Assessing the impacts of changing consumer behaviour patterns on our planetary boundaries

DRAFT – please do not cite

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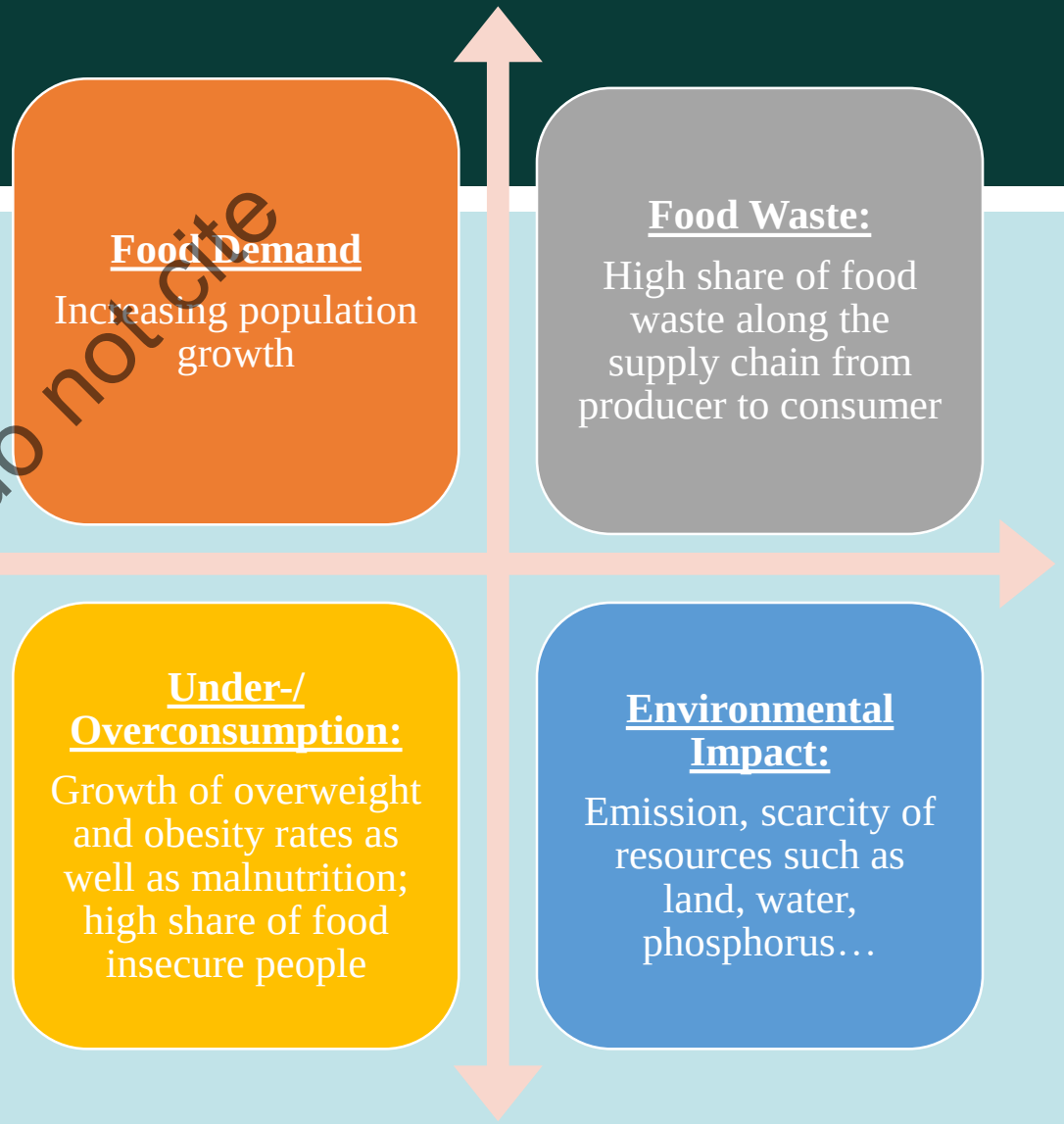
Motivation I

- **With increasing mouth to feed, we need**
  - to develop more sustainable and climate friendly systems of economic development
  - to avoid further increases in harmful greenhouse gas emissions
  - to reduce the burden on our natural biophysical planetary boundaries
- **One hot topic is the role of changing consumer behaviour and attitudes to food consumption.**



Motivation II

- Economic cost of food waste are estimated to amount to 2.6 trillion USD (3.3% of global GDP) FAO, 2014
- Reduction in food waste is expected
  - to lead to non-market biophysical benefits (land and water savings)
  - to contribute to reducing greenhouse gas emissions by reducing emission intensive activities such as primary agricultural production
- This could be achieved through not only food waste reductions, but also changes in consumers' diets through the sourcing of protein from non-meat activities.

Objective

- We aim to examine how changing consumer choice patterns impact on a wealth of economic, social and environmental market indicators and the resulting trade-offs, for a selection of regions across the world.
- Specifically, we aim to assess the impact of…

food waste reductions

dietary changes

Outline

- Motivation
- Objective
- Methodology
- Experiment Design
- Results
- Conclusion

Methodology

This study:

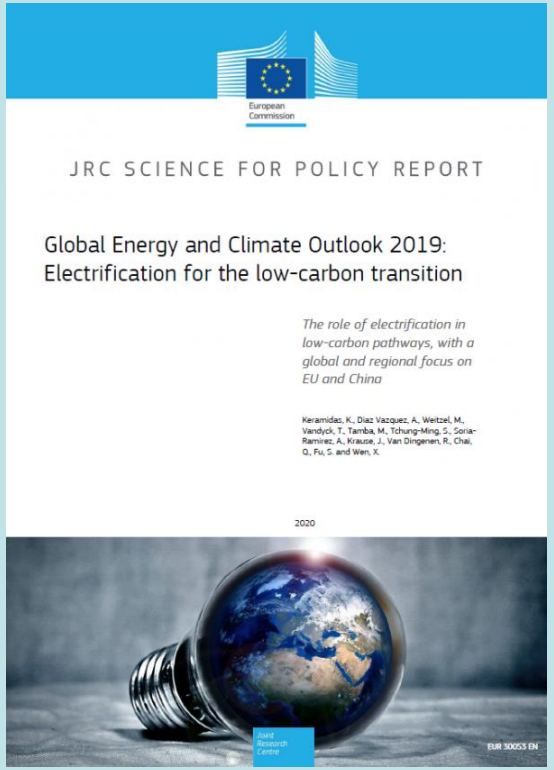
- employs an advanced CGE neoclassical model known as the Modular Applied GeNeral Equilibrium Tool (MAGNET) (Woltjer et al., 2014), which is a recursive dynamic variant of the standard GTAP model
- applies a model benchmarked to version 9 GTAP database (2011)
- uses a biobased variant of the standard GTAP database consisting of numerous additional biobased activities splits (including waste and recycling) (Philippidis et al., 2019) to enhance to analysis of the circularity of food waste reductions

Baseline

- Time period 2011 to 2050 based on the Global Energy and Climate Outlook (GECO) published by the Joint Research Centre of the European Commission (Keramidas et al., 2018).
- Detailed assumptions are implemented regarding:

  real macroeconomic growth, population change, fossil fuel prices, energy usage, efficiency by types of activity and region, emissions changes, land productivities
- Treatment of primary agriculture captures:

  agricultural factor rigidities, asymptotic land supplies, long run biophysical estimates of land productivities
- Adjustment of regional income elasticities of household demands



Scenario Overview: Food Waste

Scenario1

- **Halving food waste by 2030, 75% food waste reduction in 2050**
- Highly ambitious scenario: All regions achieve the SDG target in 2030 and gradually reduce food waste by 75% until 2050

Scenario 2

- **75% food waste reduction in 2050:**
- Ambitious scenario, although countries fail to reach the SDG target in 2030, they gradually reduce food waste by 75% until 2050

Scenario3

- **Halving food waste by 2030, 50% food waste reduction in 2050**
- Regions only reach the 50% target in 2030, after that no further efforts in reducing waste until 2050.

