

Tackling food consumption inequality to fight hunger without pressuring the environment

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Ending hunger is a Sustainable Development Goal of the UN. However, feeding a growing world population by increasing food production without implementing more sustainable consumption will threaten the environment. We explore alternative hunger eradication scenarios that do not compromise environmental protection. We find that an economy-growth-oriented scenario, which ignores inequitable food distribution and is aimed at ending hunger by increasing overall food availability, would require about 20% more food production, 48 Mha of additional agricultural land and would increase greenhouse gas emissions by 550 Mt of CO₂ equivalents yr⁻¹ in 2030, compared with the business-as-usual scenario. If hunger eradication efforts were focused solely on the under-nourished, food demand would increase by only 3%, and the associated environmental trade-offs would be largely reduced. Moreover, a combined scenario that targets the under-nourished while also reducing over-consumption, food waste, agricultural intensification and other environmental impacts would reduce food demand by 9% compared with the business-as-usual scenario and would lead to the multiple benefits of reducing hunger and contributing to environmental sustainability.

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AFOLU activities in AIM team

Land

Biodiversity and Ecosystem

- IPBES
- WWF
- Ohashi et al (in press)

Mitigation in LULUCF

Bioenergy

- Wu et al., 2018

Food security, hunger

- Hasegawa et al., 2018, 2019
- Fujimori et al., 2019

AFOLU-Japan

Ozone

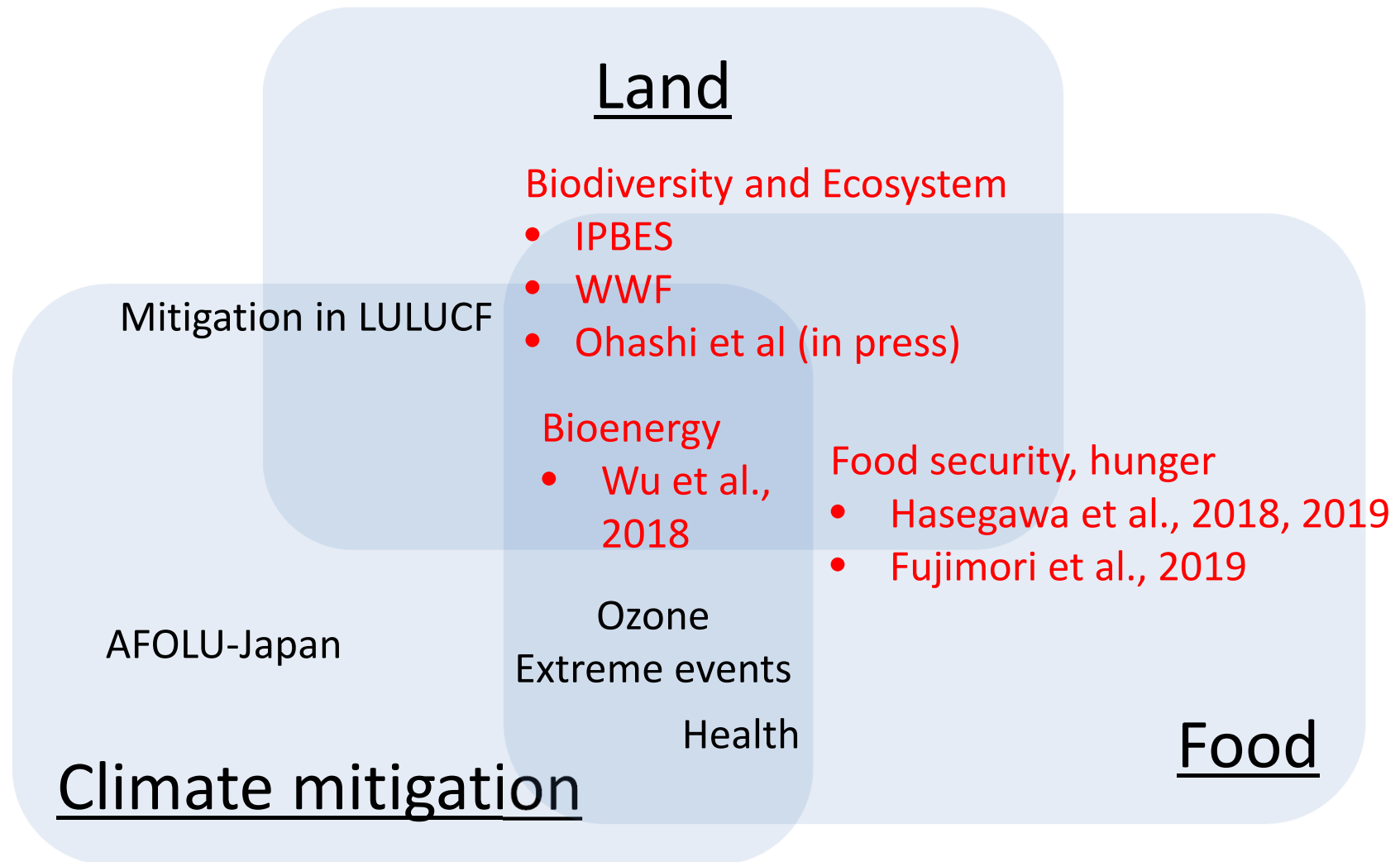
Extreme events

Health

Climate mitigation

Food

AFOLU activities in AIM team in 2019



How to feed the growing population

- Ending hunger is a Sustainable Development Goal of the United Nations.
- Increasing food production through agricultural intensification and extensification is one approach to meeting the dietary needs of a growing world population.
- But, increasing food production will threaten the environment.



