

Food loss and waste within food value chains: an in-depth overview

Dr Xuezhen Guo

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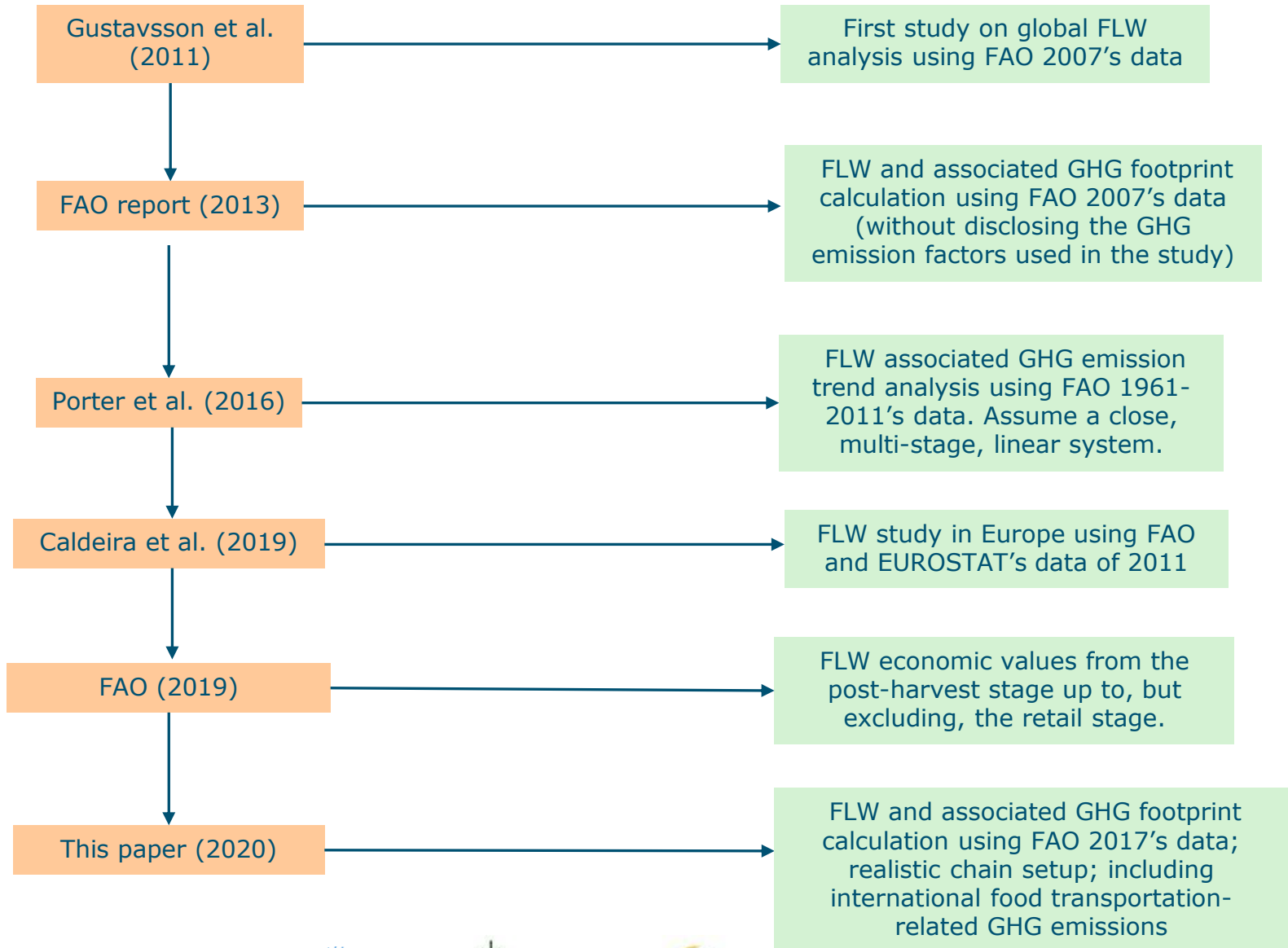
RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Background information

- Reducing food loss and waste (FLW) is prioritized in SDG target 12.3 to contribute to “ensure sustainable consumption and production patterns”.
- Food loss and waste have significant impacts on climate change (6% to 8% of the total greenhouse gas emissions)
- Food loss and wastes have also huge implications on nutrition security

Existing milestone studies and the knowledge gap



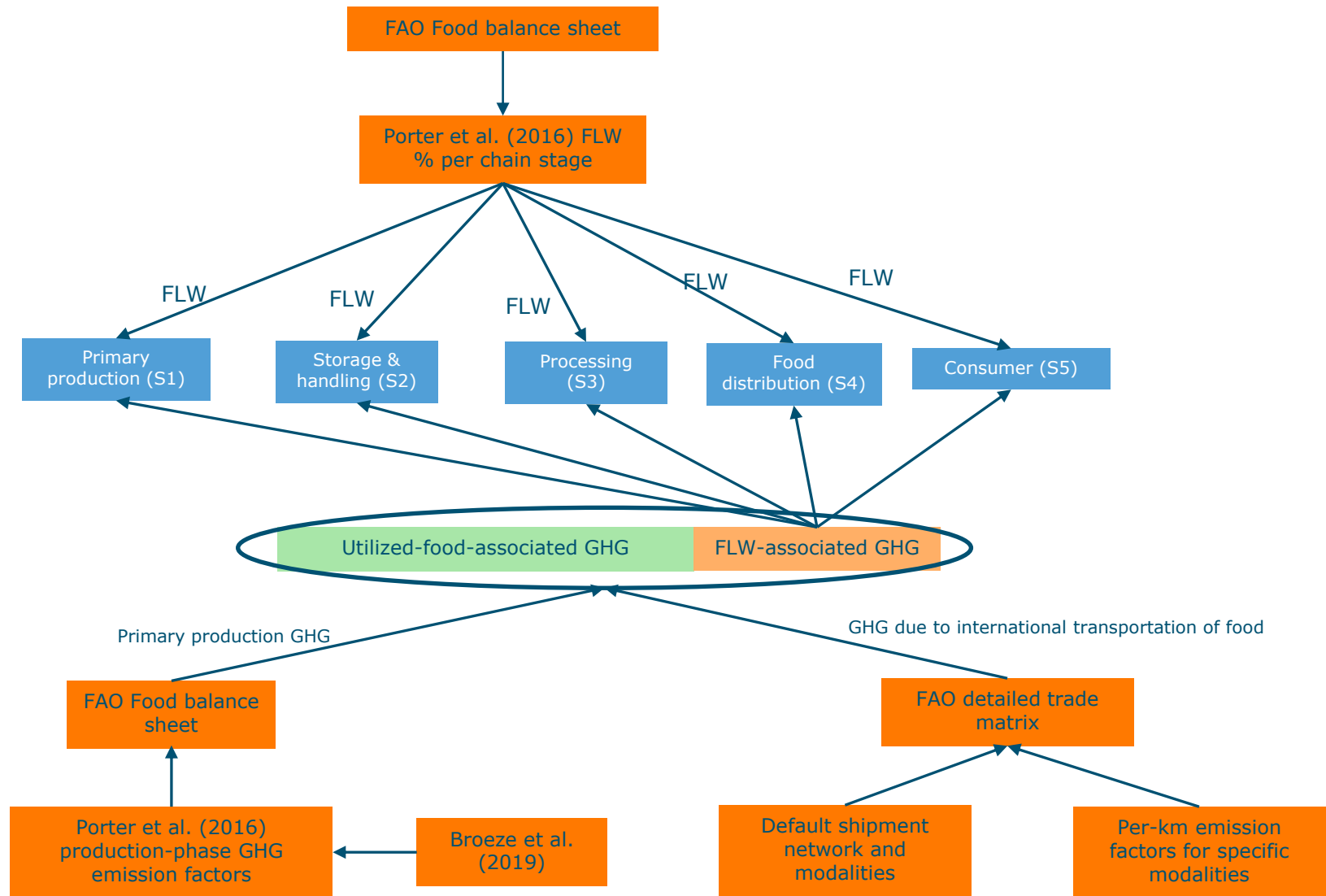
Data and Methodology

- FAO food balance sheets (2017) provide the values for food production, import, export, processing, food distribution, etc. on the country level for each food item. Using those values as the basis we calculated the product volumes at different supply chain stages in every individual country.
- Multiplying the FLW factors from Porter et al. (2016) to the volumes at the corresponding supply chain stages, we derived the FLW quantities. Porter et al. (2016) is the most comprehensive research that gives the FLW factors to different supply chain stages in 7 different FAO defined regions for different food product groups. Those regions include the major countries in the world and neglect some small countries. The countries considered in this study are the same as in Porter et al. (2016).
- Porter et al. (2016) and Broeze et al. (2019) provides the GHG emission factors for the 7 FAO defined regions at the primary production stage for different food product groups. Therefore, multiplying the GHG emission factors to the corresponding production volumes, we can derive the total primary production related GHG emissions. On top of that, we also included the international-transportation related GHG emissions for the international food trades. For this purpose, the detailed trade matrix from the FAO database is also used. GHG emissions at other chain stages are not considered due to lack of data.

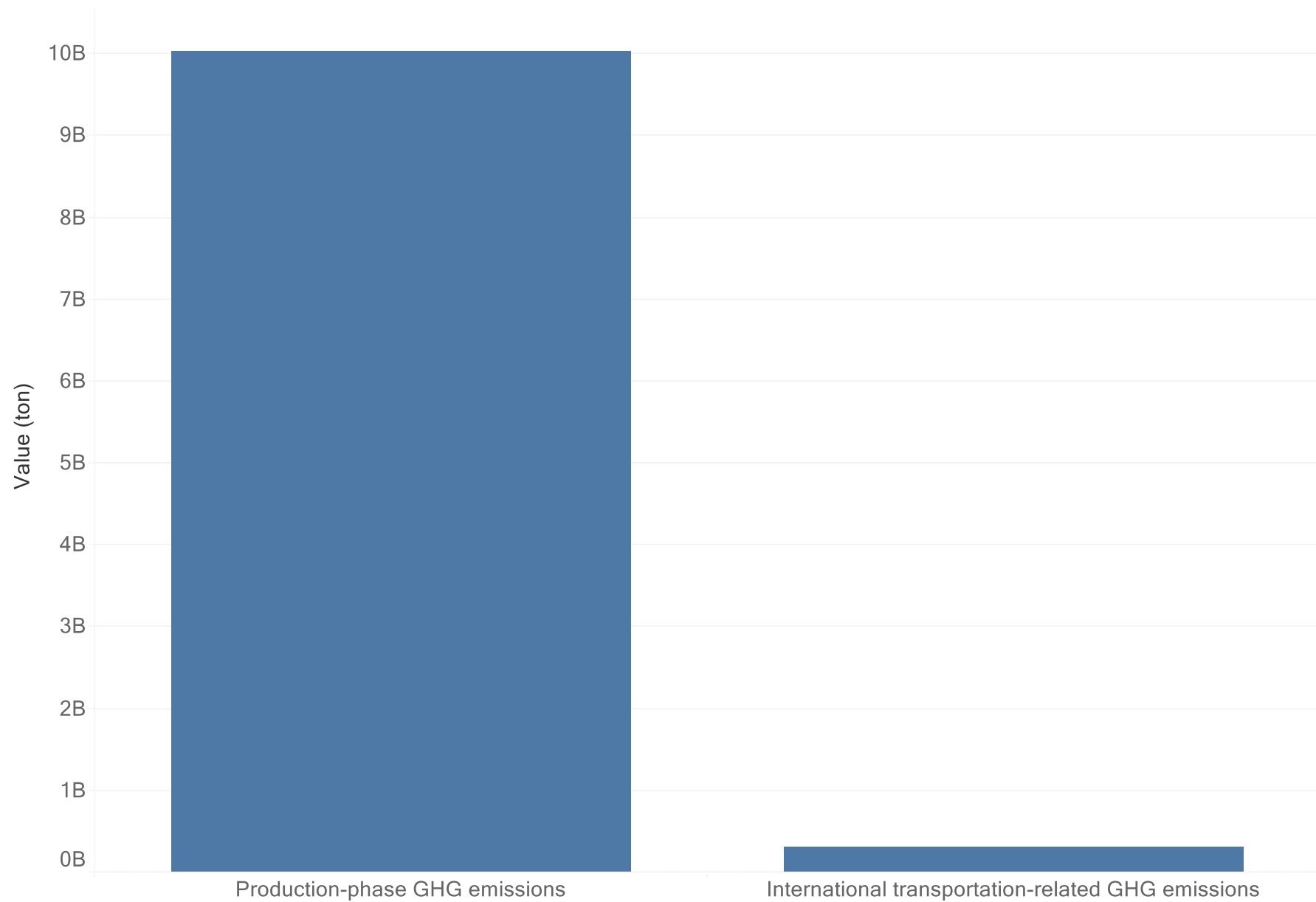
Data and Methodology

- Then attributing part of the total GHG emissions according to the occurred FLW quantity at each supply chain stage, we get the GHG emissions attached to FLW (FLW-related GHG emissions) specifically to that chain stage.