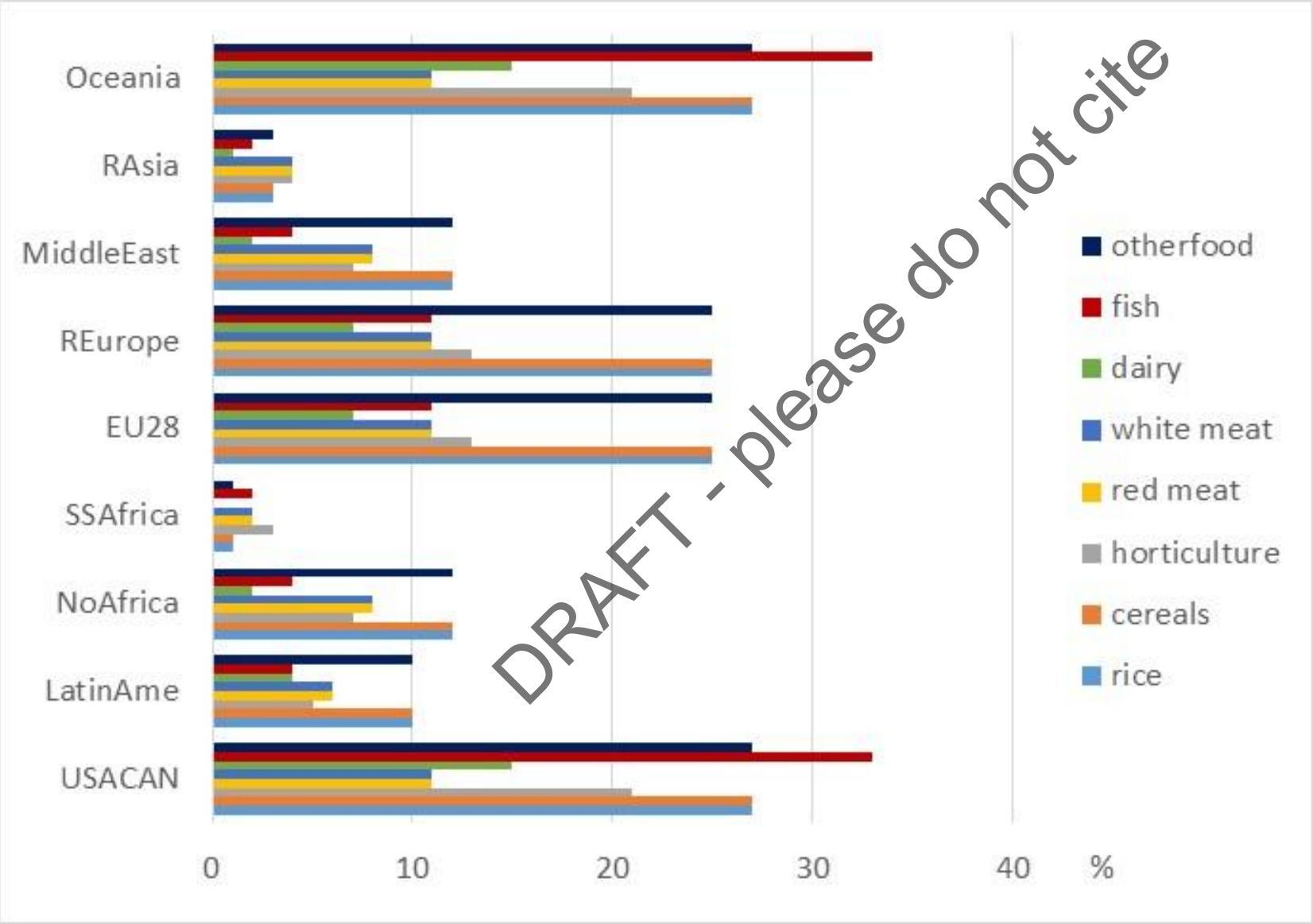
Scenario4

- **50% food waste reduction in 2050:**
- Less ambitious scenario: although countries fail to achieve the target in 2030, they gradually reduce food waste by 50% until 2050

Scenario5

- **25% food waste reduction in 2050:**
- Regions only reach a small share of their ambition towards reducing food waste. Gradual reduction of 25% of food waste until 2050.

Overview Household Food Waste



Waste Share in House-hold Food Consumption per Region

Source: Own computation, using data from FAO 2011

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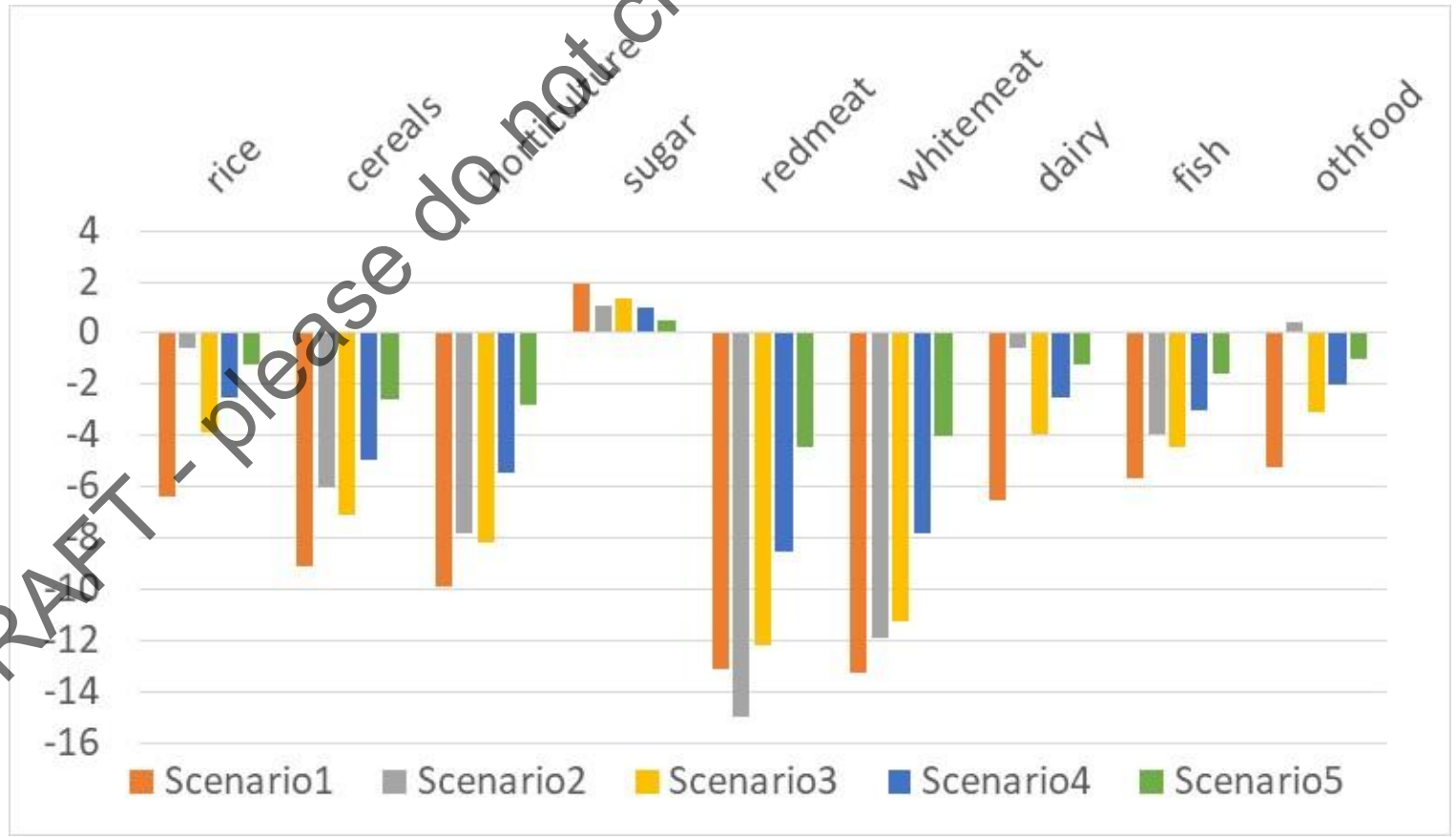
Preliminary Results

