

# Extreme climate events increase risk of global food insecurity and adaptation needs

Tomoko Hasegawa

Ritsumeikan University

The 28<sup>th</sup> AIM International Workshop

National Institute for Environmental Studies (Online)

September 13 and 14, 2022



# Topics

- Effects of climate mitigation on food security
- Reconciling growing food demand and environmental protection
- Extreme climate events increase risk of global food insecurity



## Risk of increased food insecurity under stringent global climate change mitigation policy

Tomoko Hasegawa<sup>1,2\*</sup>, Shinichiro Fujimori<sup>1,2,3</sup>, Petr Havlik<sup>2</sup>, Hugo Valin<sup>2</sup>, Benjamin Leon Bodirsky<sup>4</sup>, Jonathan C. Doelman<sup>5</sup>, Thomas Fellmann<sup>6</sup>, Page Kyle<sup>7</sup>, Isaac E. Koopman<sup>8</sup>, Hermann Lotze-Campen<sup>4,9</sup>, Daniel Mason-D'Croz<sup>10,11</sup>, Yuki Ochi<sup>12</sup>

## Tackling food consumption inequality to fight hunger without pressuring the environment

Tomoko Hasegawa<sup>1,2,3\*</sup>, Petr Havlik<sup>2</sup>, Stefan Frank<sup>12</sup>, Amanda Palazzo<sup>12</sup> and Hugo Valin<sup>12</sup>

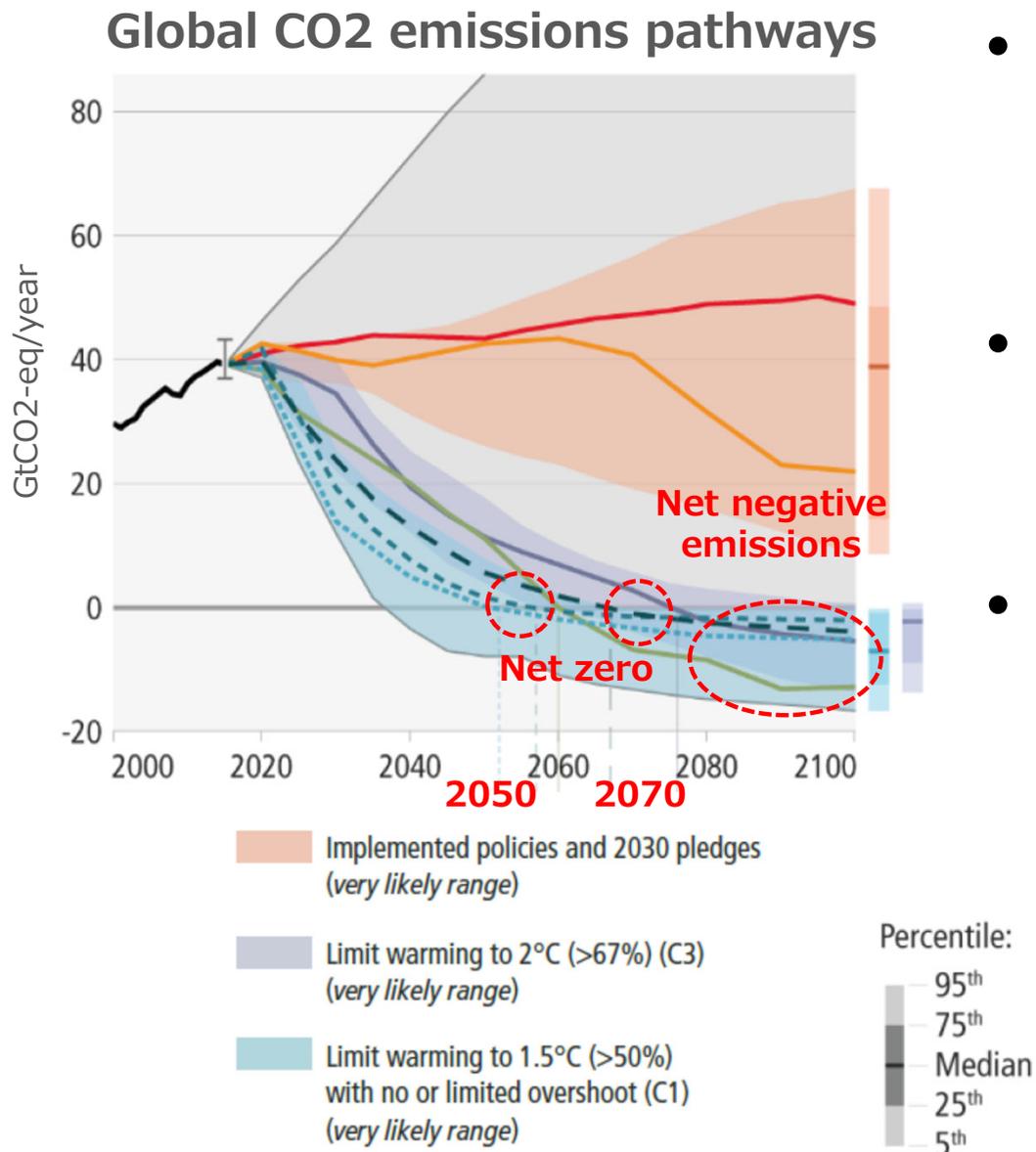
Ending hunger is a Sustainable Development Goal of the UN. However, feeding a growing world population by increasing mption will threaten the environment. We explore alternative mental protection. We find that an economy-growth-oriented med at ending hunger by increasing overall food availability,