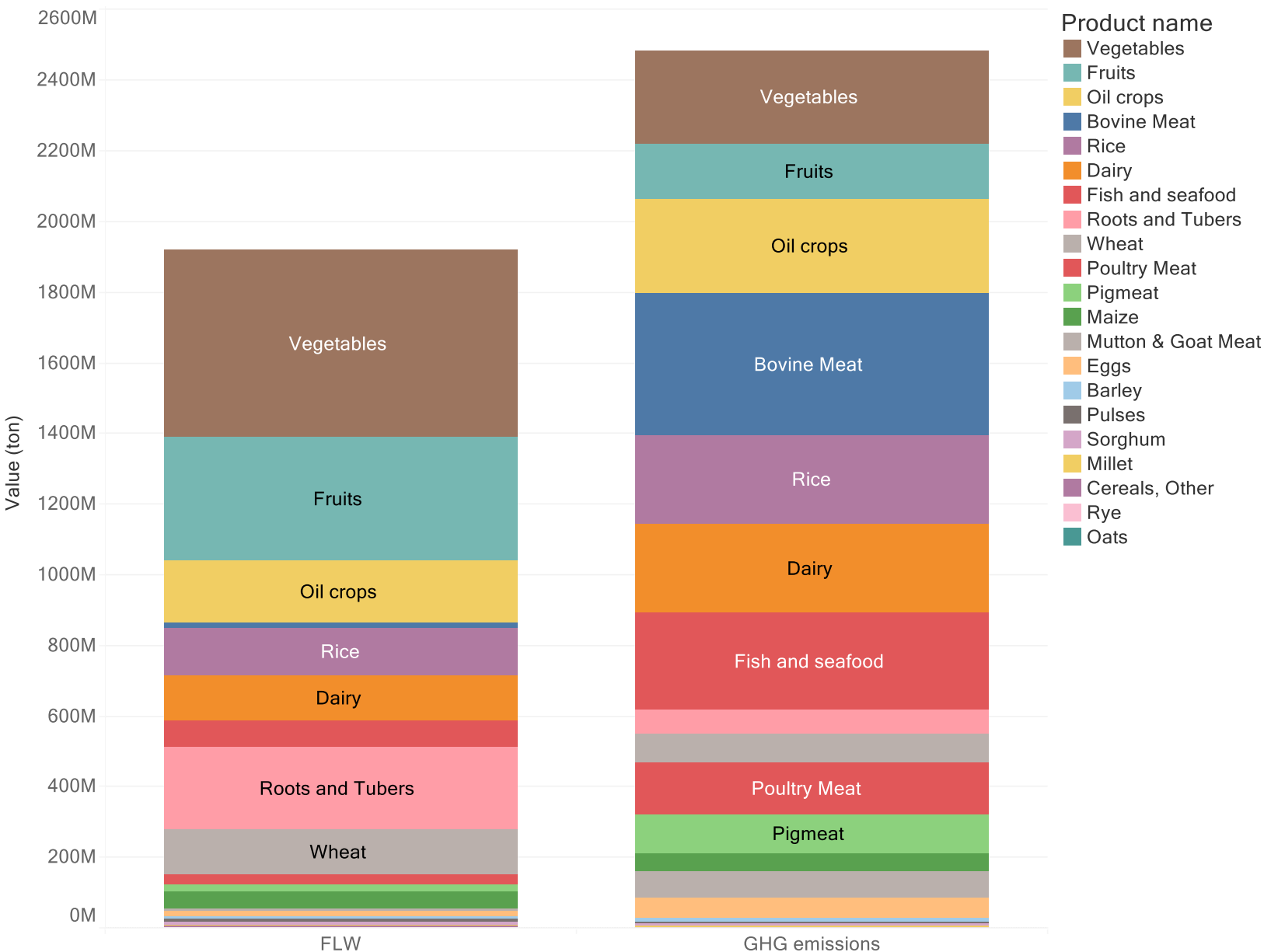
Our data and methodology



GHG emissions by type (2017)



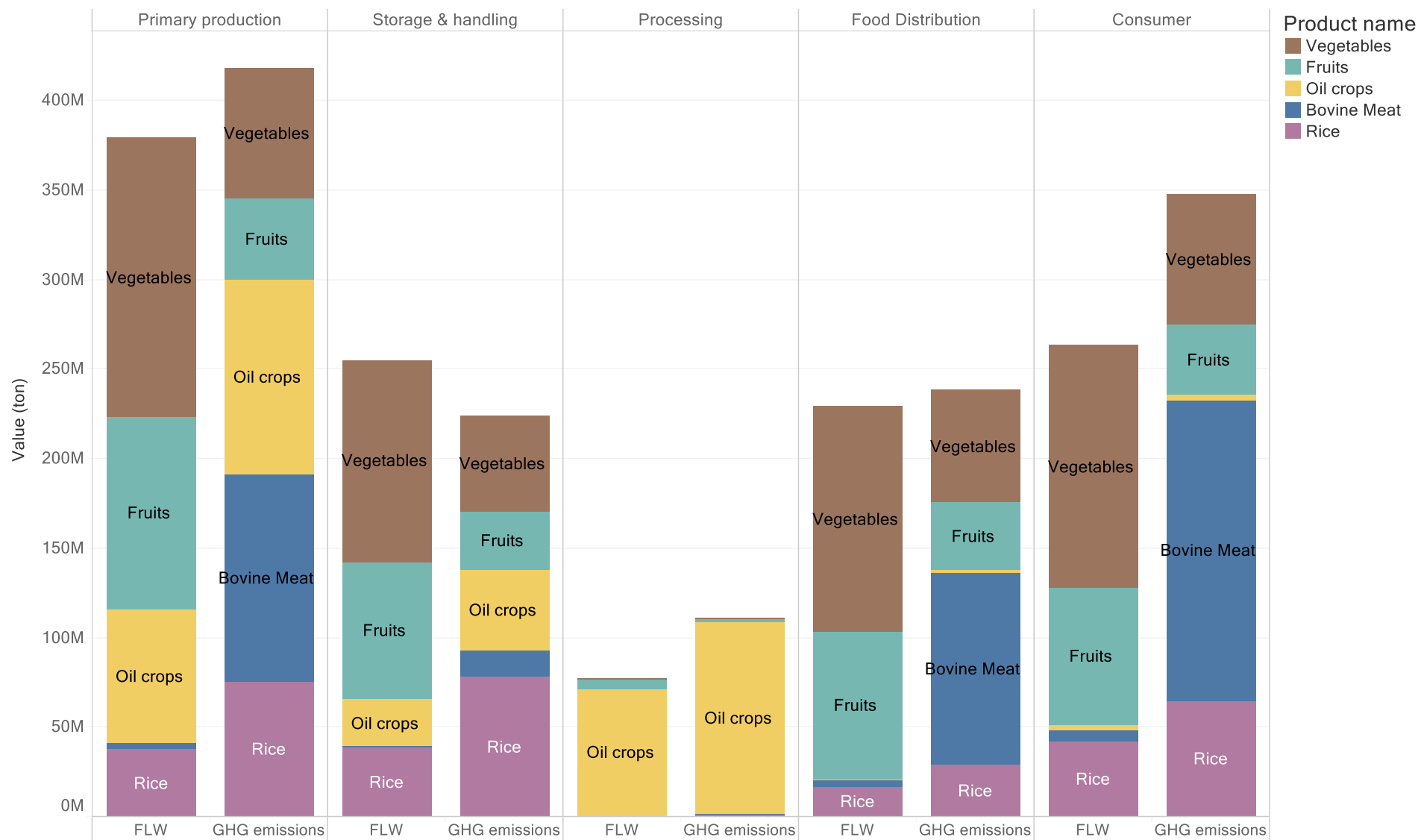
Global overview by item (2017)



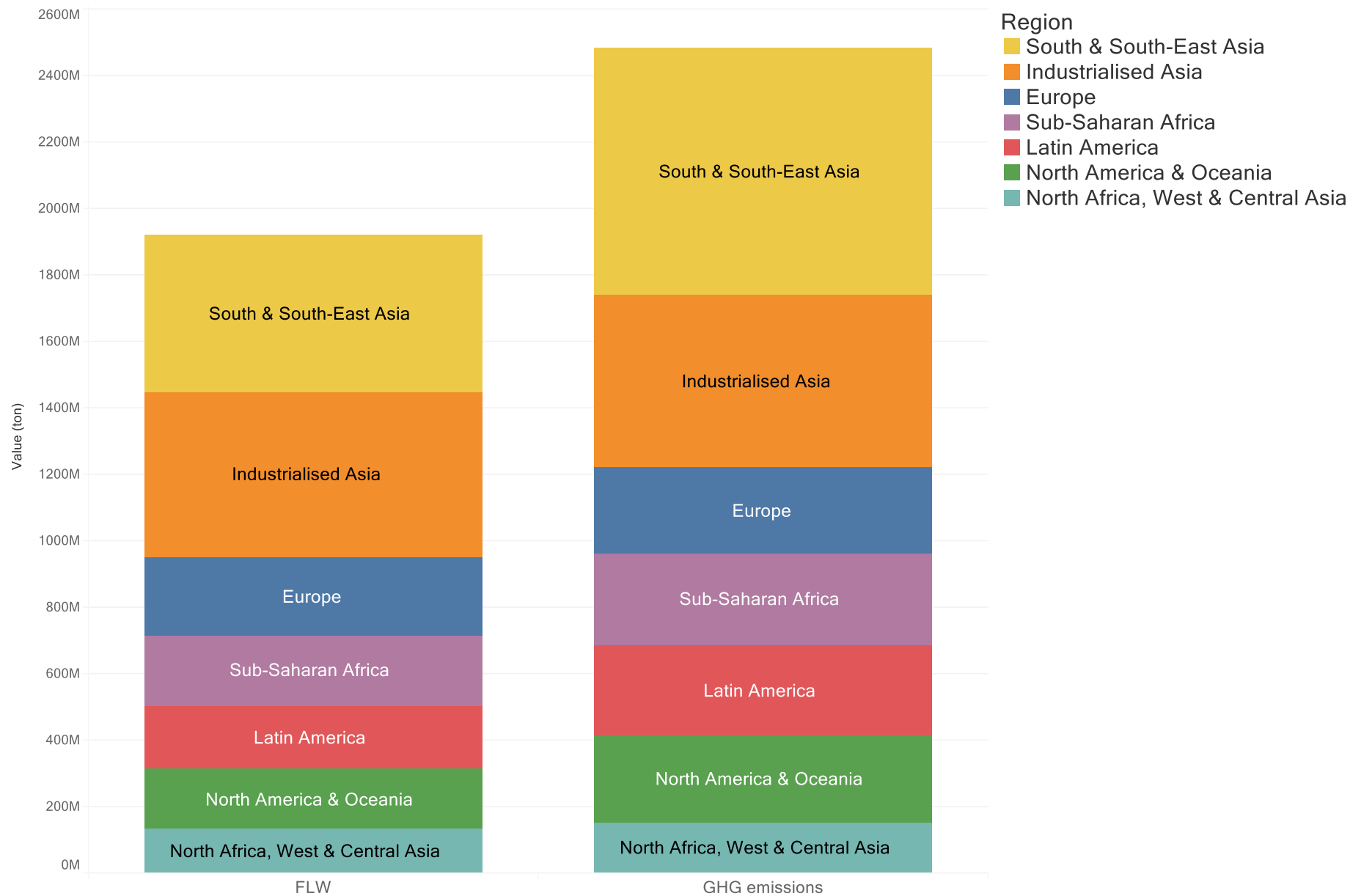
F&V Map FLW (2017) (Ton)