FOOD WASTE

Global Consumer Demand Changes compared to baseline (% points)

Scenario	
1	**Halving food waste by 2030, 75% food waste reduction in 2050**
2	**75% food waste reduction in 2050 - gradually**
3	**Halving food waste by 2030, 50% food waste reduction in 2050**
4	**50% food waste reduction in 2050 – gradually**
5	**25% food waste reduction in 2050 - gradually**



Global Consumer Food Price Changes compared to baseline (% points)

Scenario	
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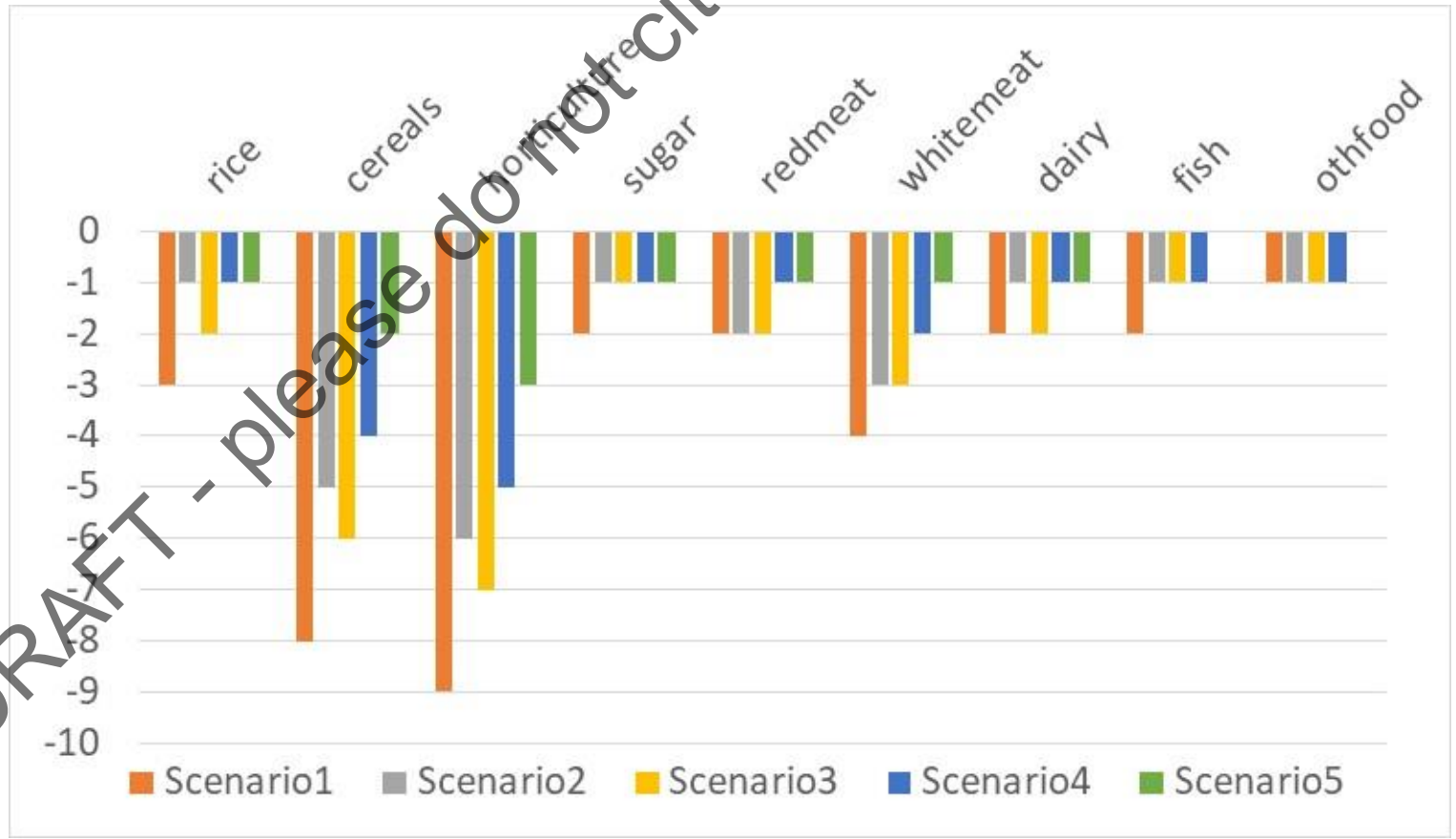

Global Output Changes compared to baseline (% points)