## Extreme climate events increase risk of global food insecurity and adaptation needs

Tomoko Hasegawa<sup>1,2✉</sup>, Gen Sakurai<sup>3</sup>, Shinichiro Fujimori<sup>2,4,5</sup>, Kiyoshi Takahashi<sup>2</sup>, Yasuaki Hijioaka<sup>2</sup> and Toshihiko Masui<sup>2</sup>

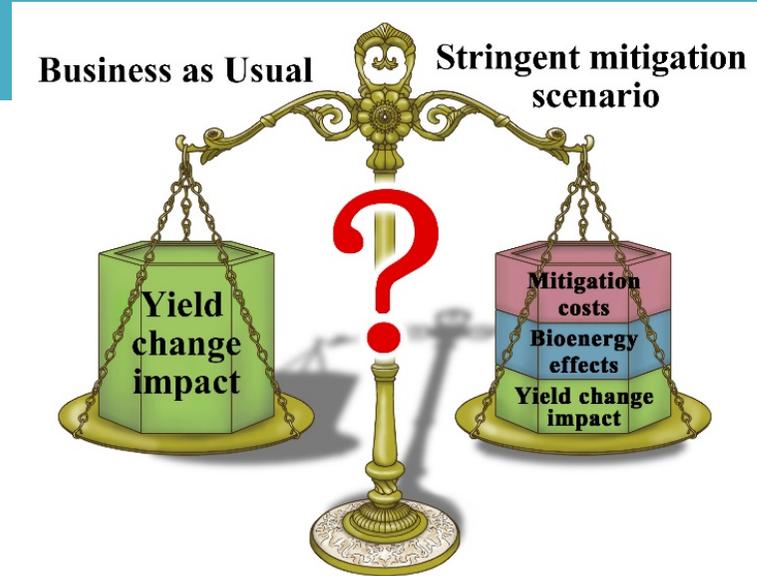
# Emissions Pathways toward 1.5°C



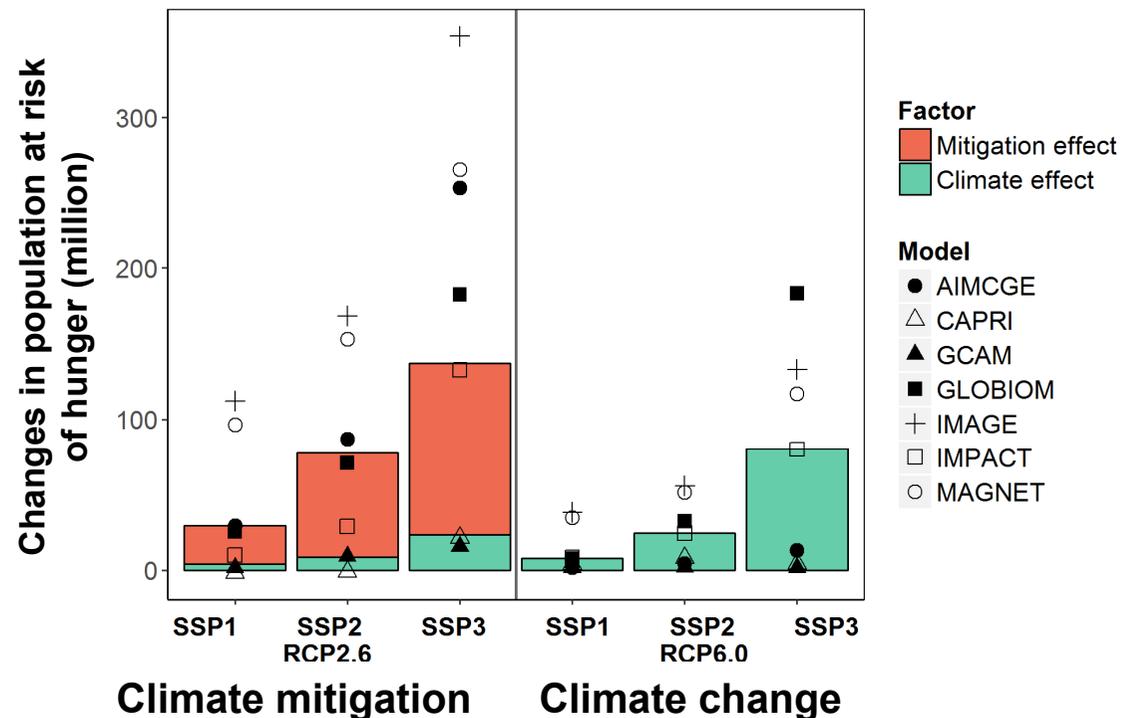
- Net zero CO<sub>2</sub>
  - by 2050s toward 1.5°C
  - by 2070s toward 2°C
- Large negative emissions are required in the latter of this century.
- BECCS or afforestation/reforestation are main options available for negative emissions.

# Consequences of climate change and mitigation on food security

- Trade-offs between climate change mitigation and food security
- Economy-wide and uniform stringent climate mitigation would negatively affect food security.
- Necessary to consider the adverse impacts and implement complementary measures to reduce them.