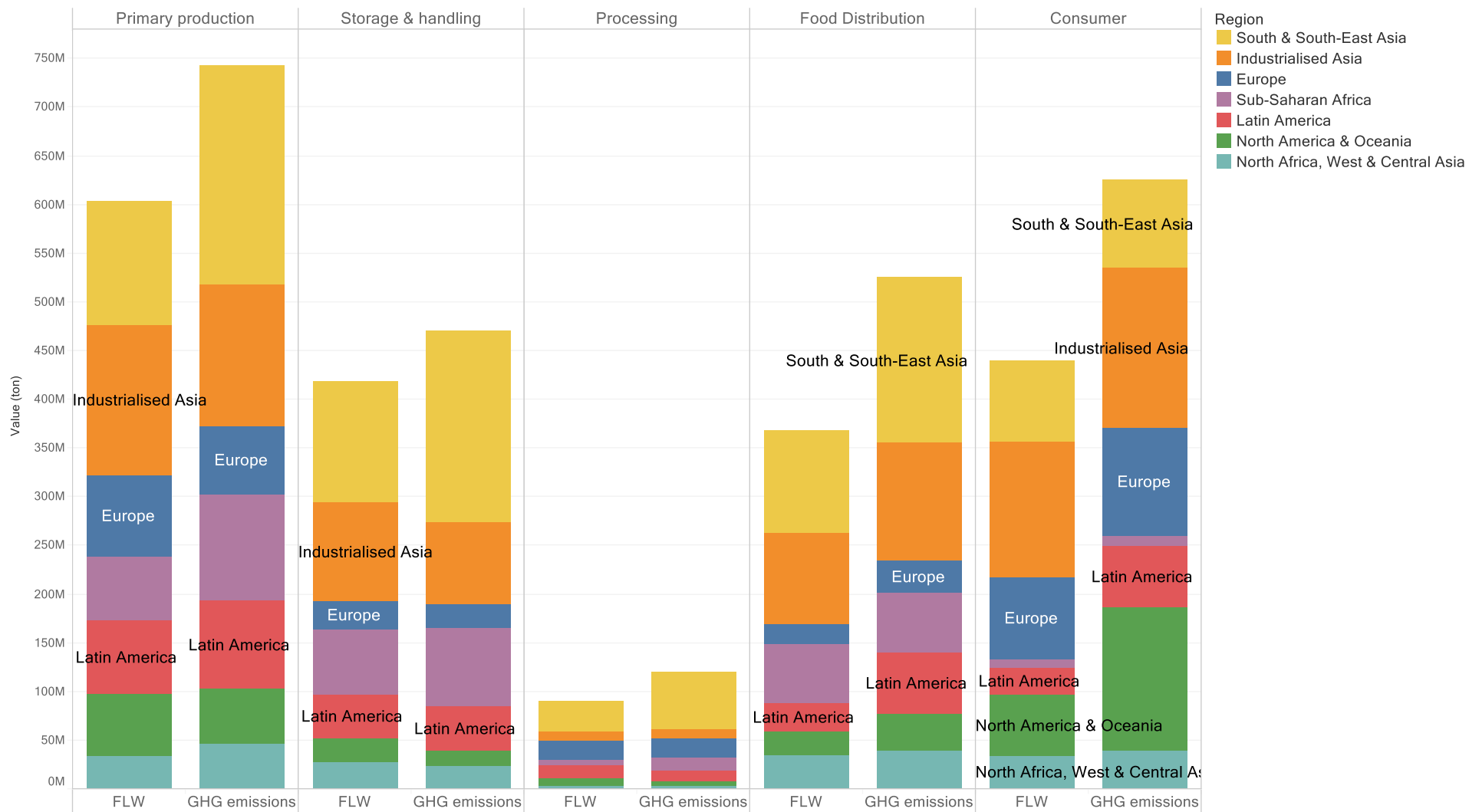
Global overview on top 5 items by chain stage (2017)



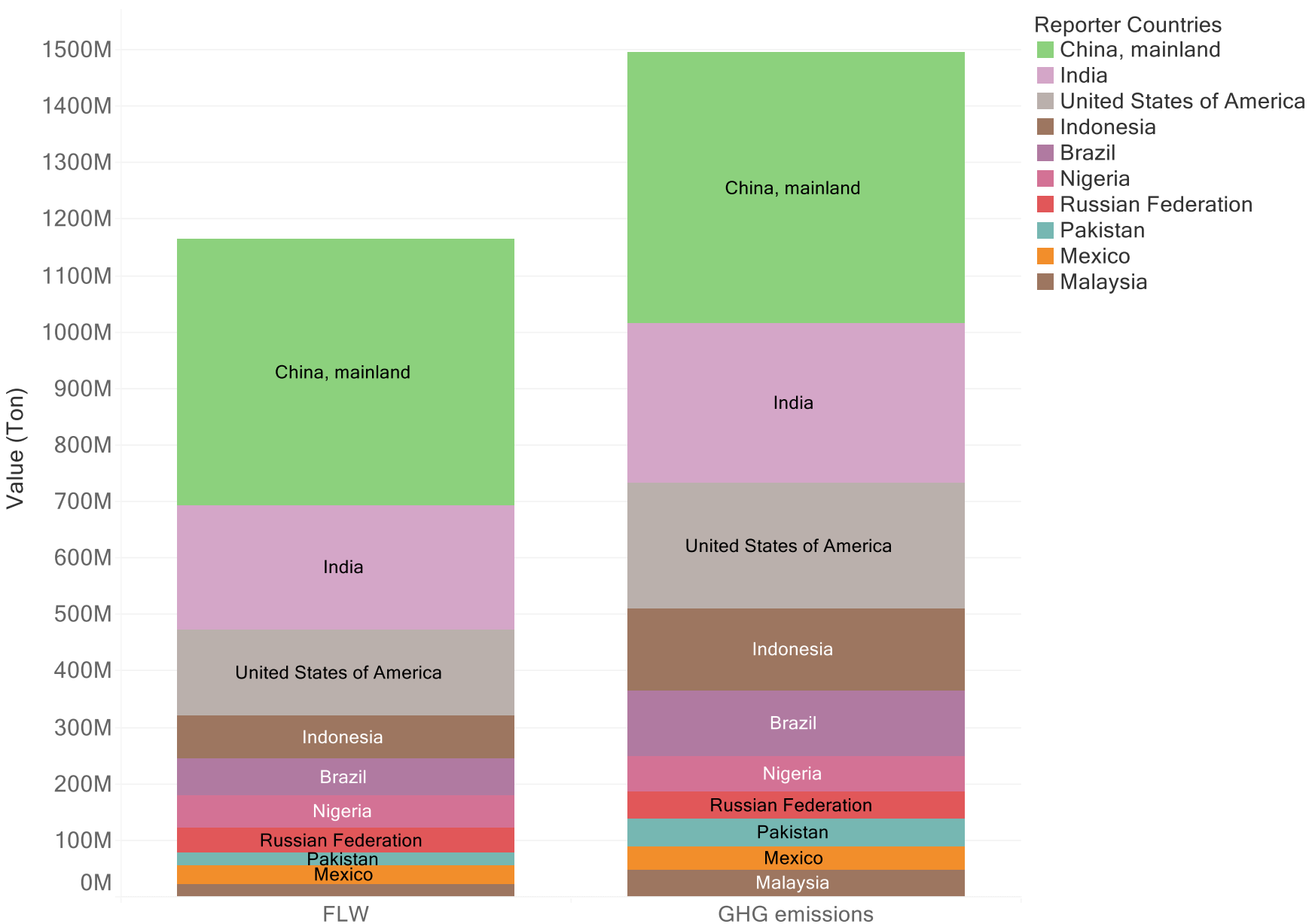
Overview by region (2017)



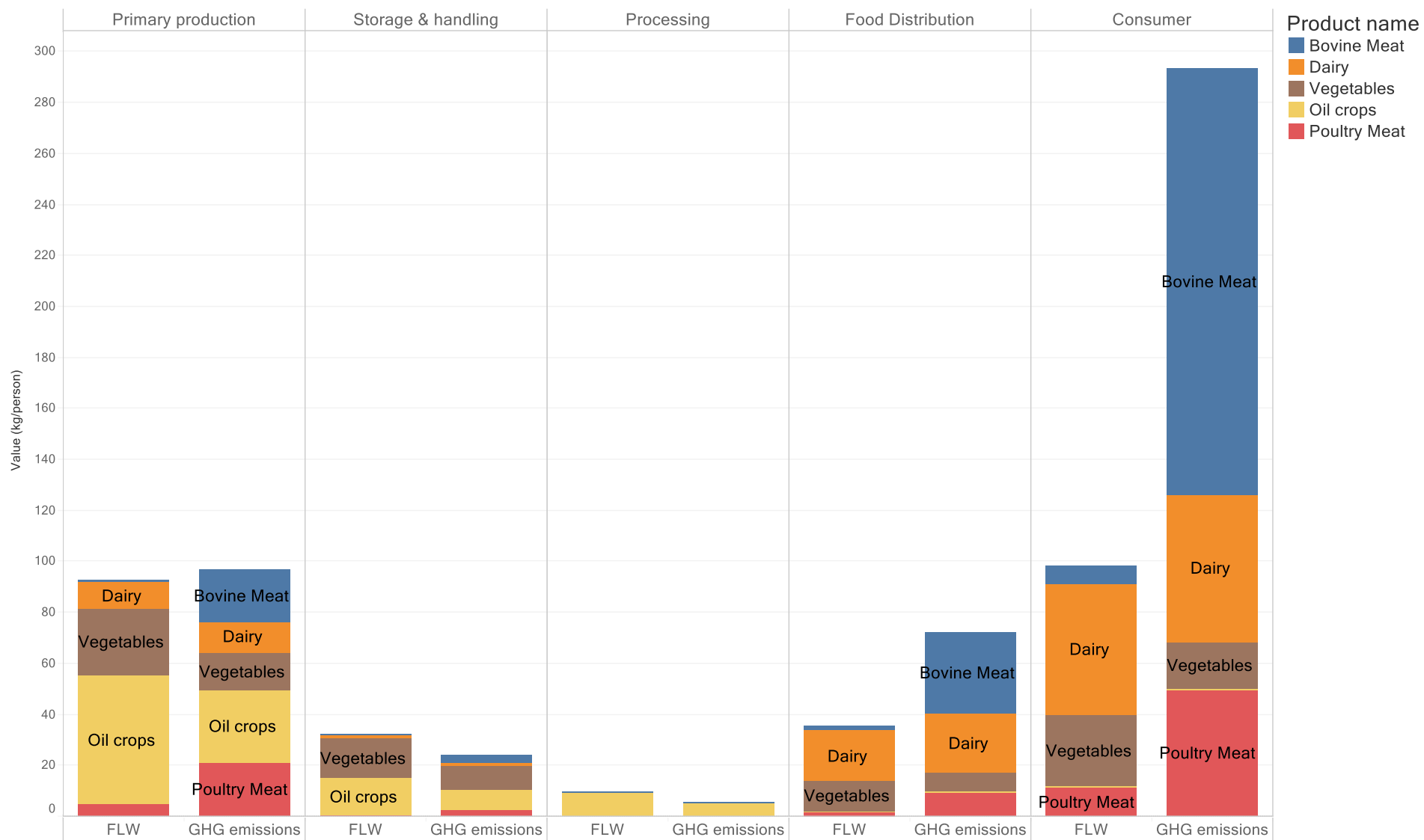
Overview by region by chain stage (2017)