Scenario
Halving food waste by 2030, 75% food waste reduction in 2050
75% food waste reduction in 2050 - gradually
Halving food waste by 2030, 50% food waste reduction in 2050
50% food waste reduction in 2050 – gradually
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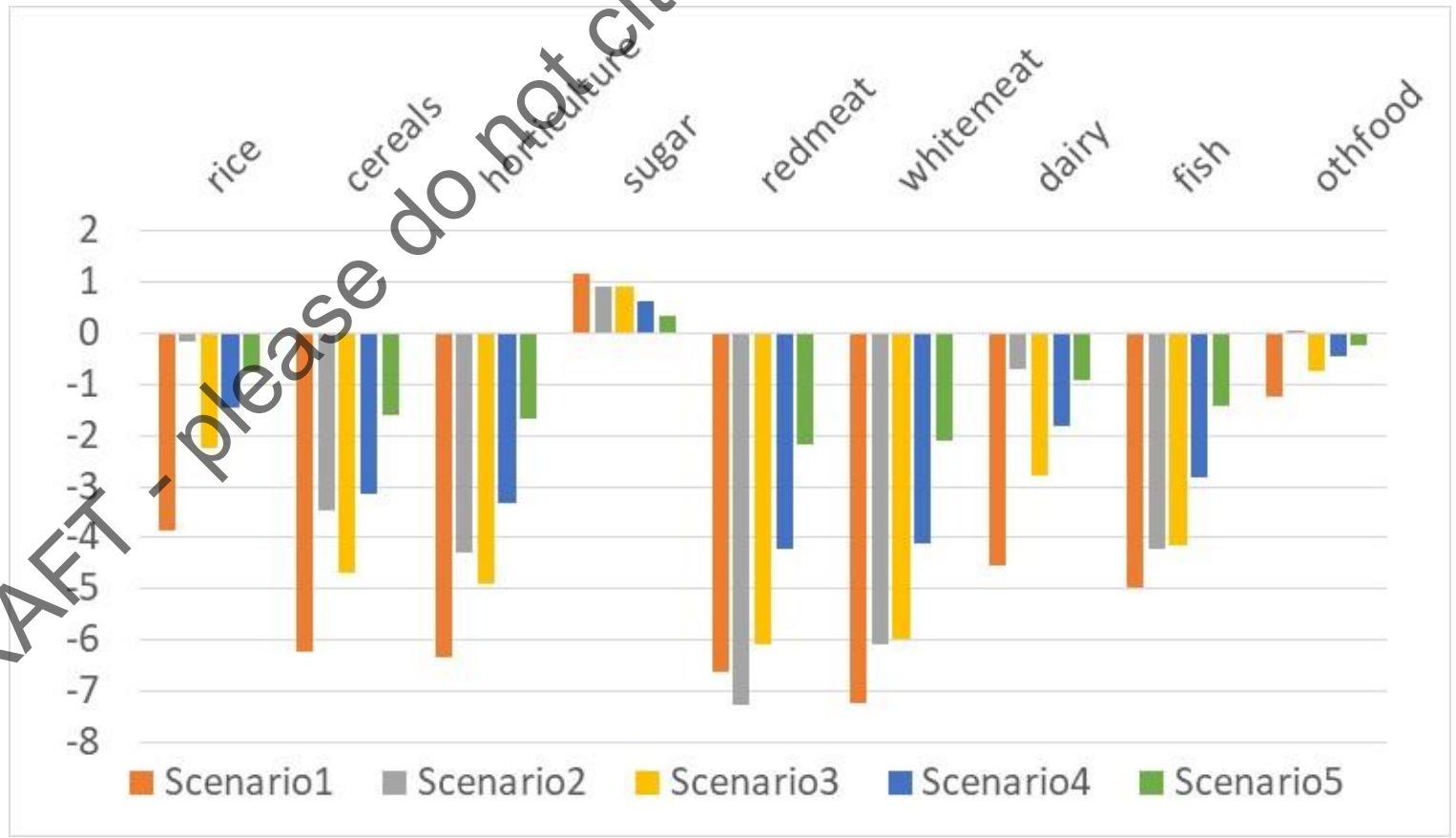
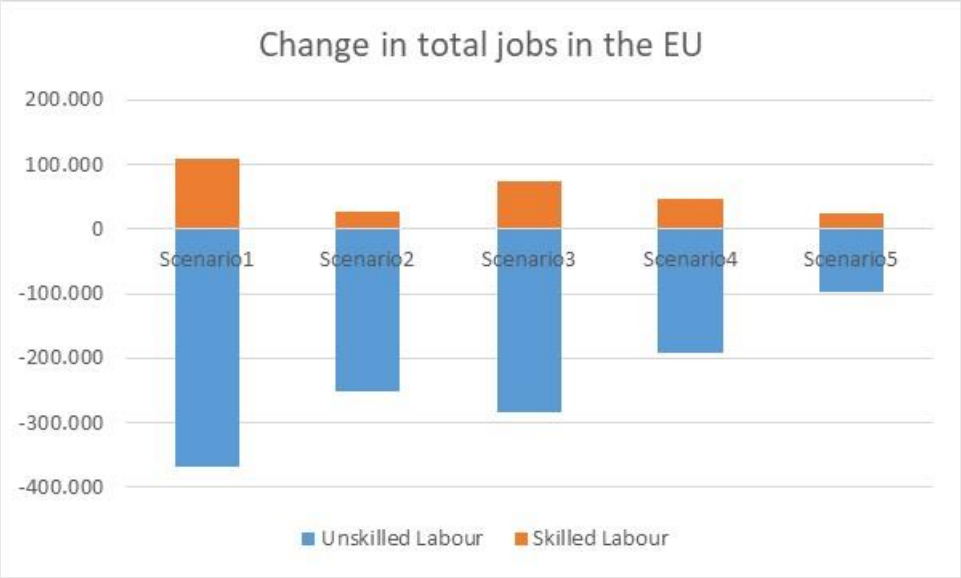
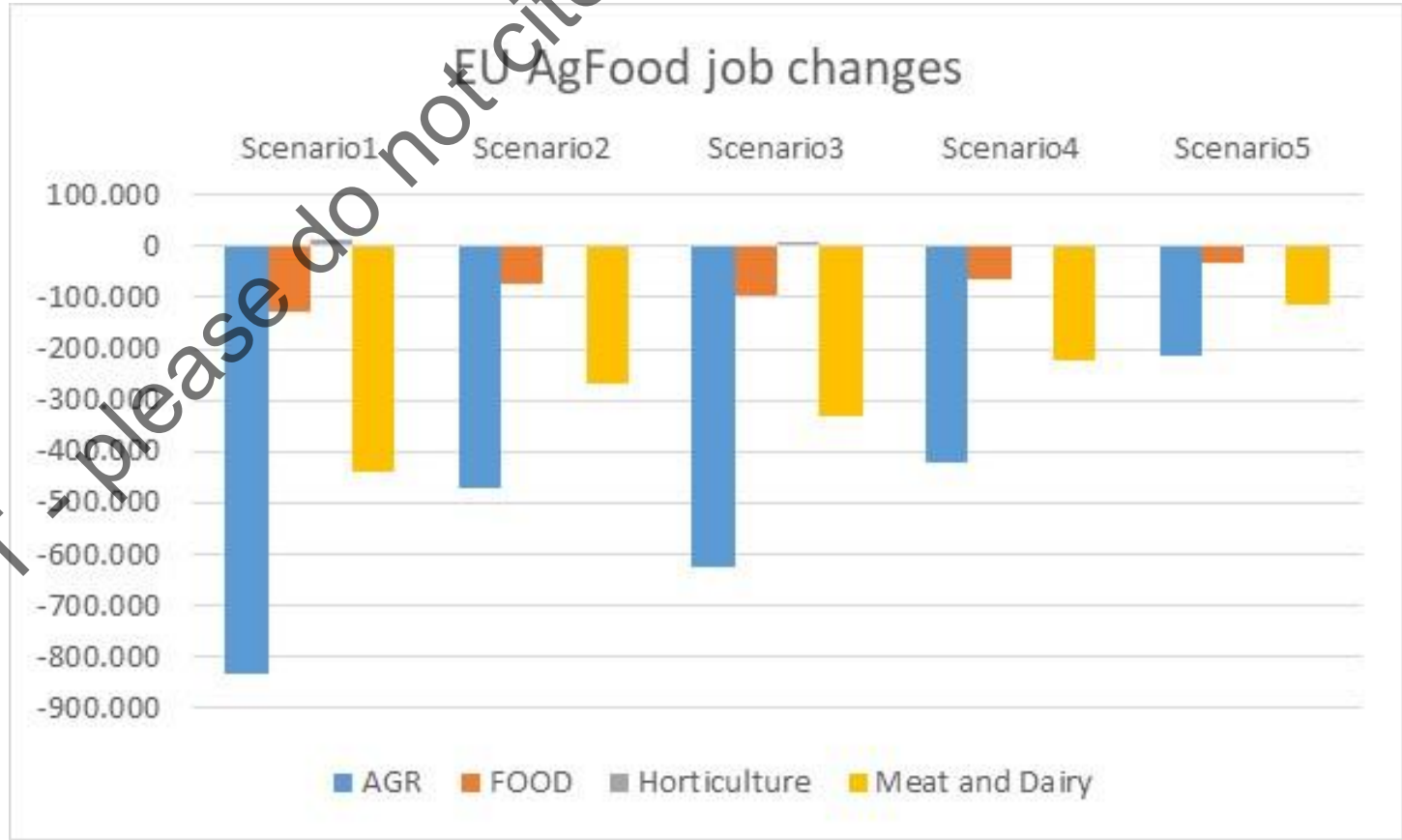


Real GDP compared to baseline (% points)

Scenario	
	Halving food waste by 2030, 75% food waste reduction in 2050
	75% food waste reduction in 2050 - gradually
	Halving food waste by 2030, 50% food waste reduction in 2050
	50% food waste reduction in 2050 – gradually
	25% food waste reduction in 2050 - gradually

EU Labour compared to baseline in 2050





Scenario
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Footprints: % change of scenarios compared to baseline in 2050