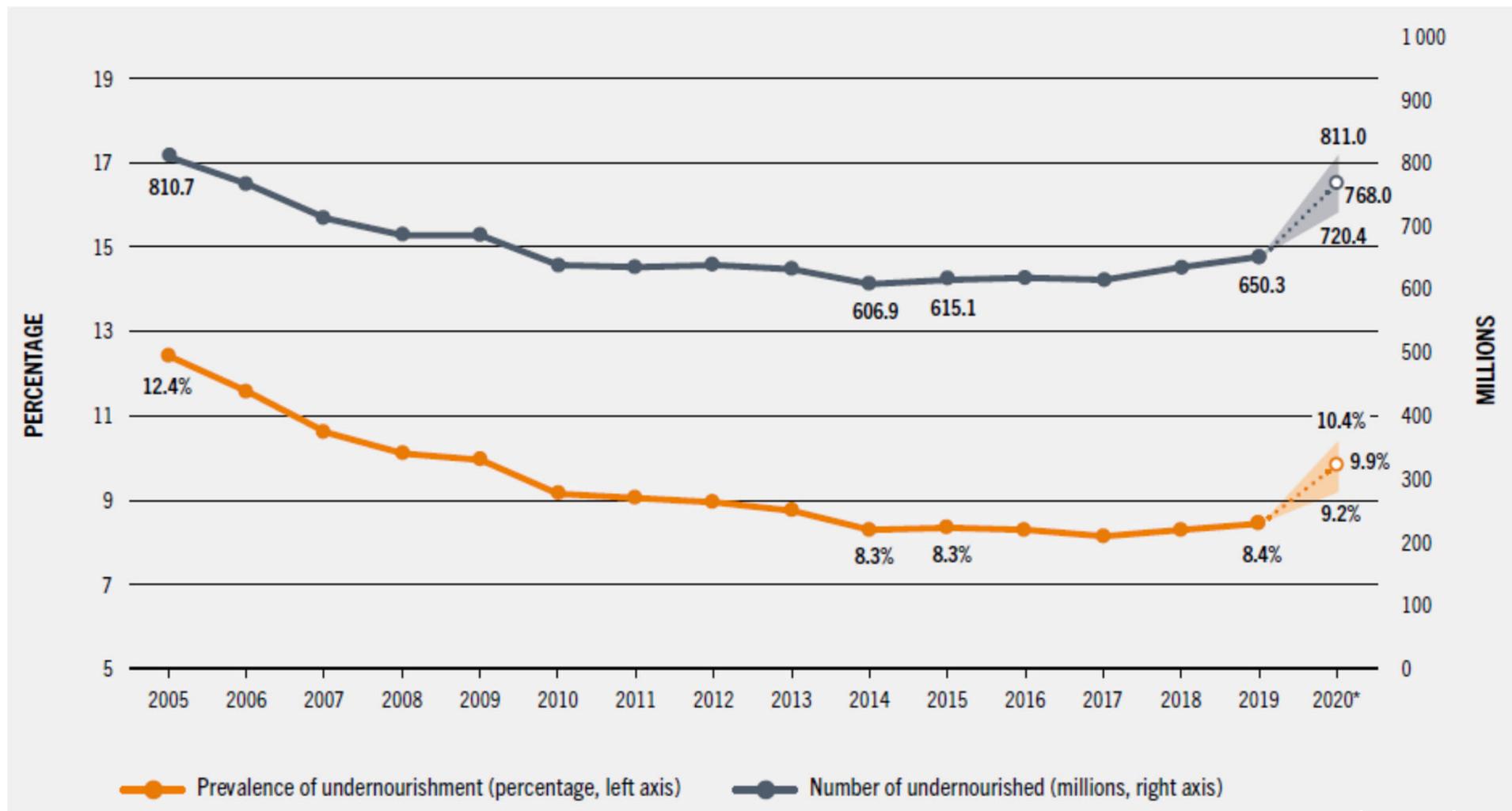
Global population at risk of hunger



# How do we meet growing food needs while protecting the environment?



- The world trend is not on track to achieve the SDG Zero Hunger target.