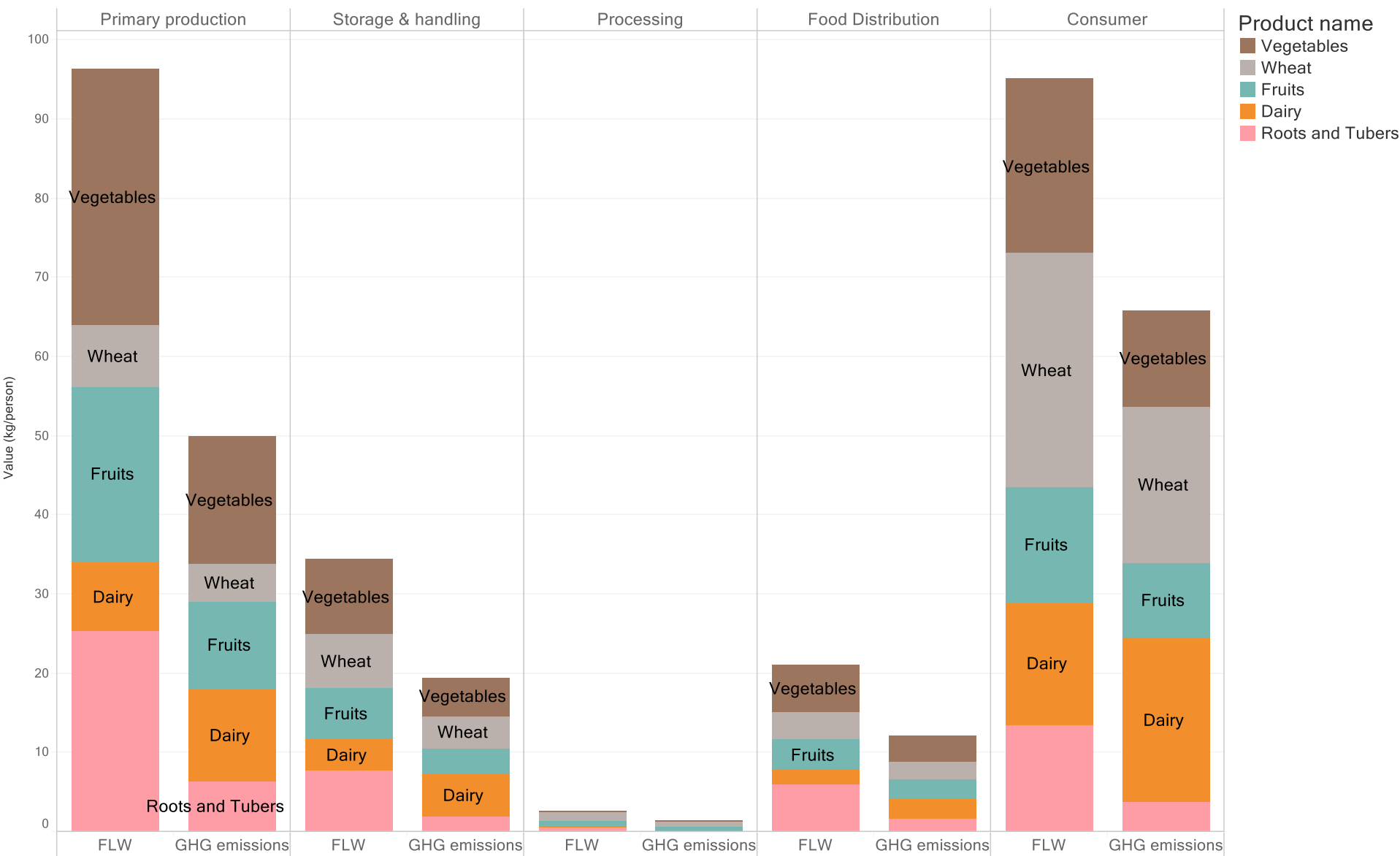
Top 10 countries total amount (2017)



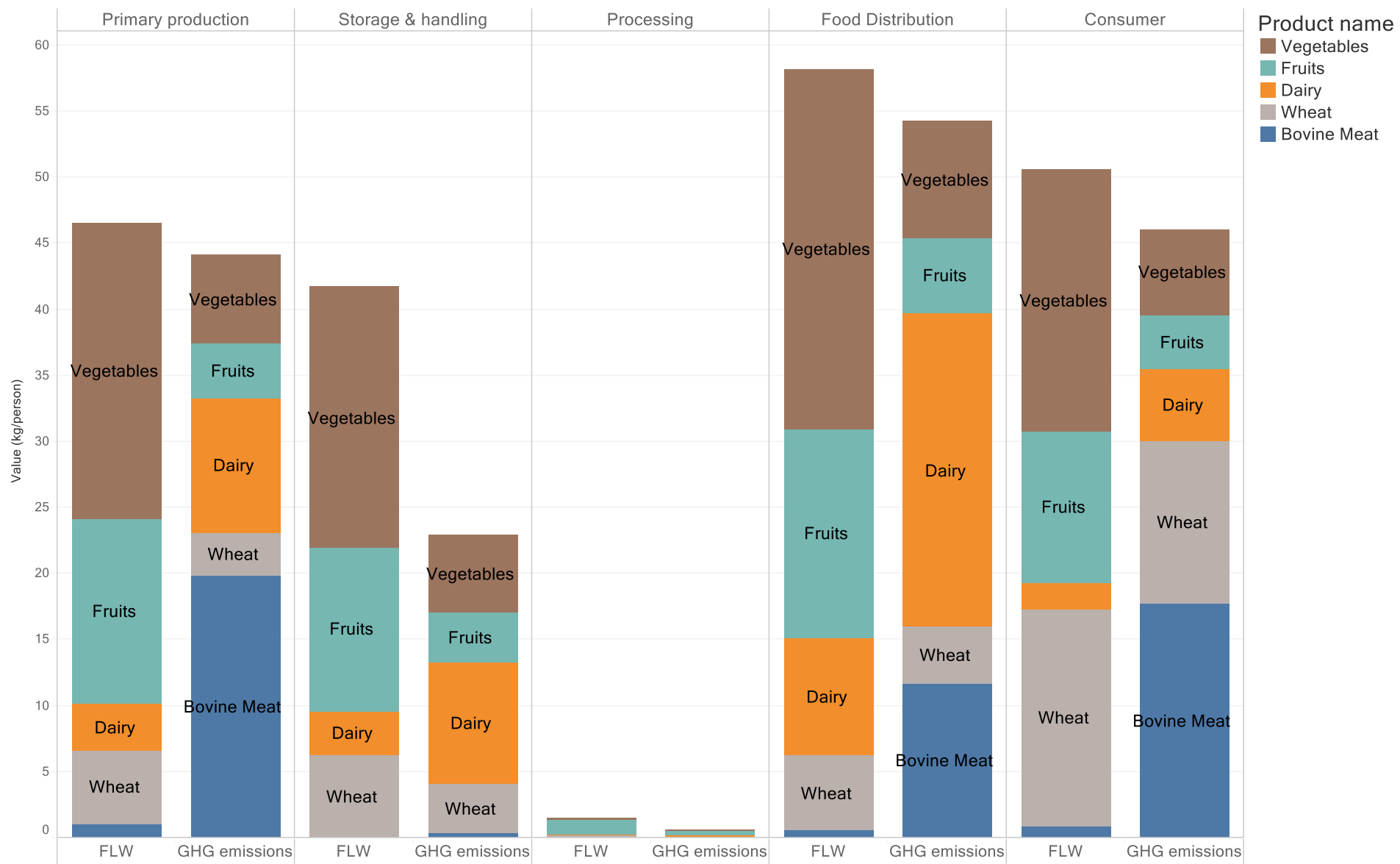
North America & Oceania on top 5 items by chain stage (2017)



Europe on top 5 items by chain stage (2017)



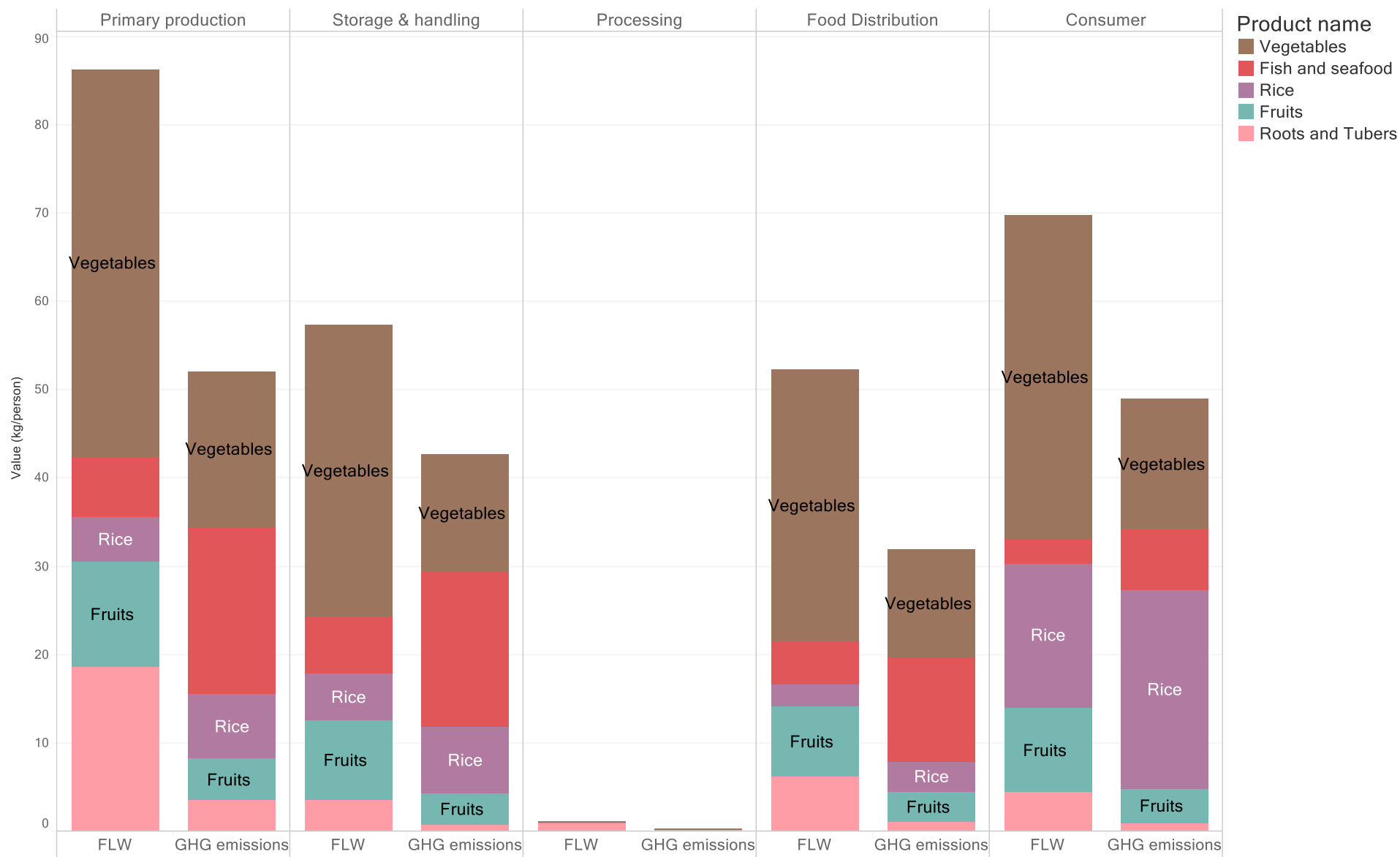
North Africa, West & Central Asia on top 5 items by chain stage (2017)