Scenario	
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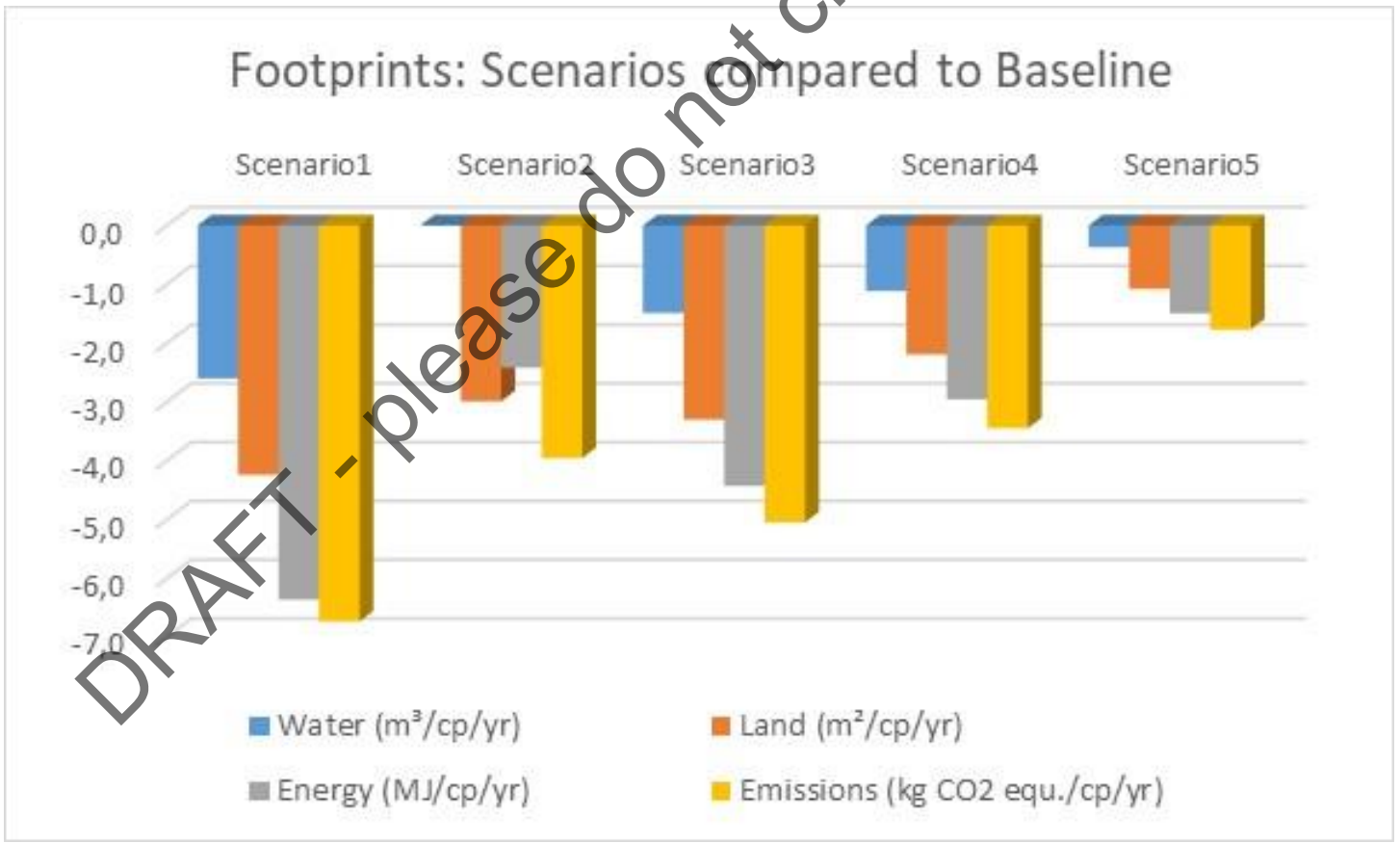

Emissions

Scenario	
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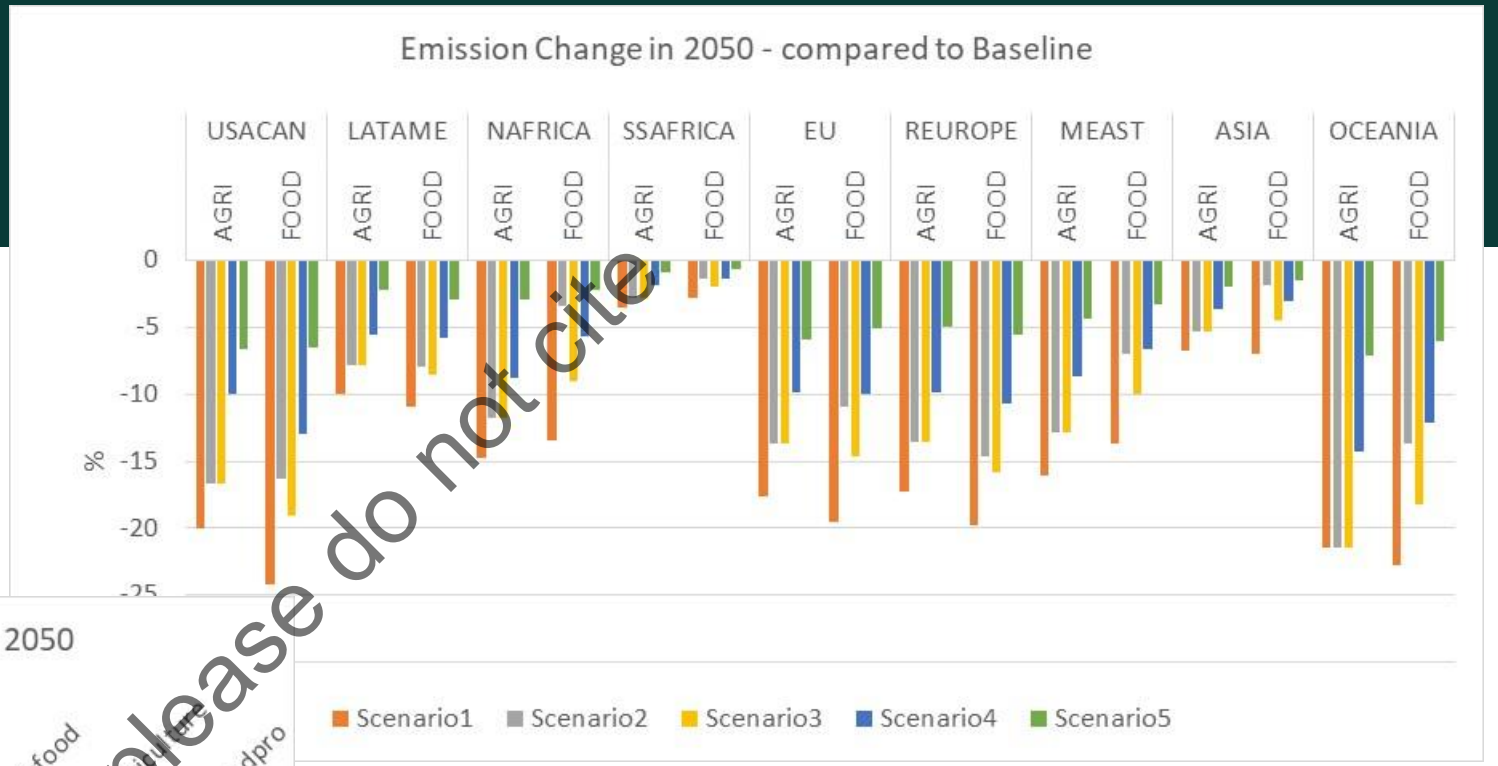