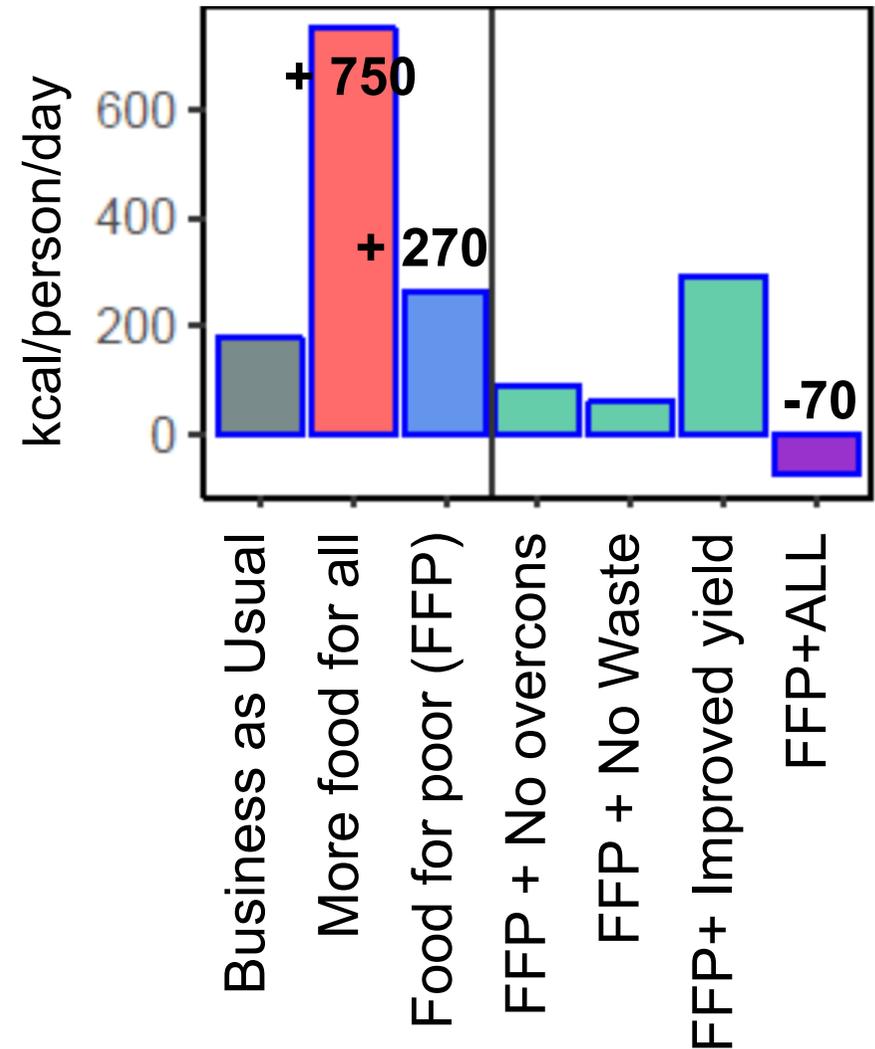


# How do we meet growing food needs while protecting the environment?



- The environmental impacts of food production required to end hunger.
- Increasing food production is a common approach but can pose environment risks.

Food requirements to meet everyone's needs



## Food policies

Food support targeted to the poor

Reduced food waste

Reduced food over-consumption

Crop yield improvement

# Impacts of food needs to end hunger on the environment



## More food for All people

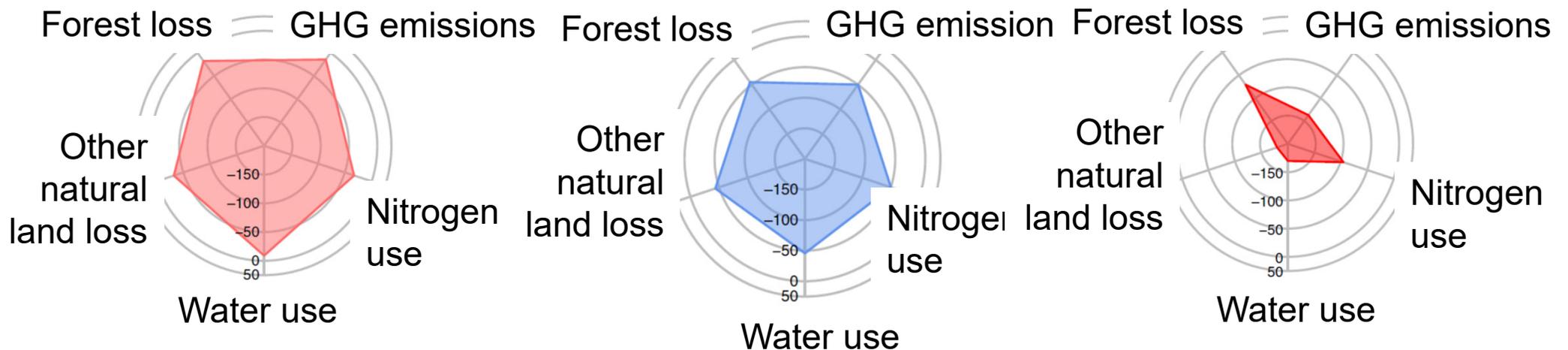
- + 20% Food production ↑
- + 48Mha Agricultural land ↑
- + 550 MtCO<sub>2</sub>eq GHG emissions ↑