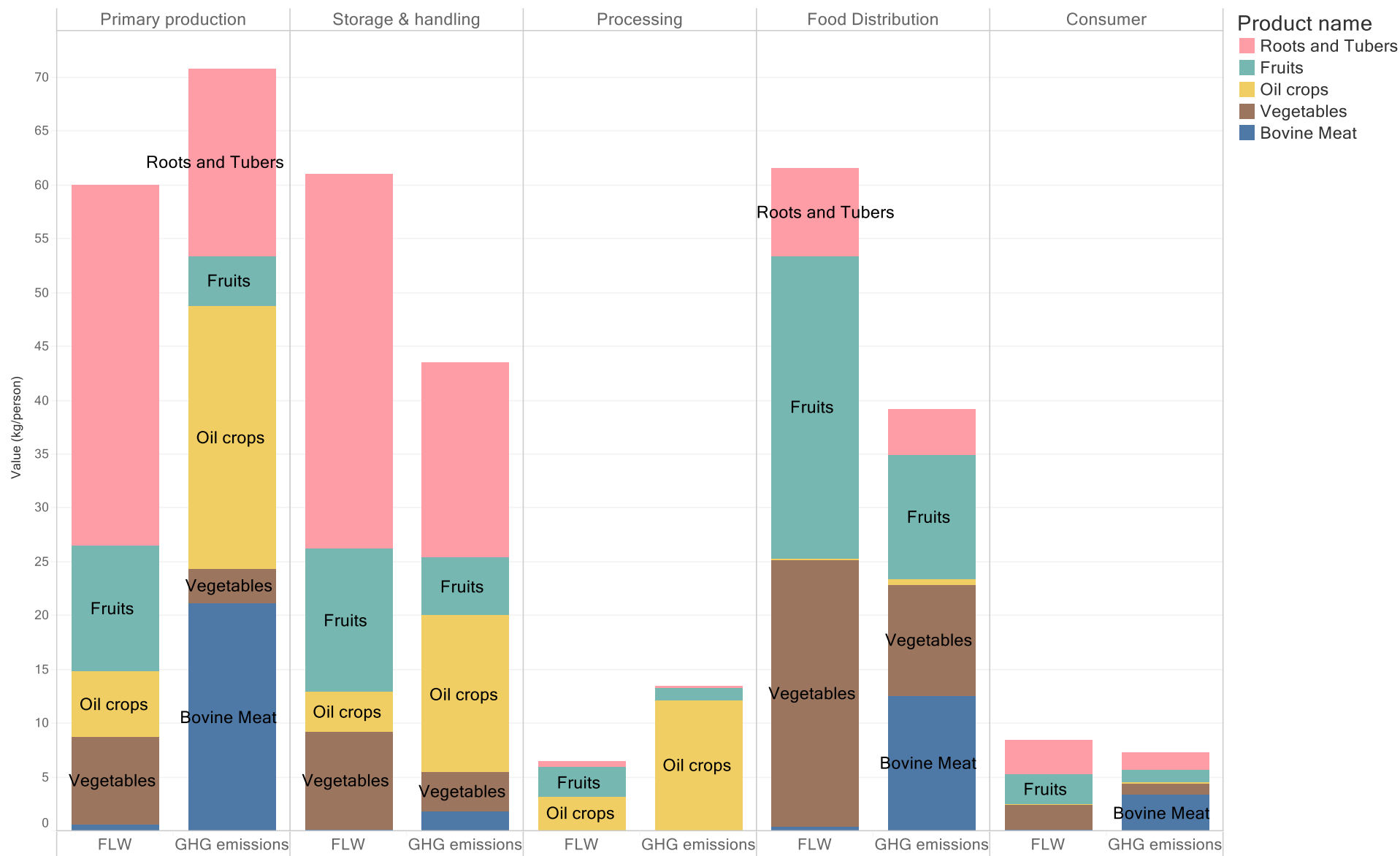
South & South-East Asia on top 5 items by chain stage (2017)



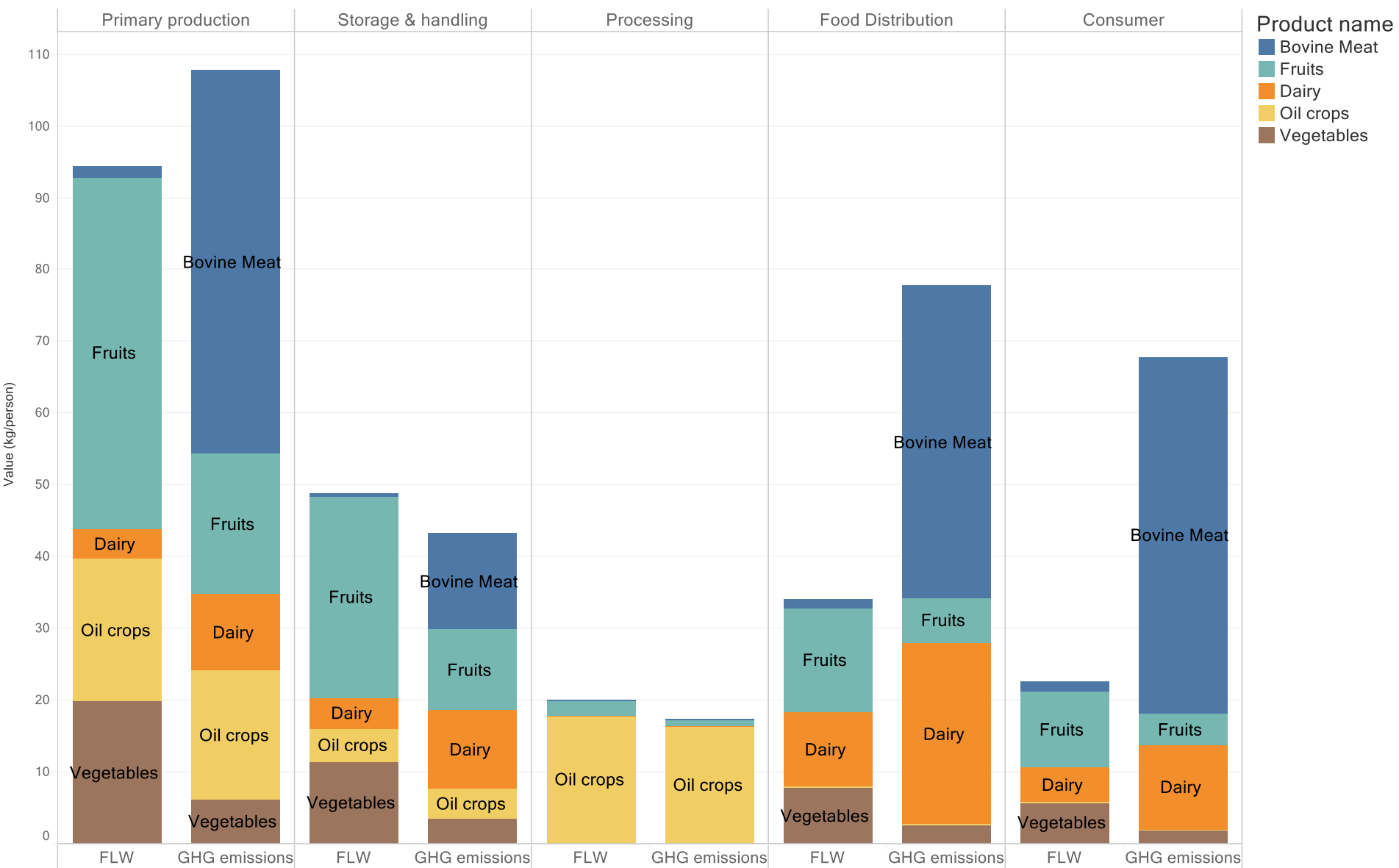
Industrialised Asia on top 5 items by chain stage (2017)



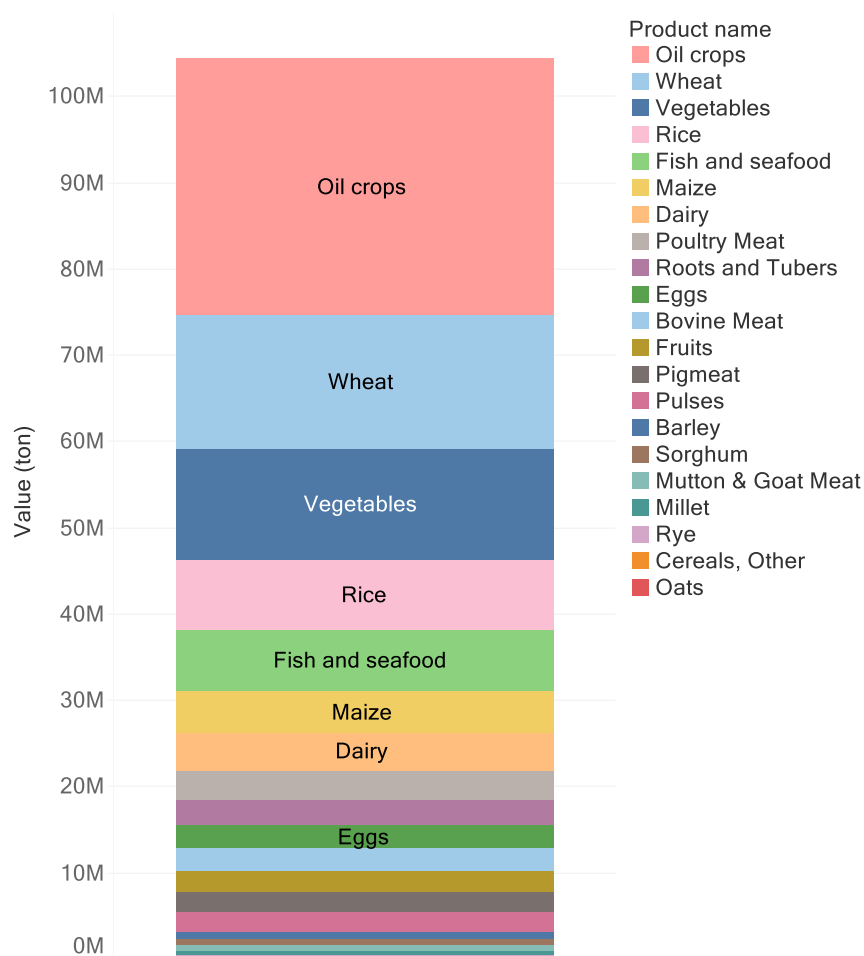
Sub-Saharan Africa on top 5 items by chain stage (2017)



