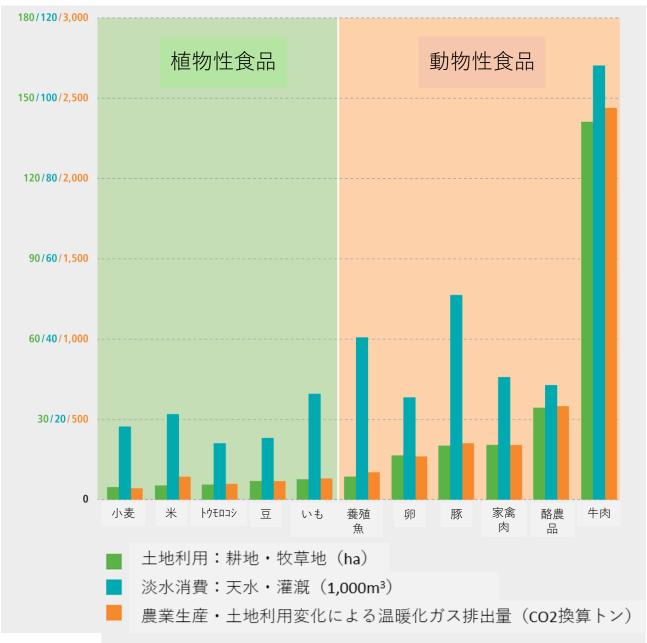
資料: Stockholm Resilience Centre (2022) より環境省作成