## Food for poor only

- + 3% food production ↑

## Food for poor + ALL policies

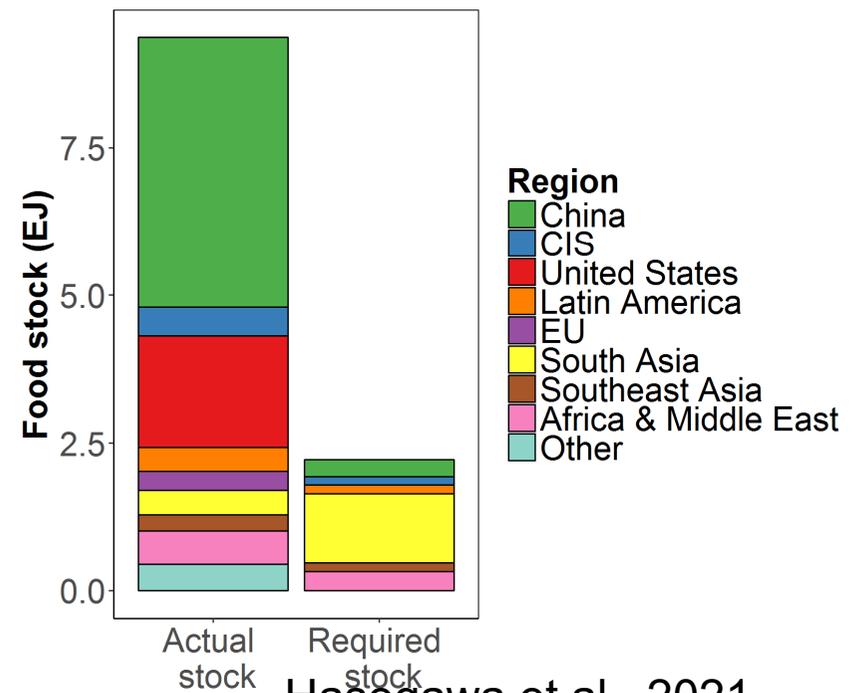
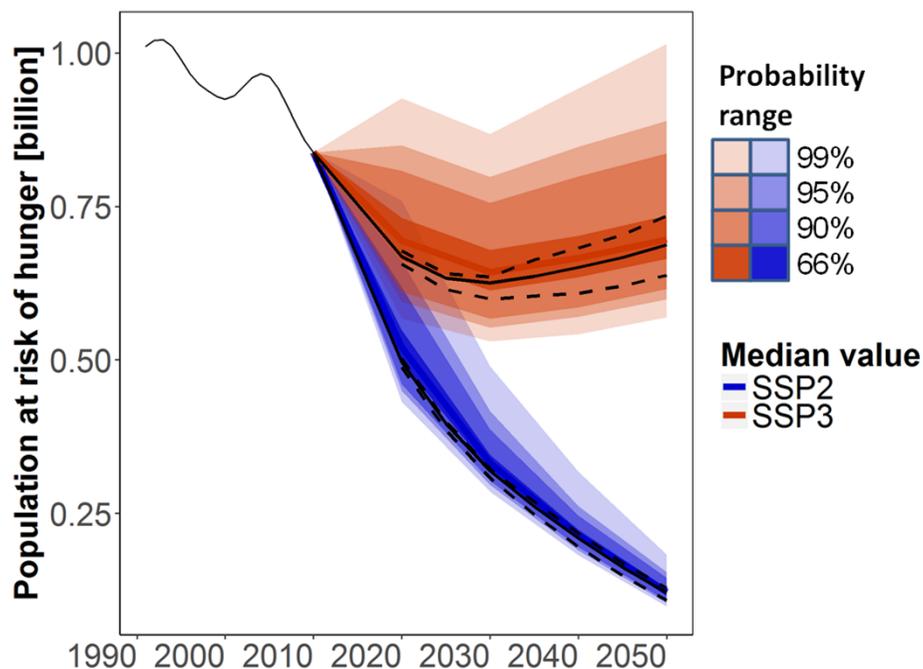
- 9% food production ↓
- 230 Mha agricultural land ↓
- 1360 MtCO<sub>2</sub>eq GHG emissions



# Extreme climate event increases risk of global food insecurity and adaptation needs



- Climate change can increase the frequency and intensity of extreme climate event.
- + 11–36% of the world population may face hunger by 2050 under a once-per-100-year extremely climate.
- Globally the current total reserve is quantitatively sufficient, even in the worst case.
- However, in some affected regions e.g., South Asia, the amount of food requirement to offset such an effect is triple the region's current food reserve.



# Thoughts

- Taking actions focusing on climate mitigation or implementing global uniform emissions mitigation may cause adverse impacts on low-income regions. Also, equally increasing food consumption for all people by 2030 would negatively affect the environment.
- Therefore, achieving the SDGs requires an integrated strategy. No single policy or effort is sufficient to achieve SDGs. It is important to consider what kind of impact one measure will have on another and then implement all related inclusive policies and efforts.
- In future, we may face global food insecurity due to extreme climate events and/or climate mitigation. Thinking about how to address future global food insecurity in terms of global collaboration and domestic food measures is of great importance.

# Thank you very much!

※ This work was supported by the Environment Research and Technology Development Fund (JPMEERF20202002 and JPMEERF20211001) of the Environmental Restoration and Conservation Agency of Japan and JSPS KAKENHI (19H02273) of the Japan Society for the Promotion of Science, the Ritsumeikan Global Innovation Research Organization (R-GIRO), Ritsumeikan University and the Sumitomo Foundation.