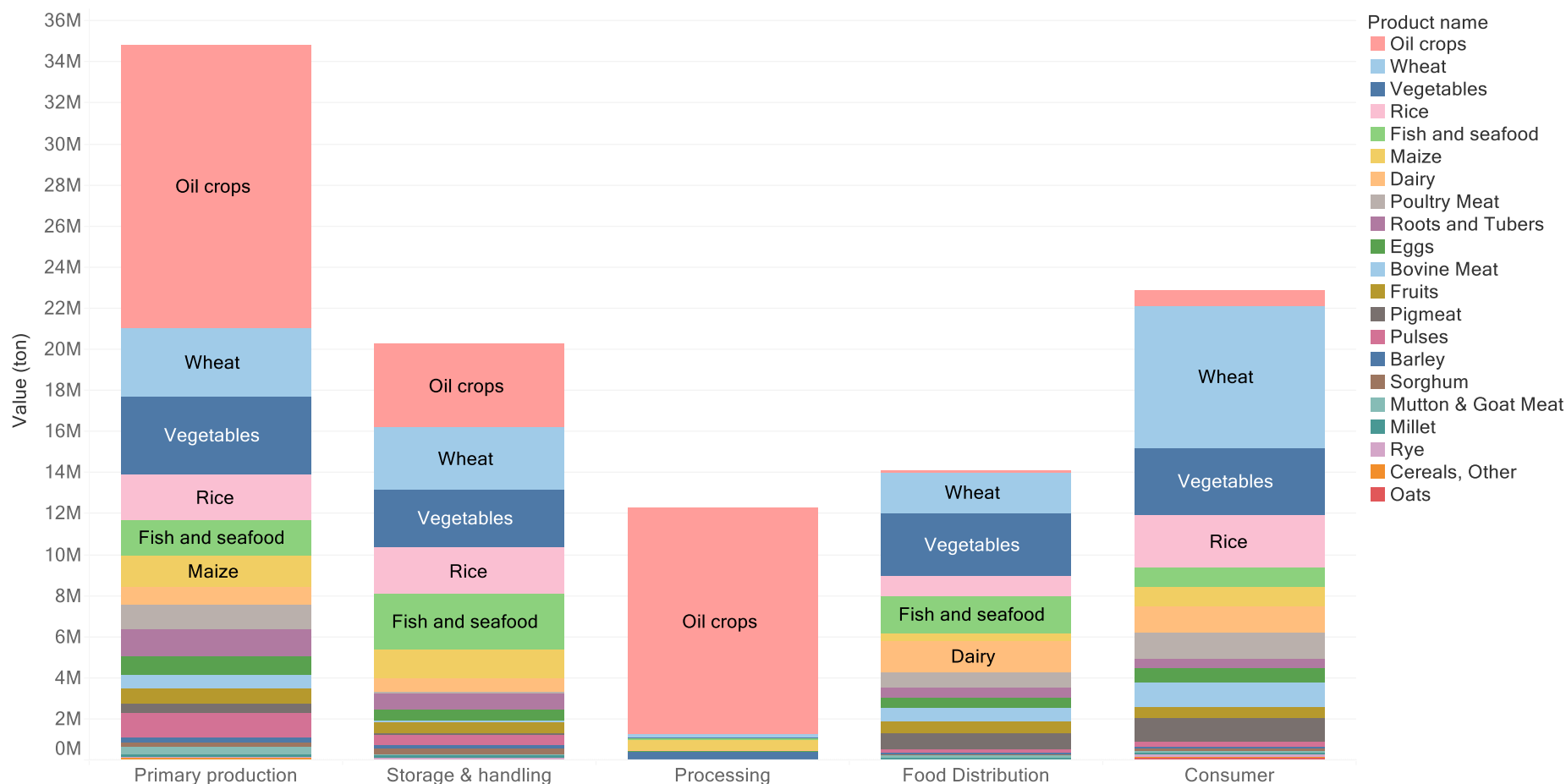
Latin America on top 5 items by chain stage (2017)



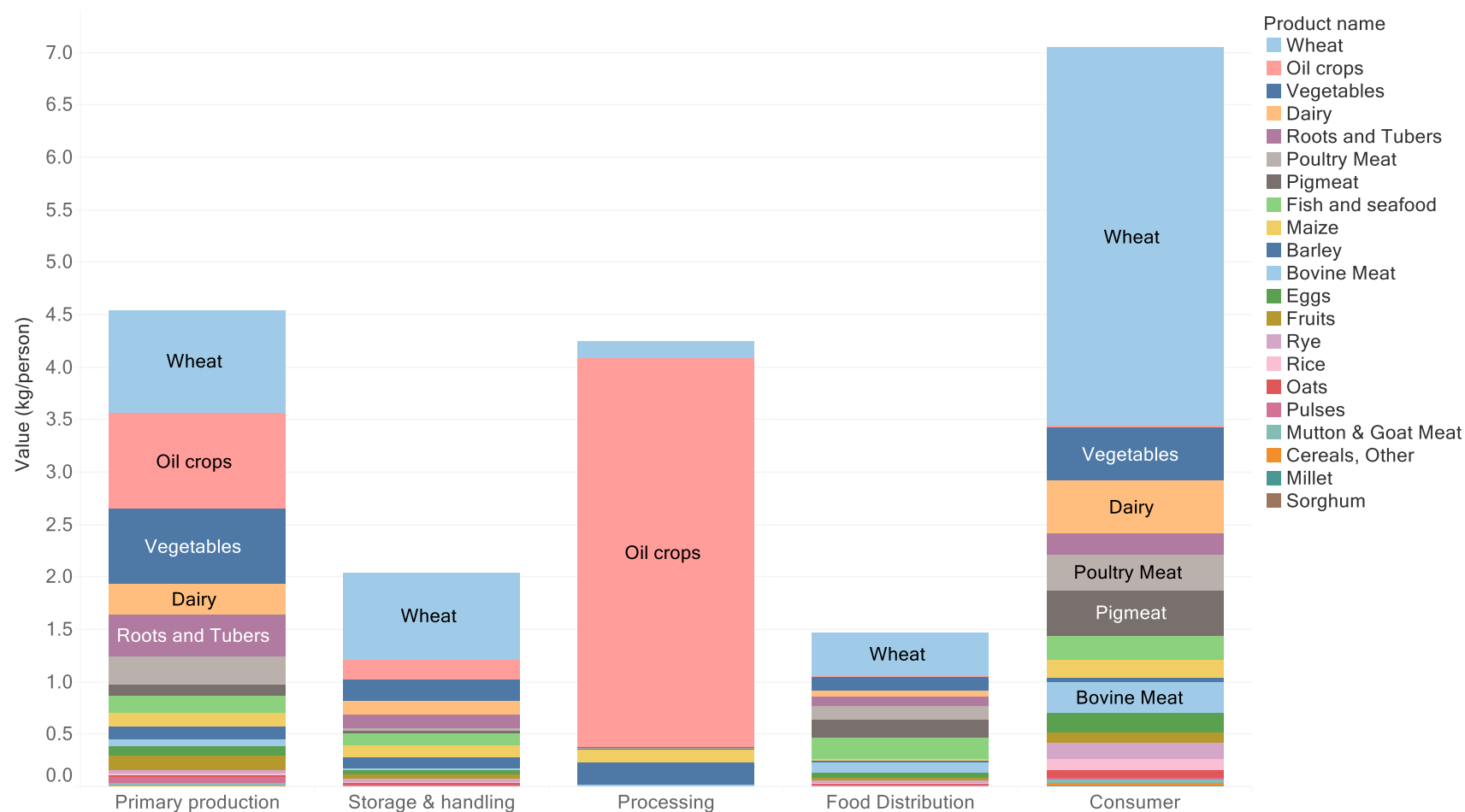
The global protein losses by item (2017)



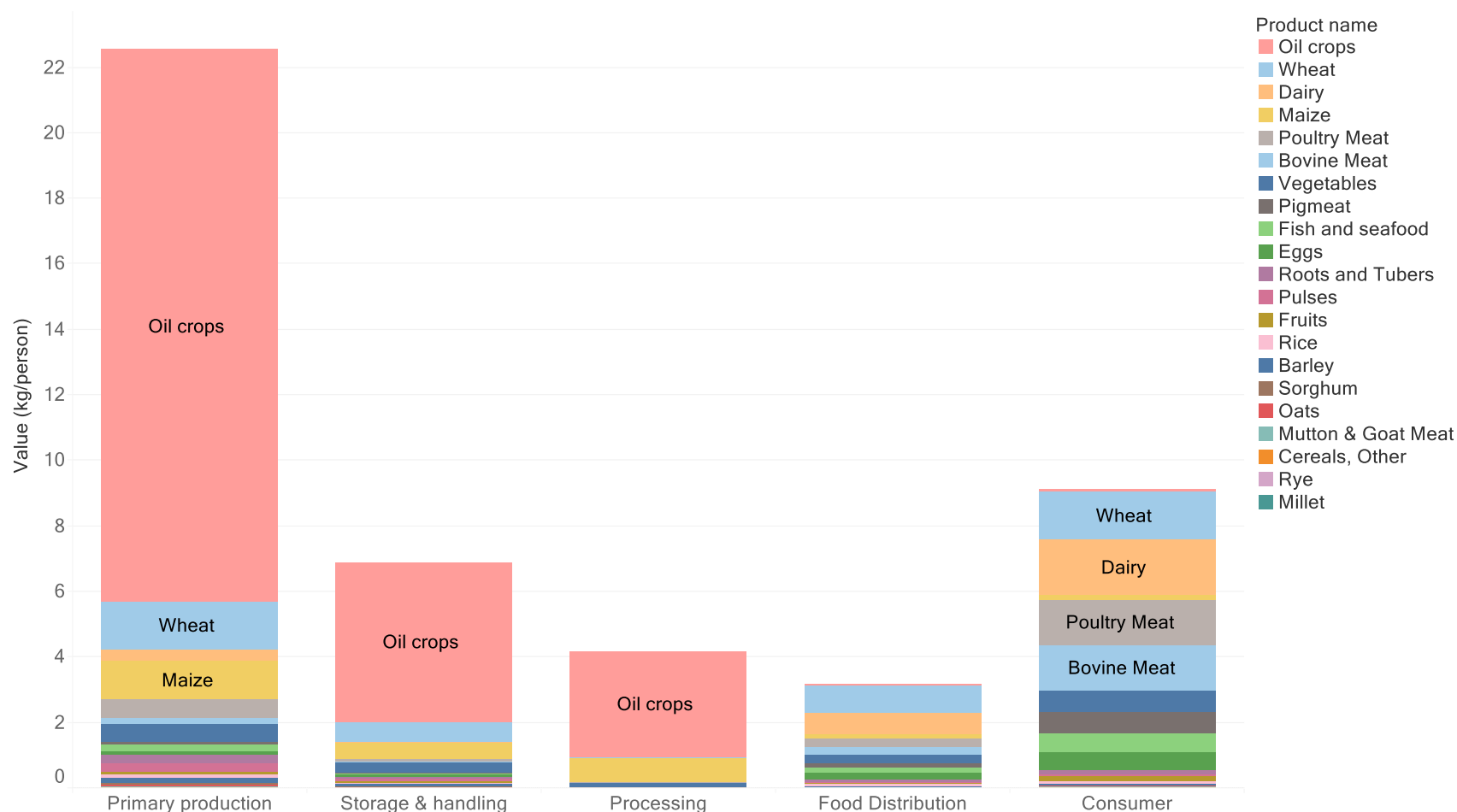
The global protein losses by item by chain stage (2017)