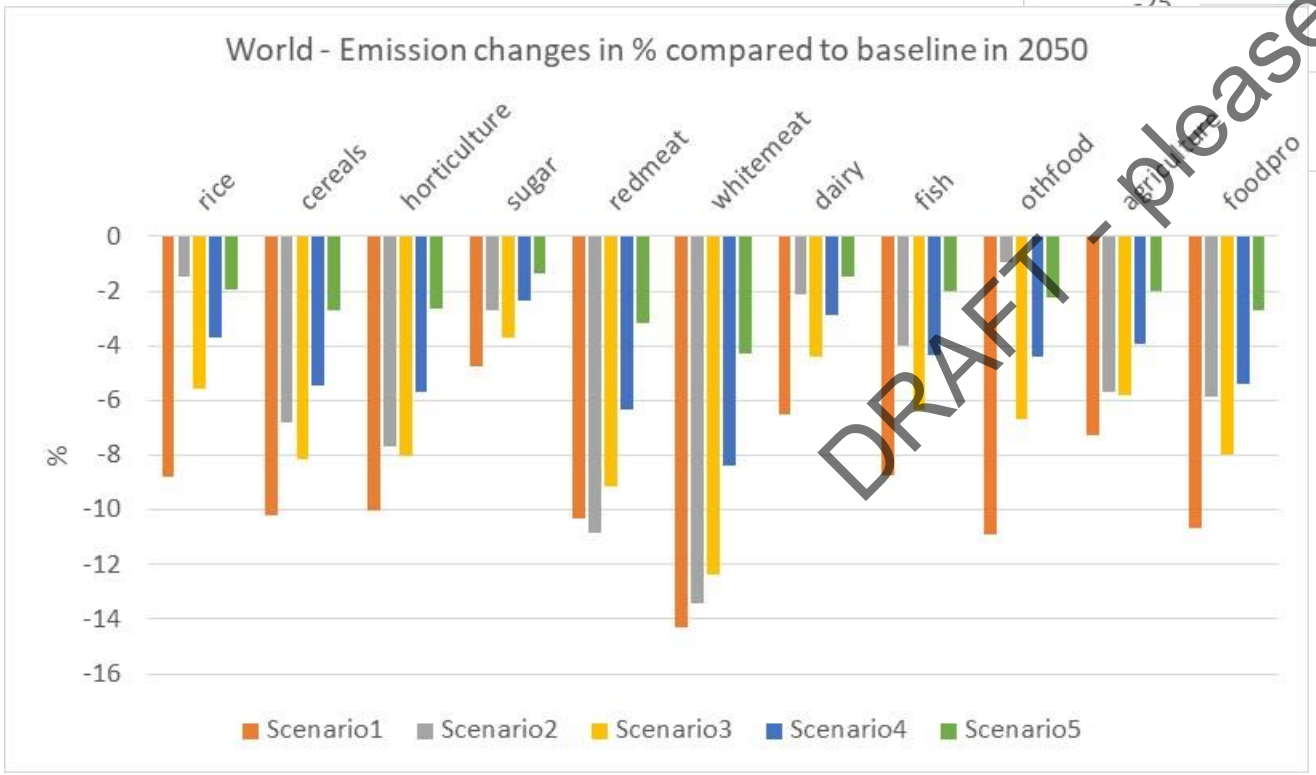

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Land Use

Scenario	
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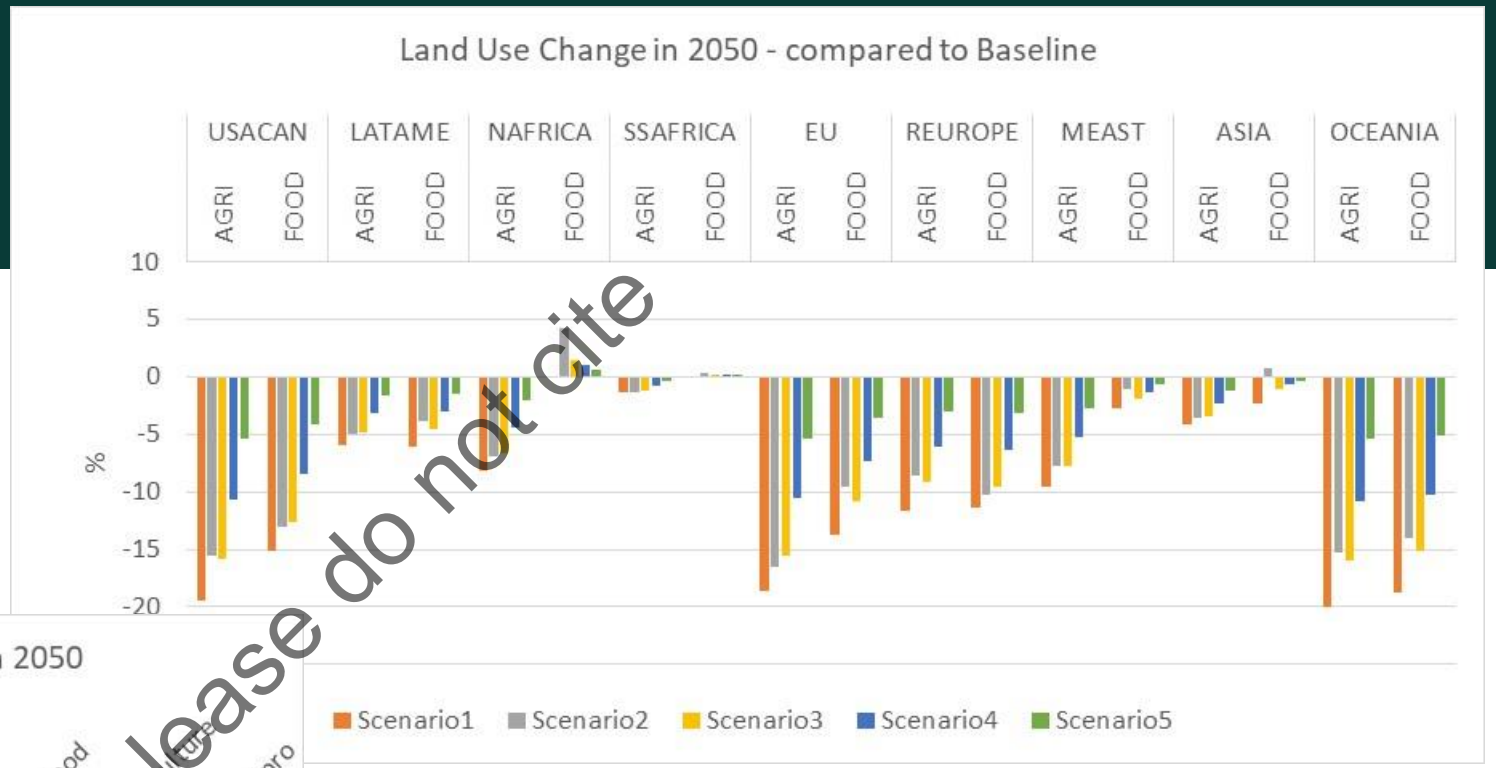