Objectives

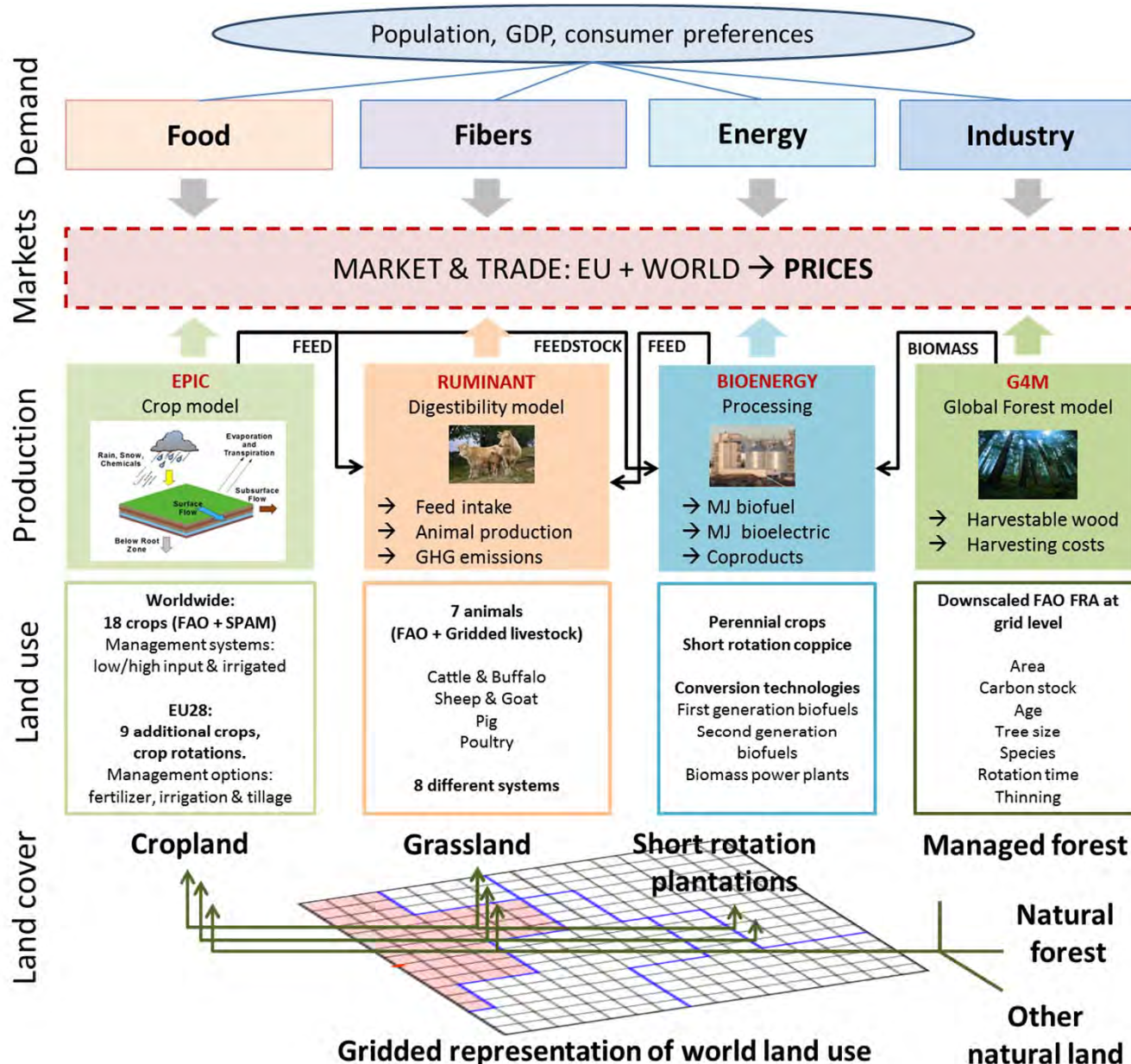
- To explore alternative hunger eradication scenarios that do not compromise environmental protection.
- To estimate effects of ending hunger on the environment with different food and agricultural policies
- Food and agricultural policies considered in this study
 - Food support for poor
 - Reduced food waste
 - Reduced food over-consumption
 - Crop yield development in developing regions

Scenario settings

- Scenarios with different food and hunger policies
- Policies represented by exogenous food requirements
- Estimate required food production, land and environment effects.