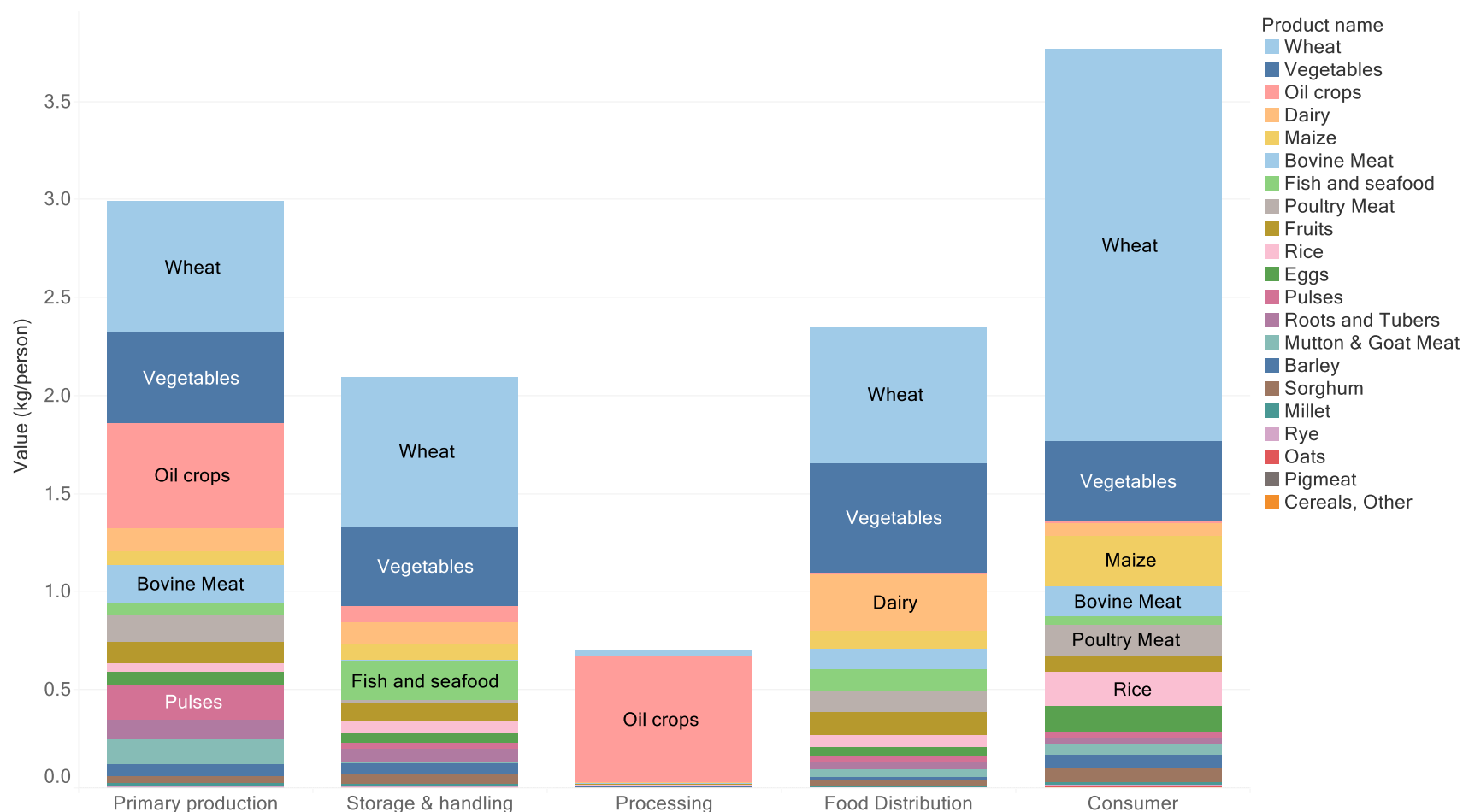
Europe protein losses by item by chain stage (2017)



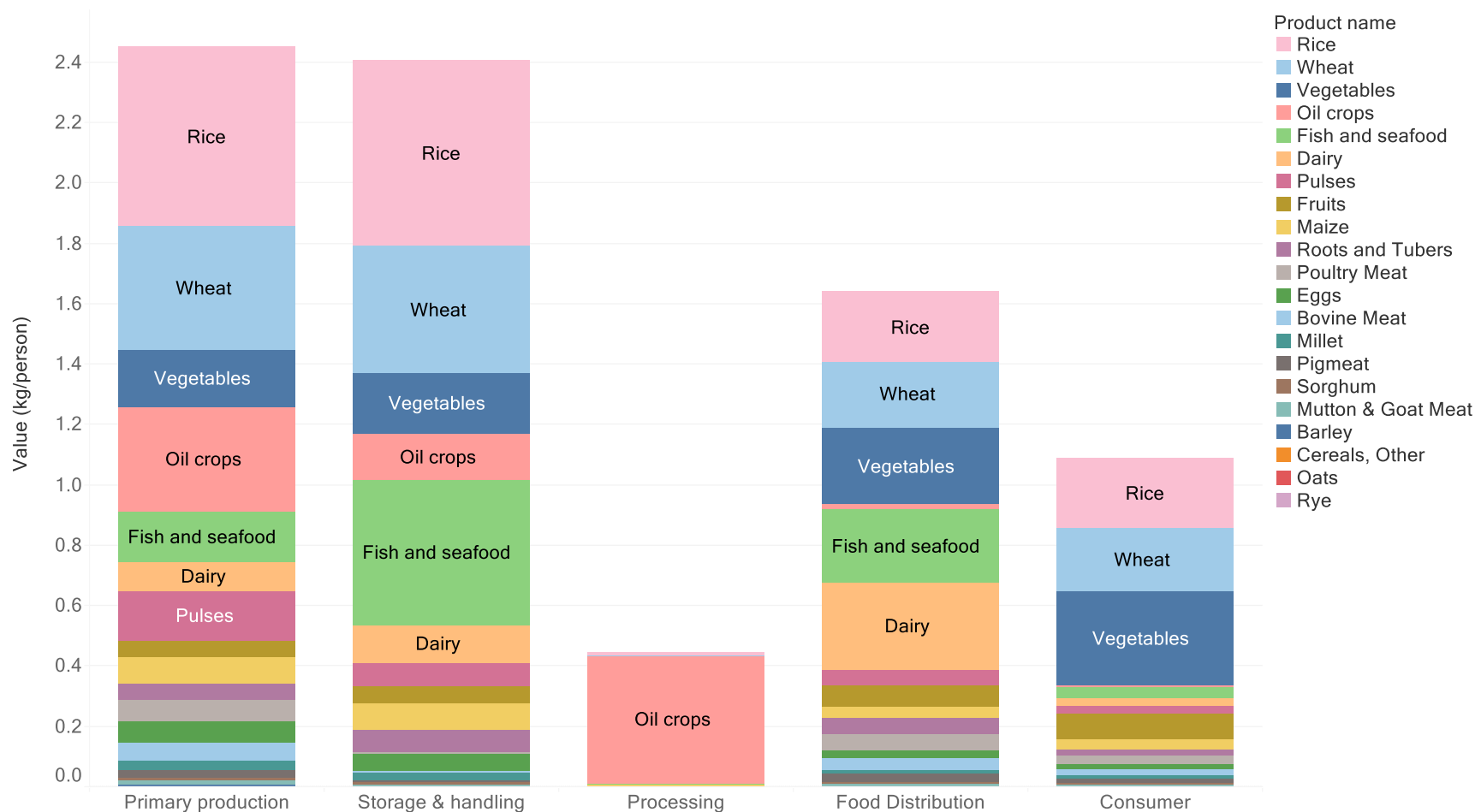
North America & Oceania protein losses by item by chain stage (2017)



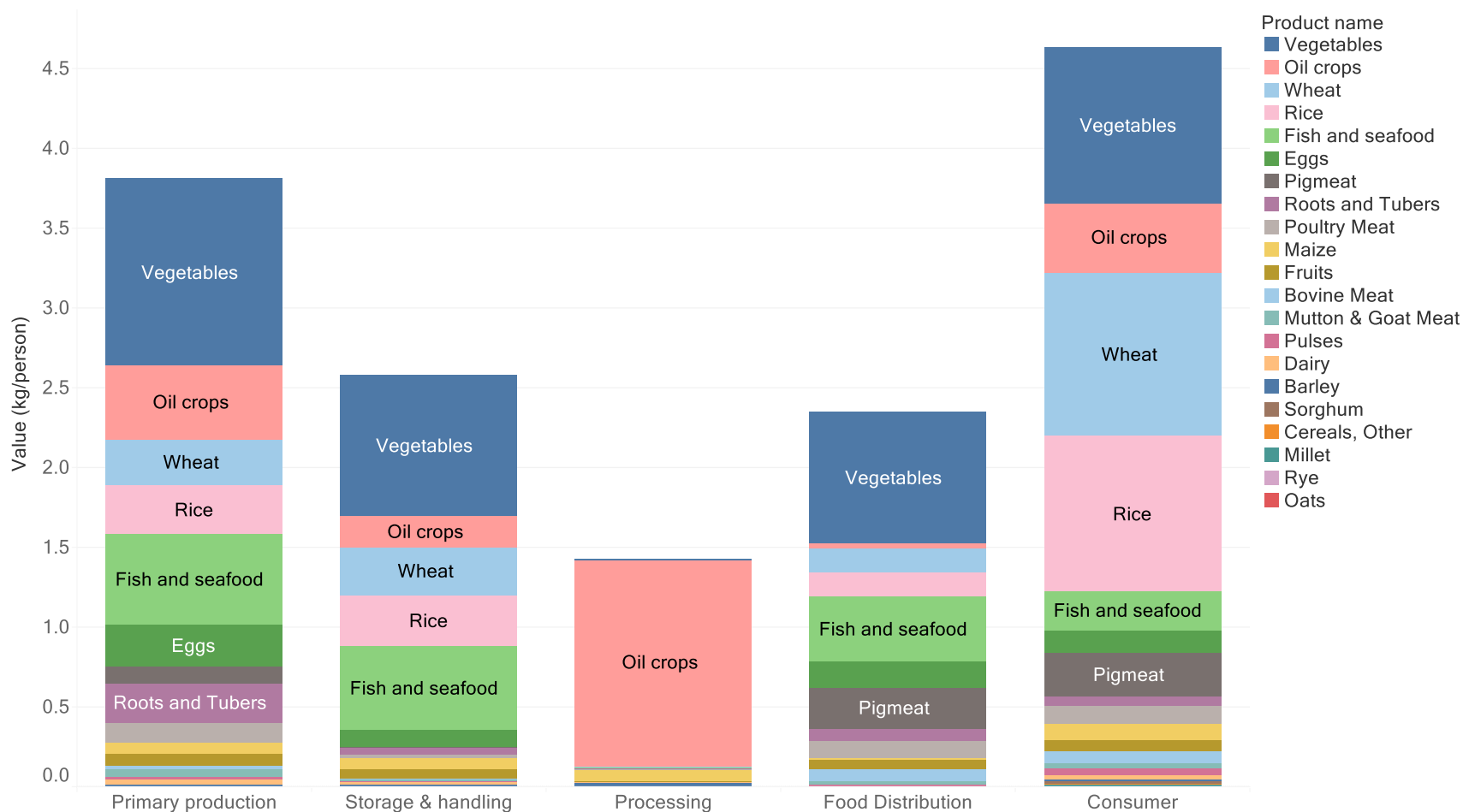
North Africa, West & Central Asia protein losses by item by chain stage (2017)