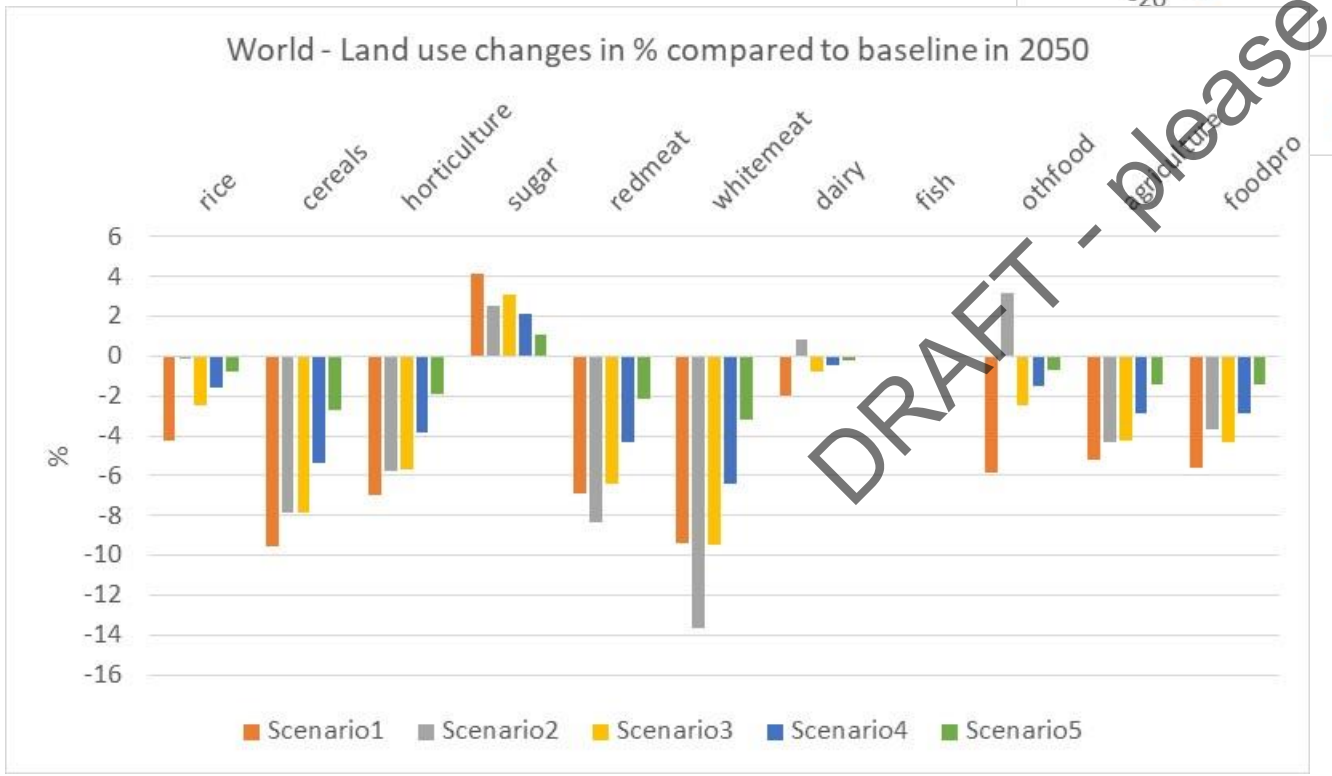

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Water Use

Scenario	
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3	Halving food waste by 2030, 50% food waste reduction in 2050
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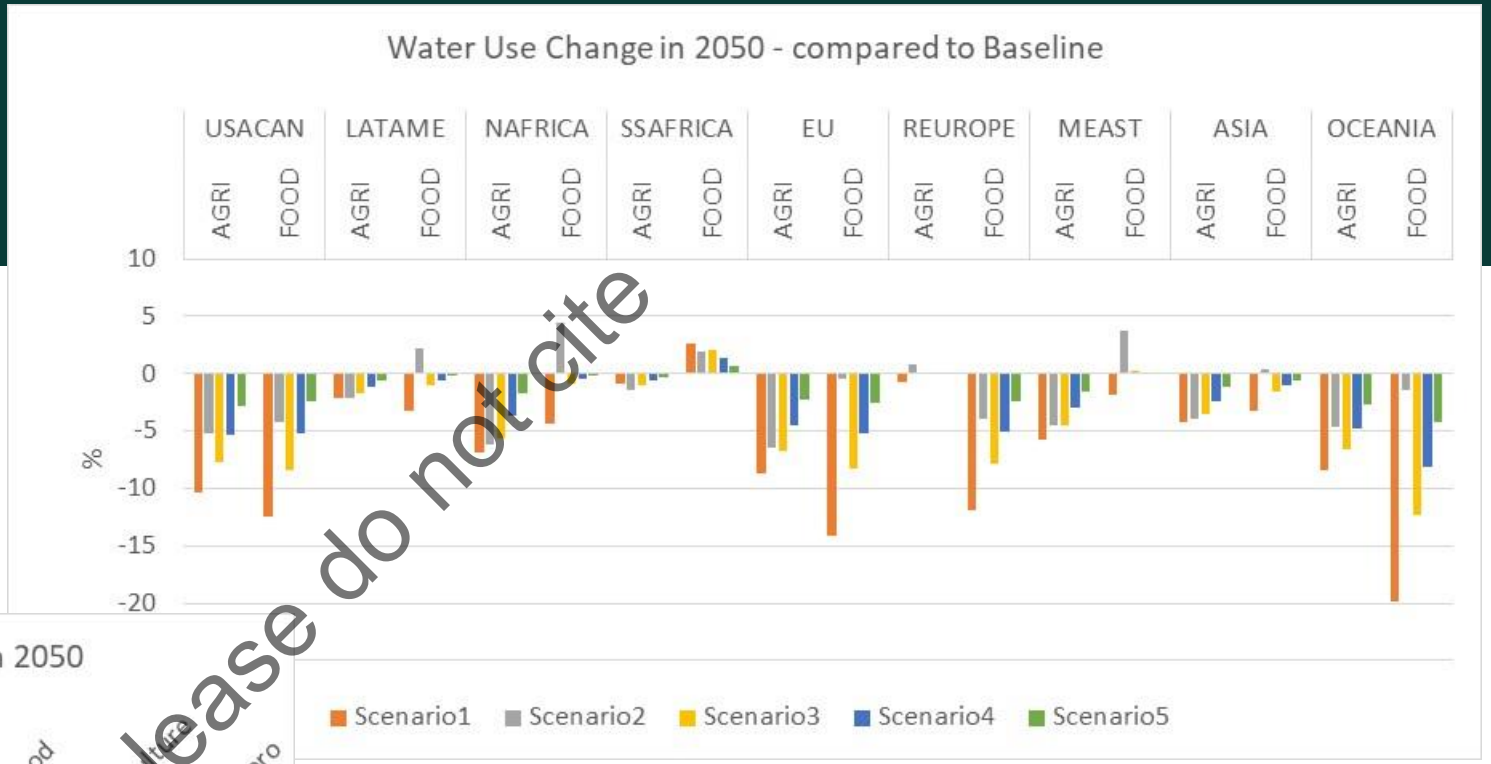