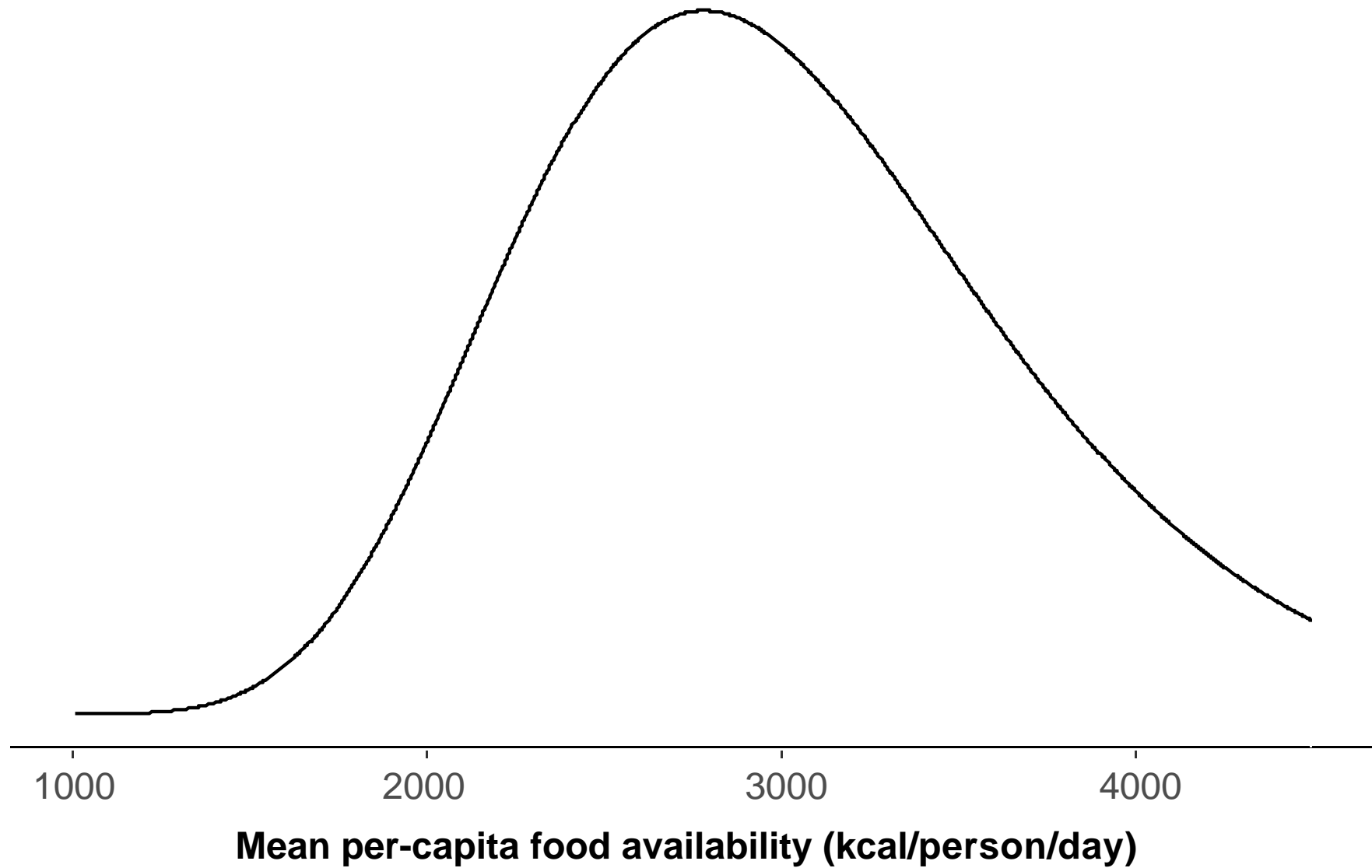
Scenarios	End hunger by 2030
Business as Usual (BaU)	No
More food for All	Yes
Food for Poor	Yes
Food for Poor + (a) reduced food waste	Yes
Food for Poor + (b) reduced over-consumption	Yes
Food for Poor + (c) improved crop yields	Yes
Food for Poor + ALL (a+b+c)	Yes