出典:環境省「環境白書・循環型社会白書・生物多様性白書(令和5年版)」

文献:Earth beyond six of nine planetary boundaries, K. Richardson eta al. Science

Advances 9, eadh2458 (2023) 13 September 2023

Iトンのタンパク質を生産するには……

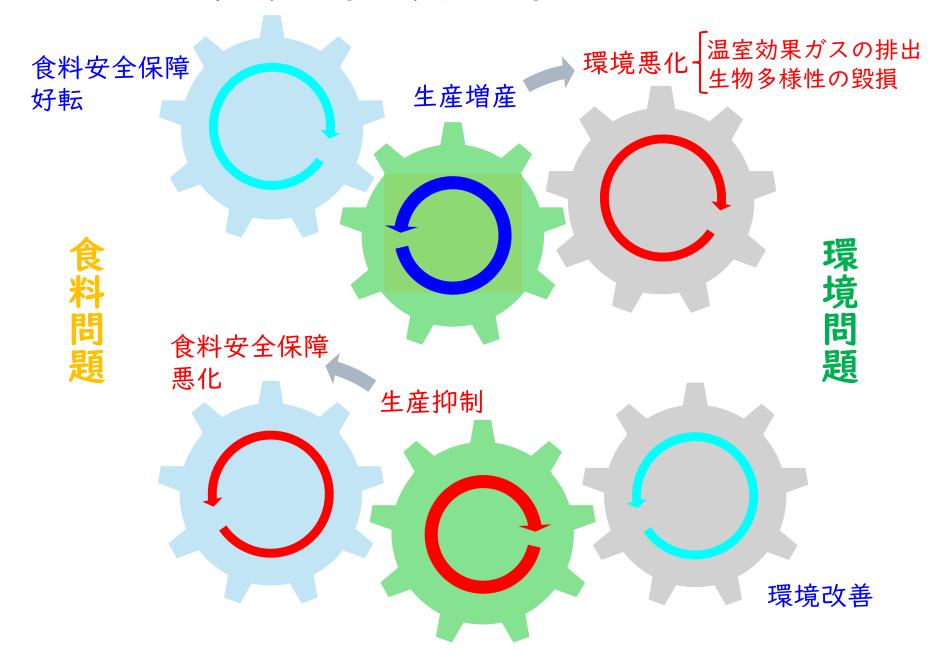


畜産物生産では、 (飼料を介して) 間接的に 多くの土地と水を 必要とする。

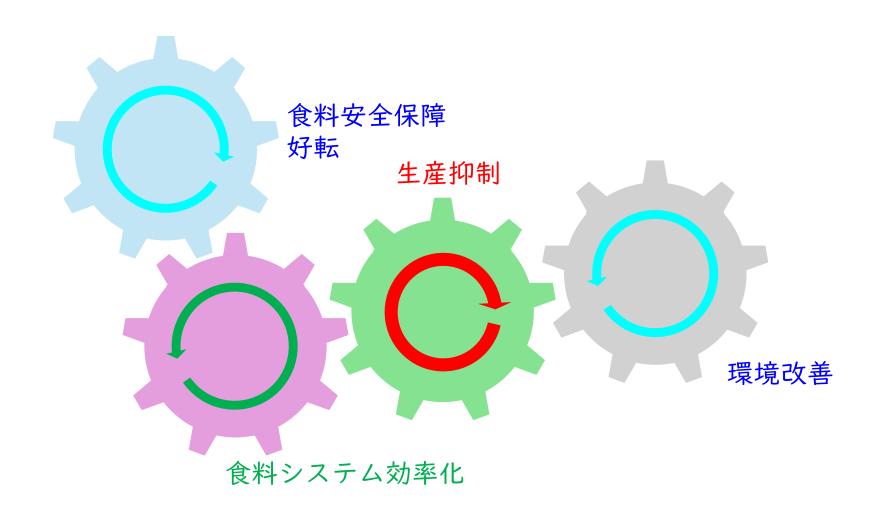
牛肉はGHG排出が 著しく多い

出典: IFPRI Global Food Policy Report 2016, p.71

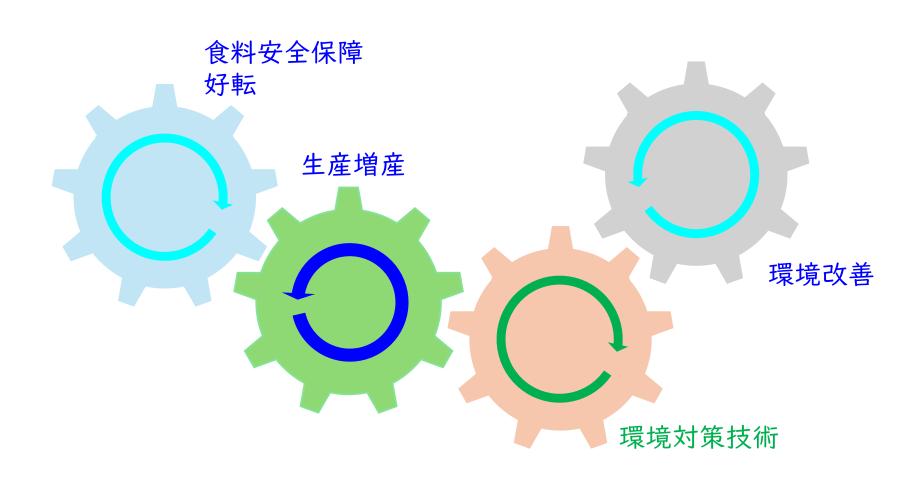
食料問題と環境問題のジレンマ



食料安全保障と環境改善を両立させるには(1)



食料安全保障と環境改善を両立させるには(2)



環境政策の展開

【地球規模の環境政策】

- 地球サミット1992
 - 気候変動枠組条約 → COP29 [2024/10]
 - 生物多様性条約 → COP16 [2024/11]
- 国内措置
 - 地球温暖化対策計画 (2016)
 - 生物多様性国家戦略 (1995)/生物多様性基本法 (2008)

【農業・食料関連政策】※農業政策への反映には時間的遅れ

- 食料システムサミット 2021
- 国内農業環境政策
 - みどりの食料システム法 (2022)
- 海外の事例
 - EU: Farm to Fork戦略 (2020)
 - アメリカ:農業イノベーションアジェンダ (2020)