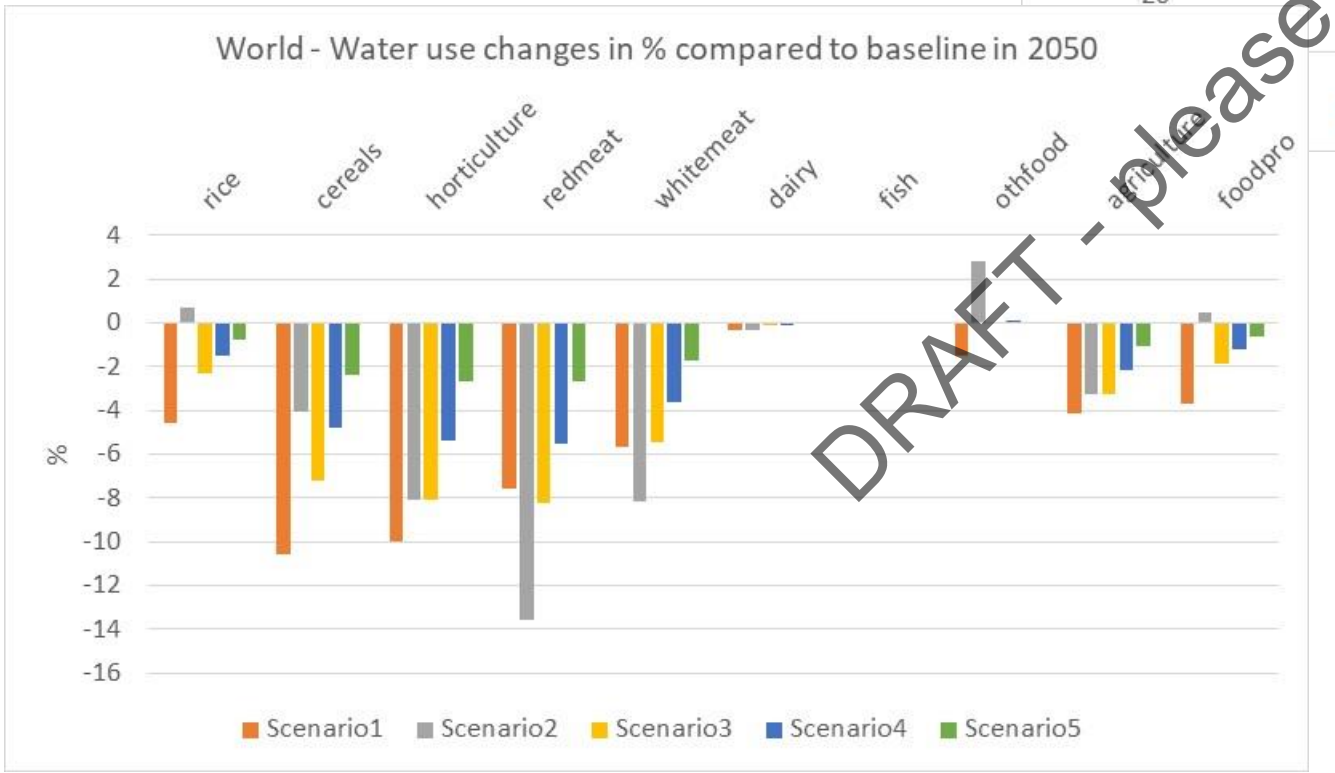

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Energy Use

Scenario	
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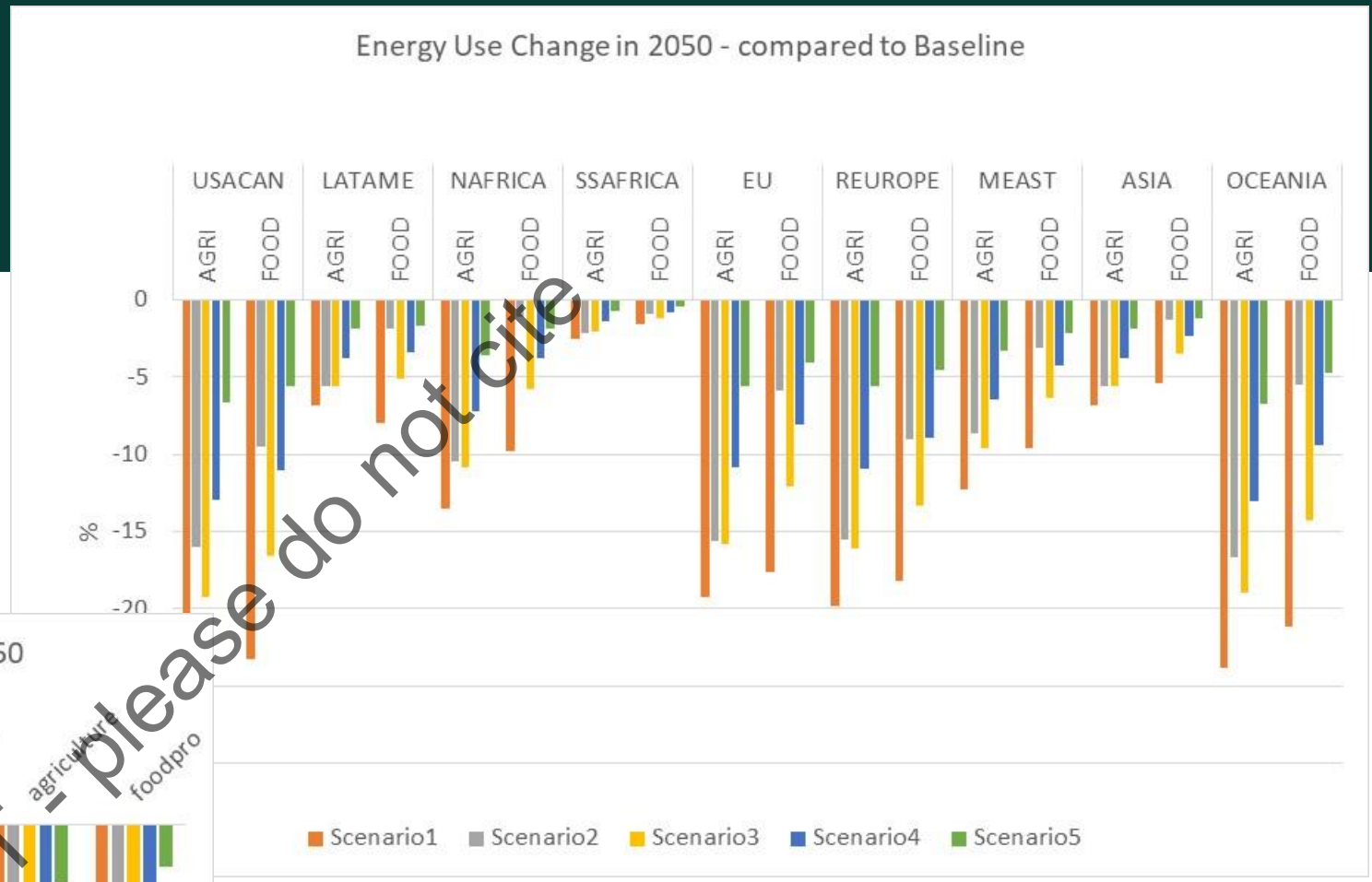

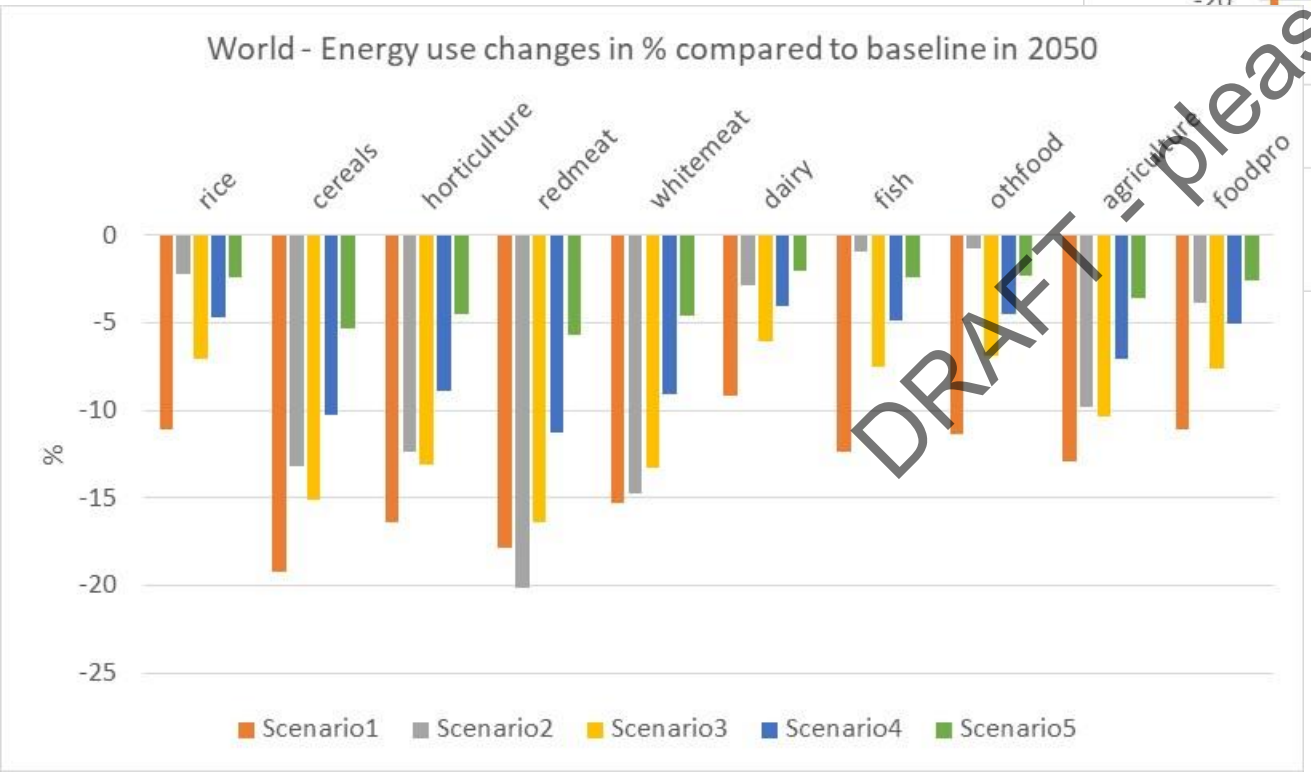

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Summary: Impact of Food Waste Reduction

Economic

- Decrease in agricultural output and output prices
- Slight GDP decreases

Social

- Job losses in the agricultural sector, except for horticulture
- Cost of food basket decreases

Environment

- Reduced greenhouse gas emissions
- Less energy use
- Decrease in land use
- Small reduction in water use

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