Global agricultural economic model: GLOBIOM

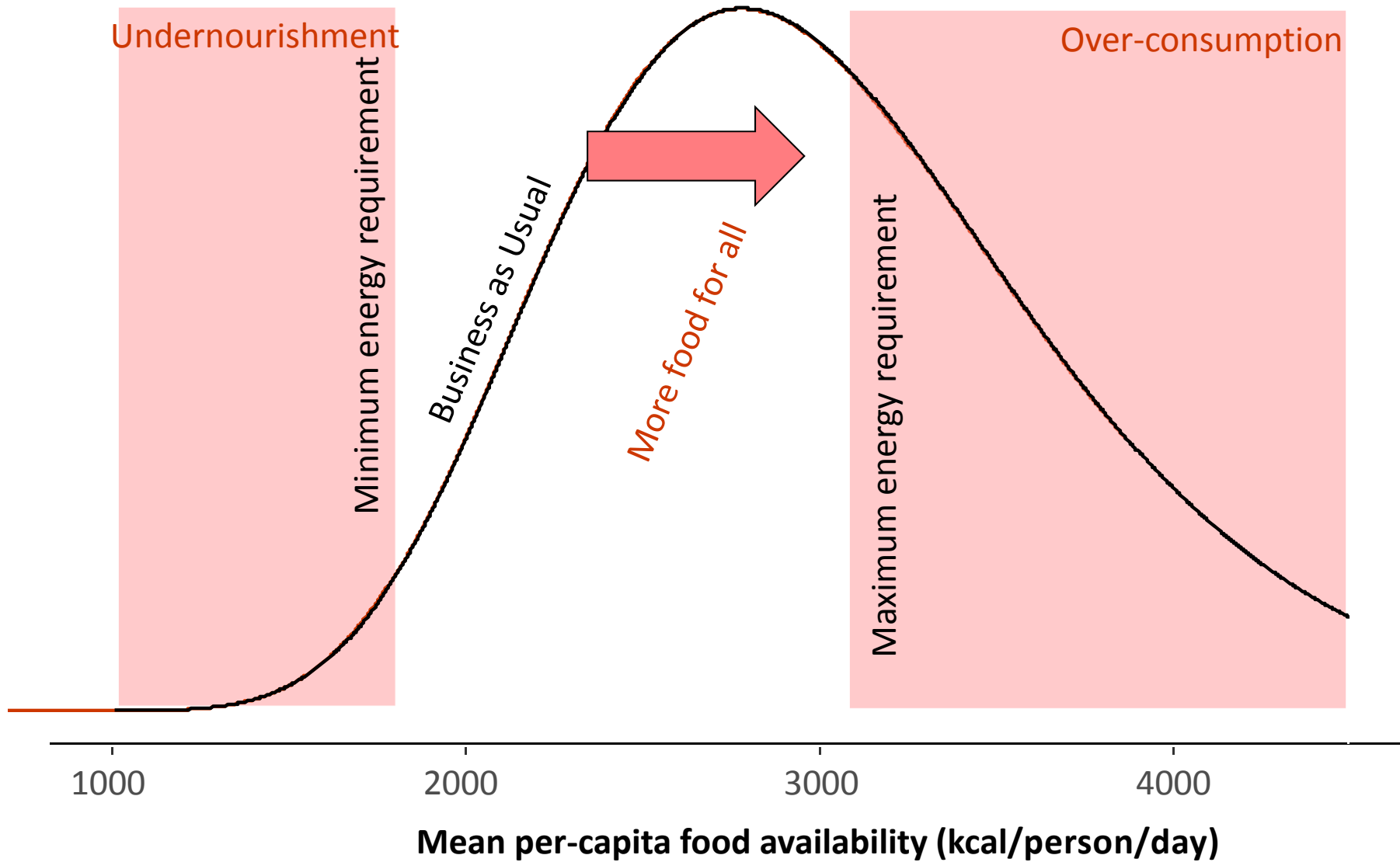


- Under given population and income, the model simulates agricultural supply and demand, land use, greenhouse gases and other environmental variables.
- Based on price mechanisms (cost minimization)
- World 30 regions

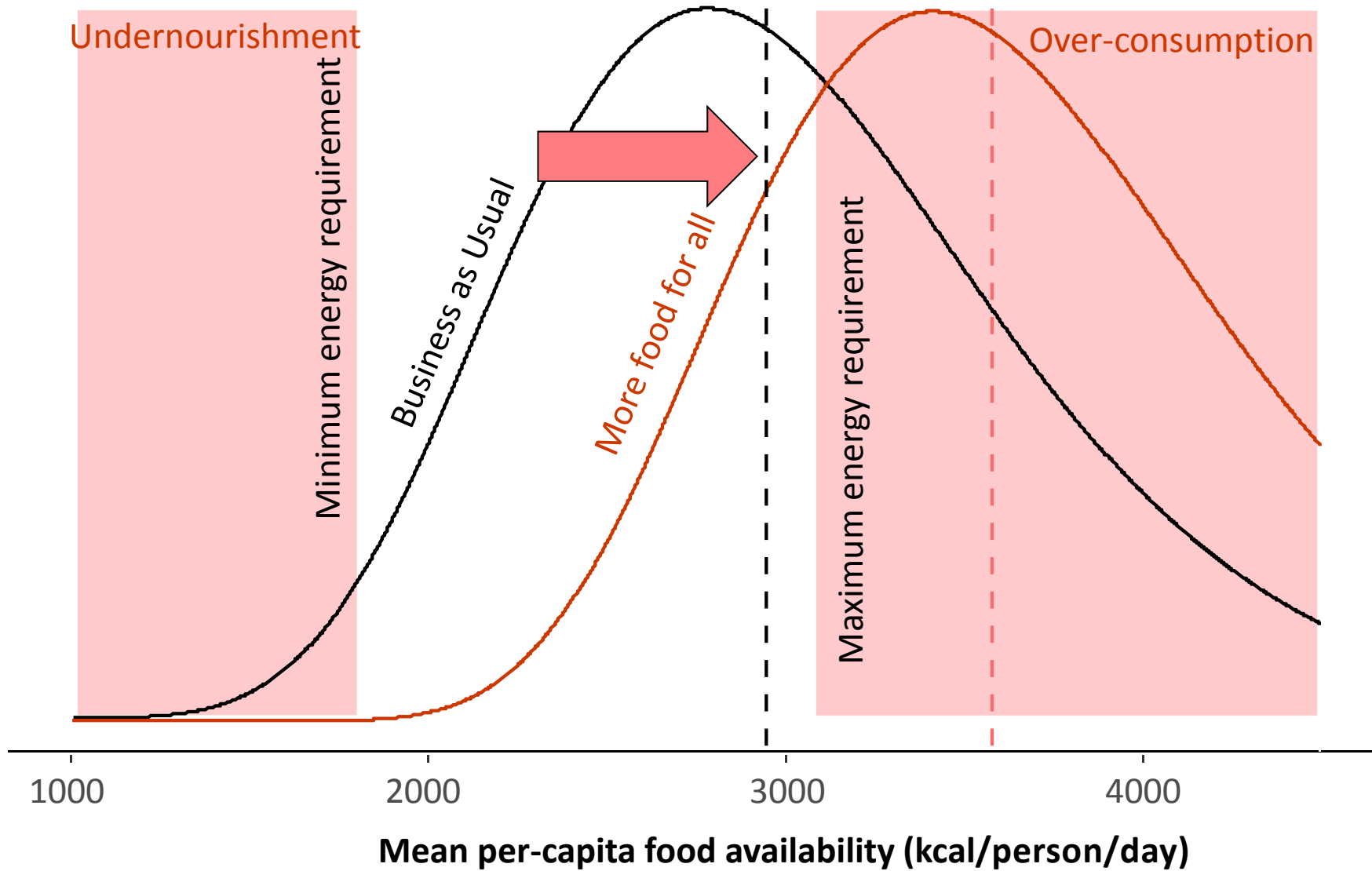
Food distribution within a country at food policies



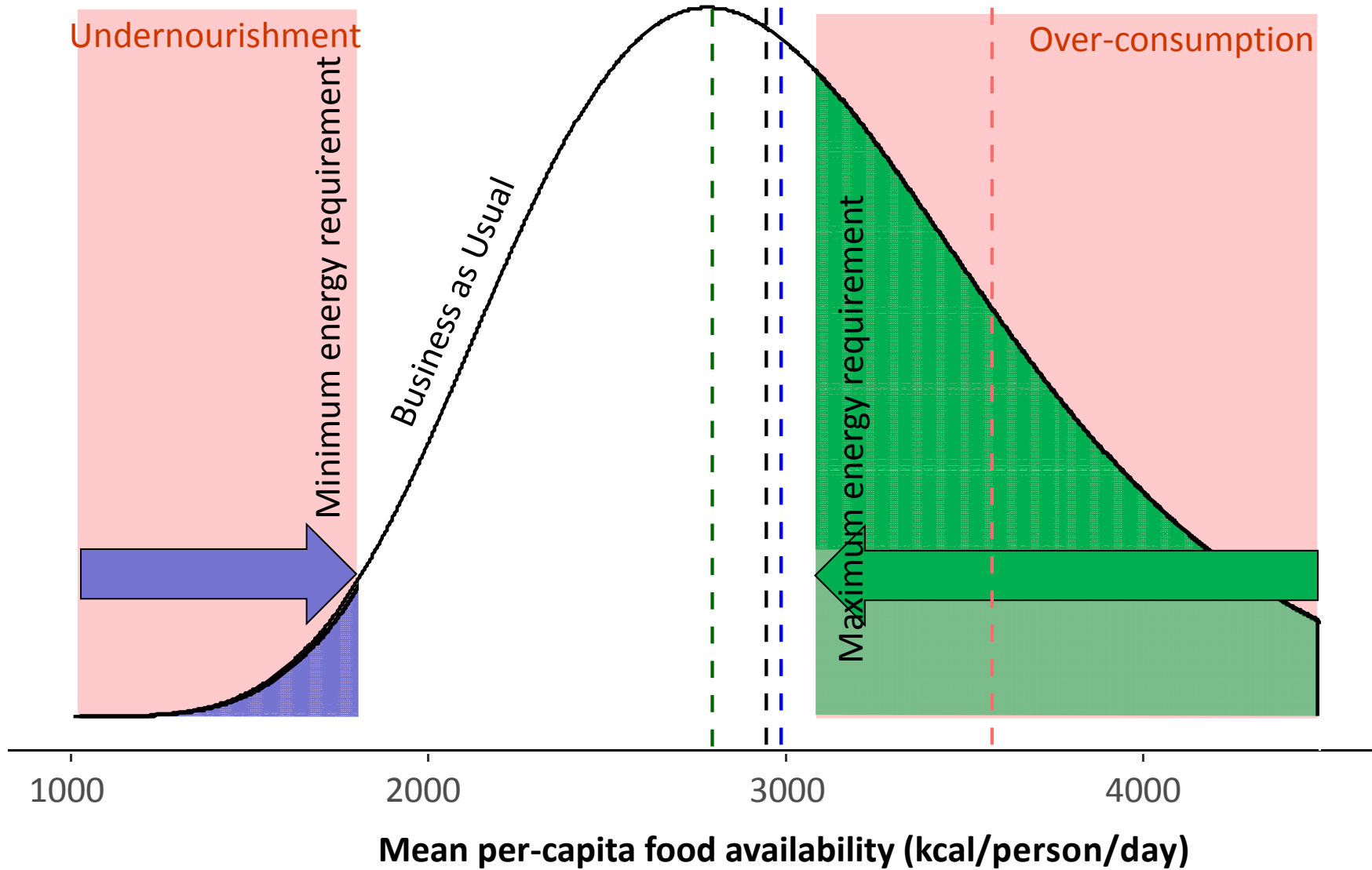
Food distribution within a country at food policies

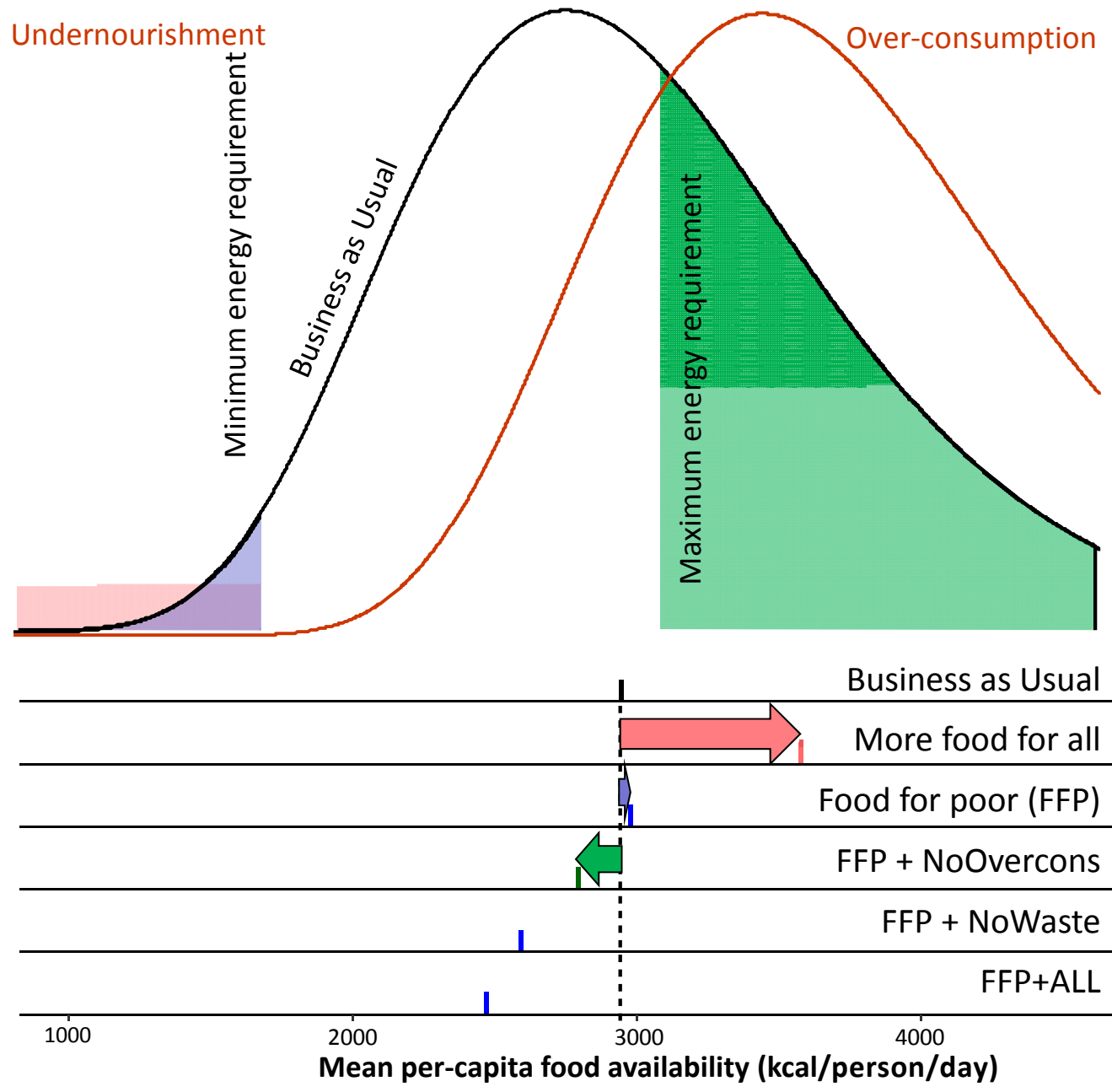


Food distribution within a country at food policies

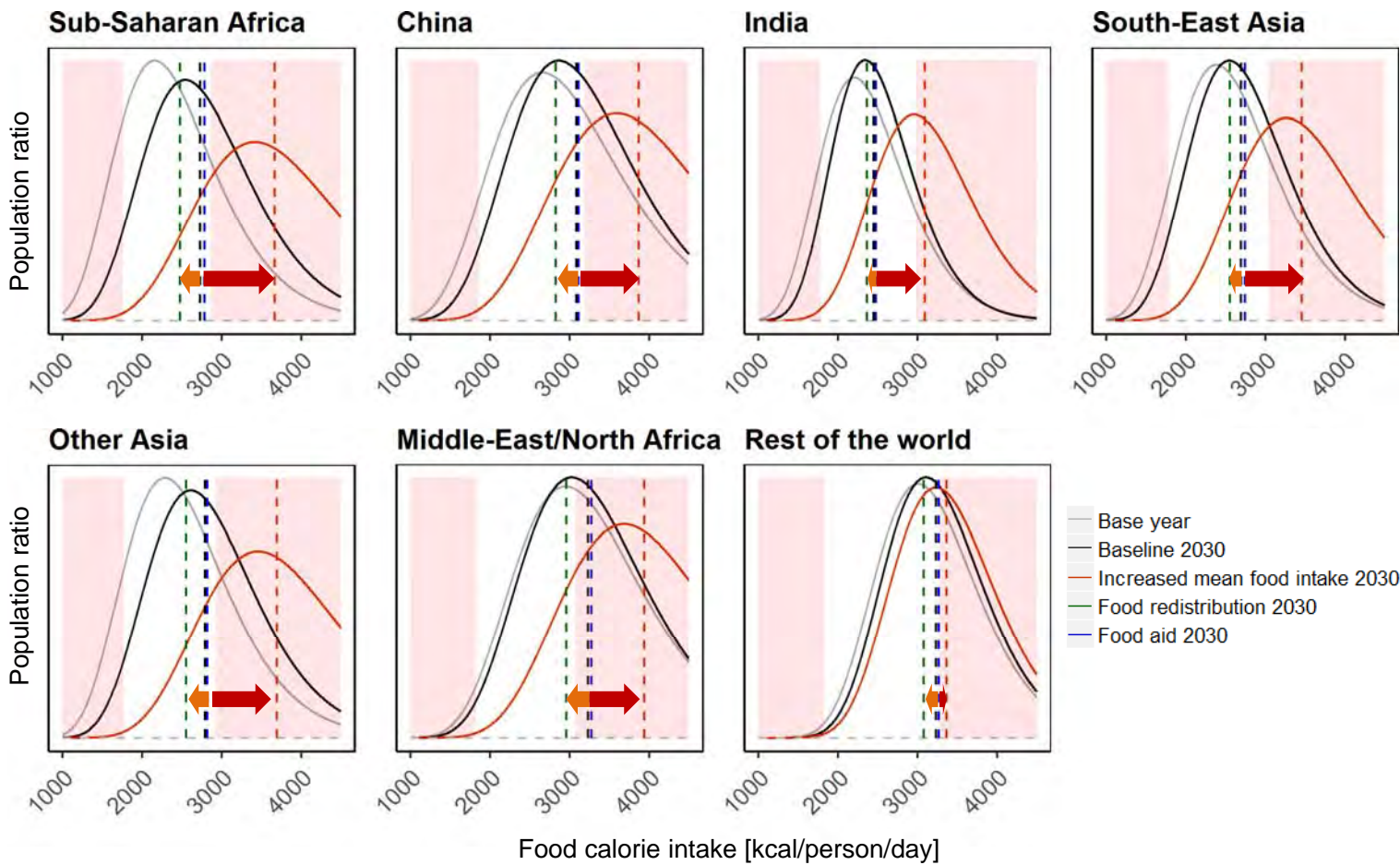


Food distribution within a country at food policies





Possible regional changes in food distribution to end hunger



Impacts on the environment

More food for All

- Food production : 20% ↑
- Agricultural land : 48Mha ↑
- Greenhouse gas emissions : 550 MtCO₂eq ↑

Food for Poor

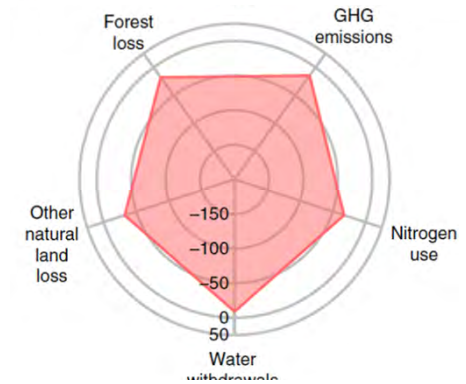
- Food production : 3% ↑

Food for Poor + ALL

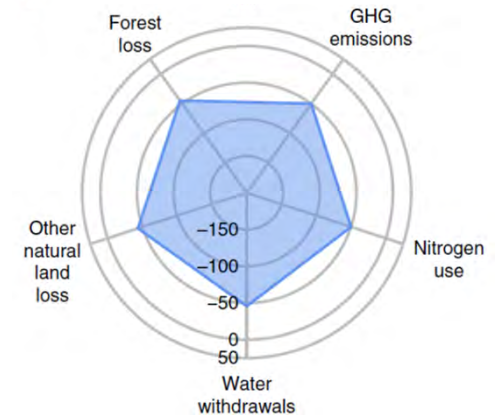
- Food production : 9% ↓
- Agricultural land : 230Mha ↓
- Greenhouse gas emissions : 1360 MtCO₂eq ↓

※ Values show the changes from BaU in 2030

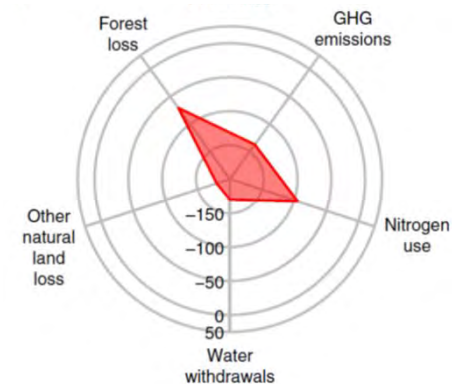
a More food for All



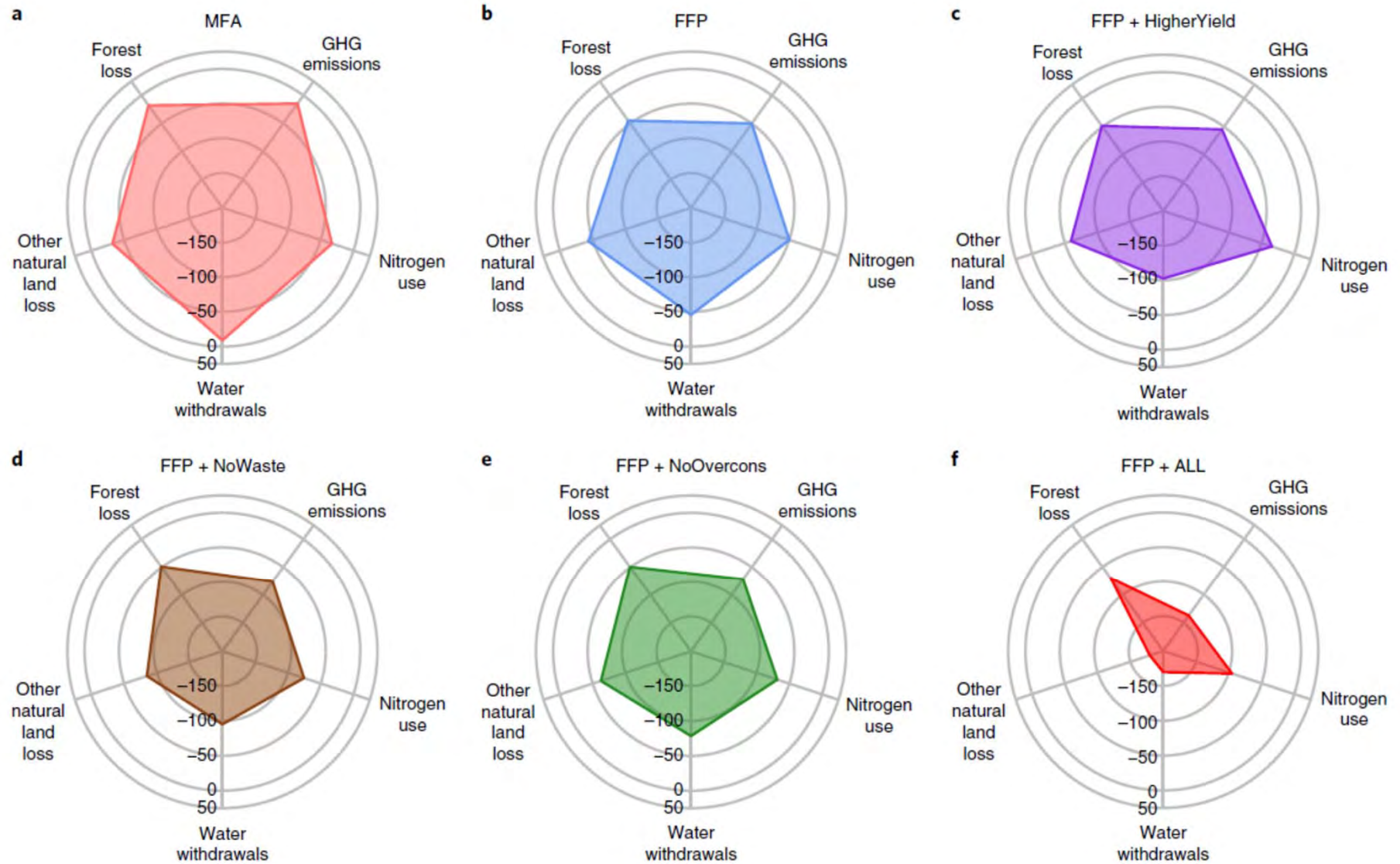
b Food for Poor



Food for poor + ALL



Impacts on the environment



Conclusions

1. As is well known, there is enough food to feed a population of 7 billion.
2. Current hunger is not caused by food shortages, but by distributional problems for social and political reasons.
3. To eliminate hunger while protecting the environment , combining intensive food support, together with food and agricultural policies such as food loss and overconsumption prevention, would be needed.
4. The simultaneous achievement of multiple goals such as the SDGs requires the implementation of multiple policies.

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AFOLU parts in AIM team

- Impacts
 - Multi-model's health impact tools (Yuki Ochi)
- Mitigation
 - Bioenergy potential estimation (Wenchao Wu)
- Land use model
 - Regional downscaling – Japan' case (Wenchao Wu)