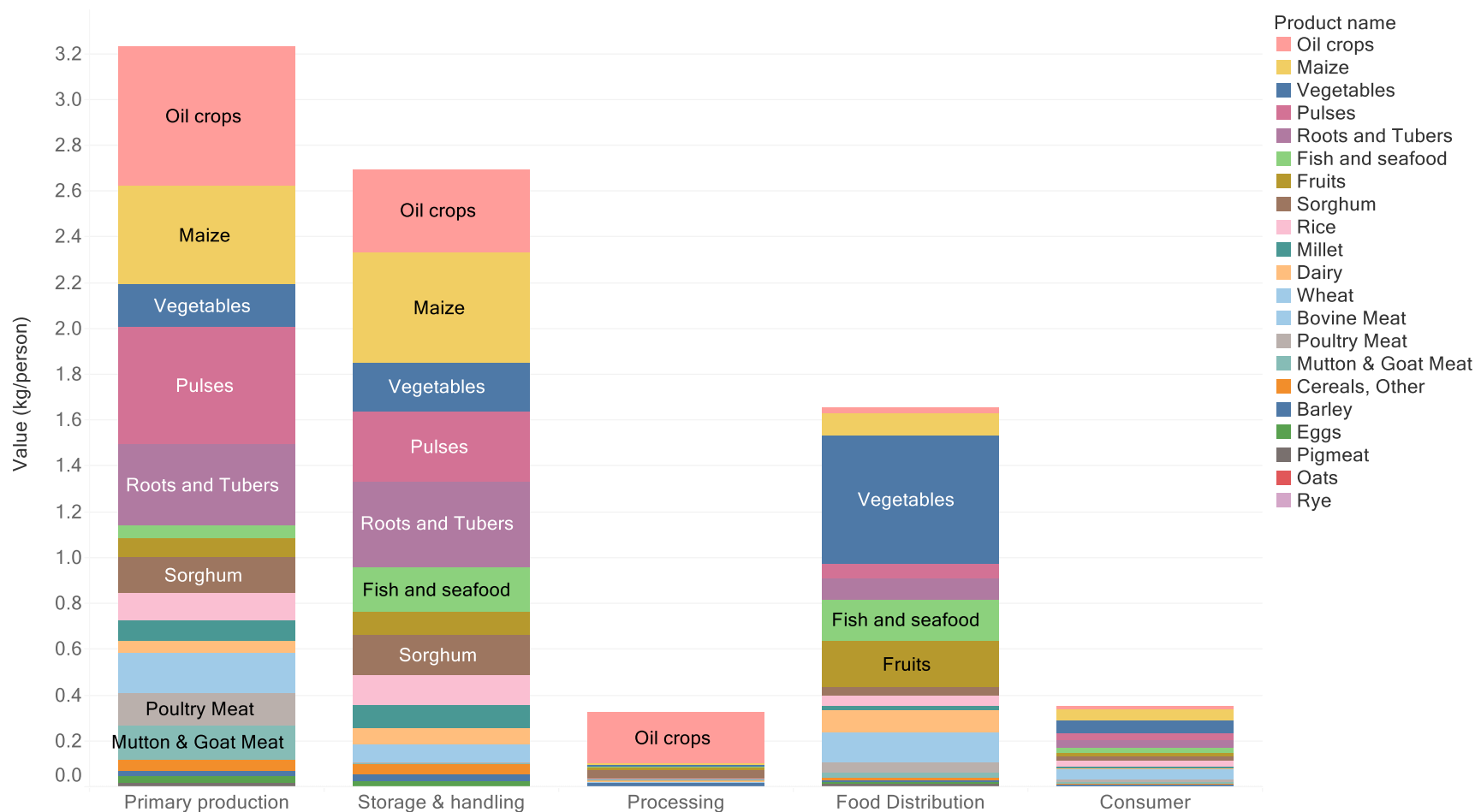
South & South-East Asia protein losses by item by chain stage (2017)



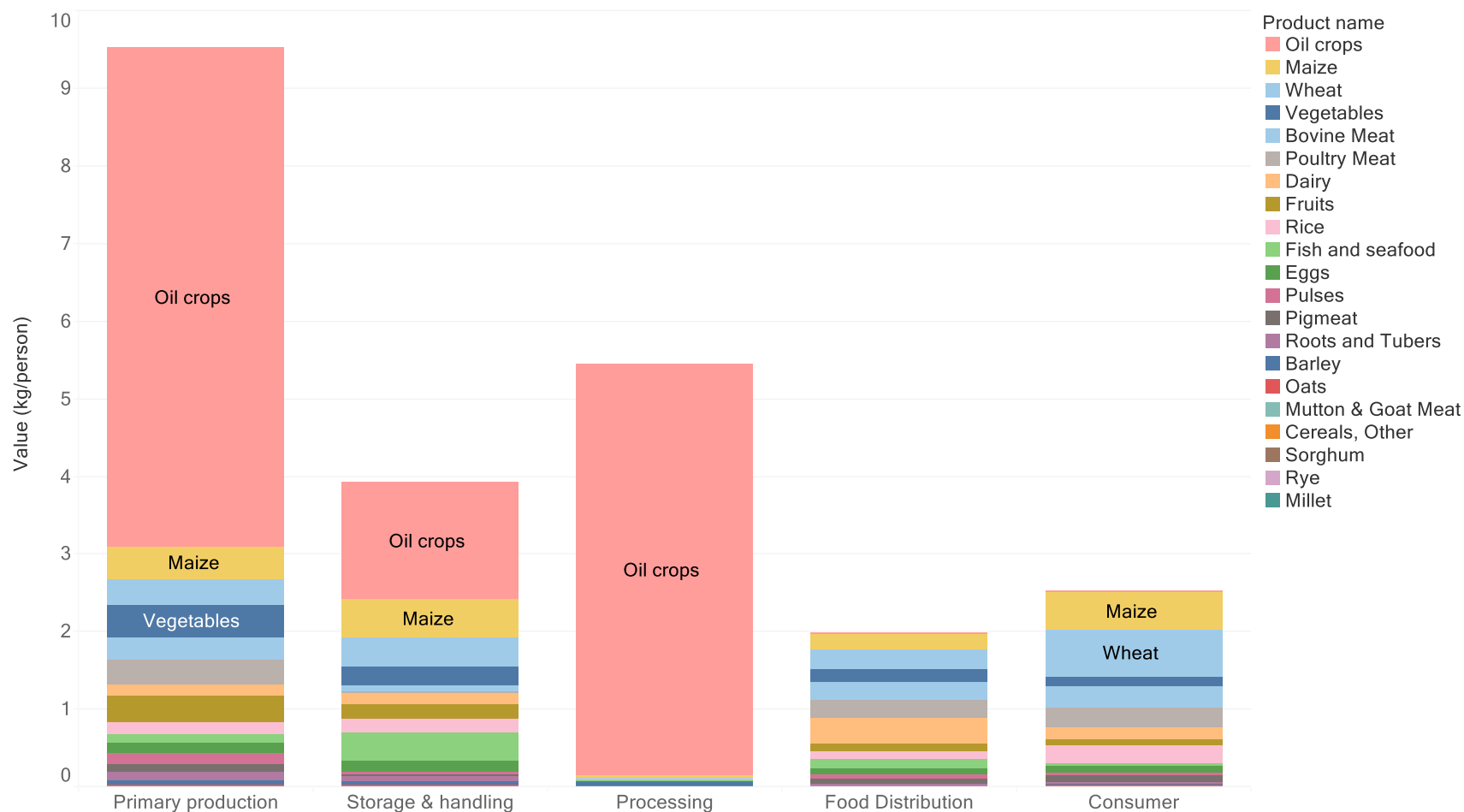
Industrialised Asia protein losses by item by chain stage (2017)



Sub-Saharan Africa protein losses by item by chain stage (2017)



Latin America protein losses by item by chain stage (2017)



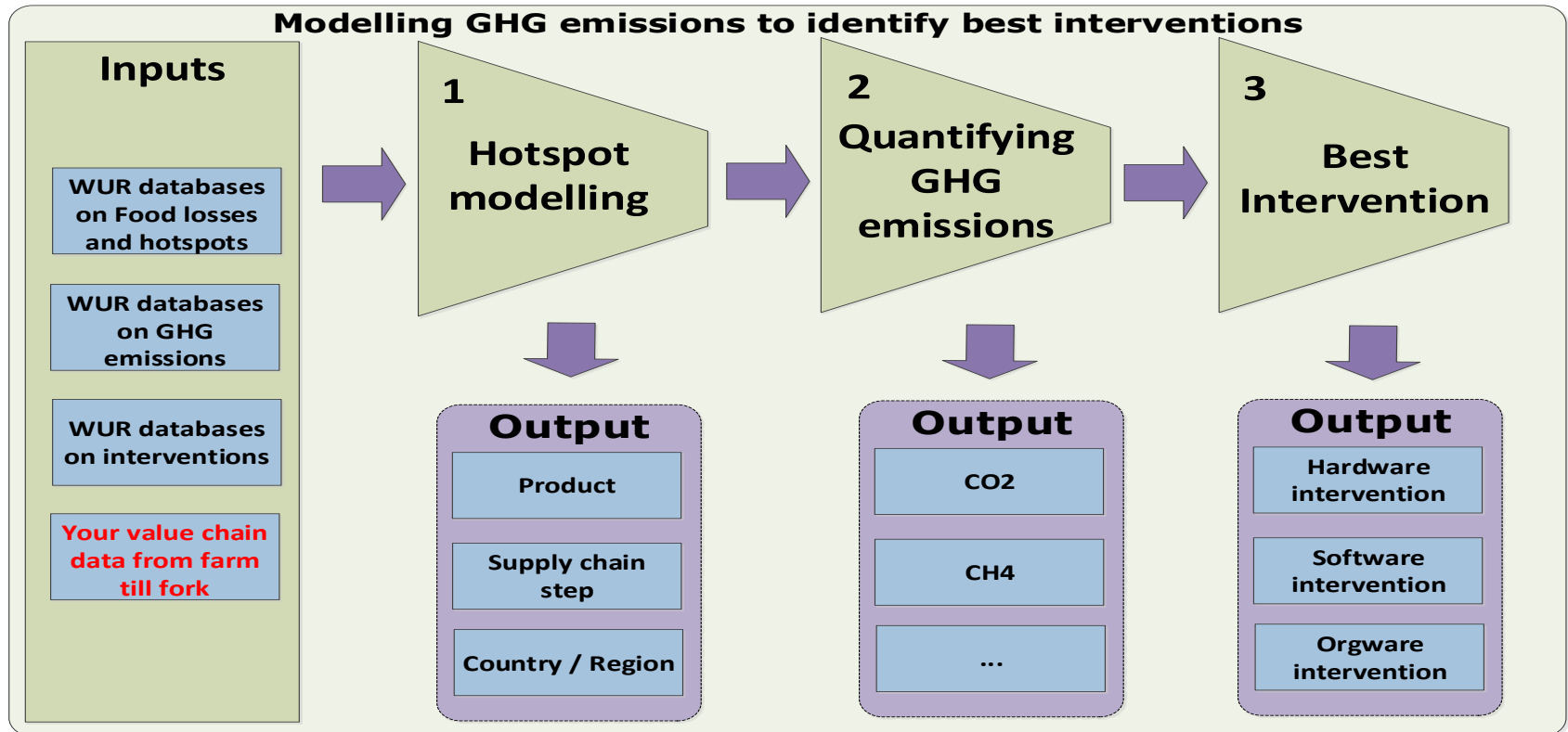
Major conclusions from this study

- The FLW percentage in 2017 found in this research is 29% which is more or less in line the FAO's claim on one-third of the global food was wasted (in 2007) although a different batch of literature on FLW factors have been used.
- Compared to FAO summary report (2013) which concluded that 1.6 Gtonnes of "primary product equivalents" were wasted in 2007, our research finds that 1.9 Gtonnes of "primary product equivalents" were wasted in 2017.
- Porter et al. (2016) calculated that 2.2 Gtonnes of FLW-associated GHG has been emitted in 2011 (only primary production considered). We find that 2.5 Gtonnes of FLW-associated GHG has been emitted in 2017.
- Bovine meat as an individual product contributes the most to the GHG emissions. It is even larger than that attributed to any product group.

Major conclusions from this study

- Fruit & Vegetables account for 46% of the total FLW but only 17% of FLW-associated GHG emissions
- For the postharvest stages, in general, the developed world has more problems at the consumer stage and the developing world has more problems at the previous stages.
- For the primary production stage, the developed world is worse off than the developing world in terms of per-person FLW. This is because the per-person primary food production in the developed world is also higher than that for the developing world.
- North America & Oceania consumes and wastes too much animal-based products especially bovine meat and dairy, which results in high FLW-related GHG emissions.
- Oil crops are the major source of protein losses in the global food chain.

Call for collaboration to reduce your FLW & GHGE



1. Hotspot modelling: food loss and waste in different stages of the food chain, per food product aggregated per country and global region
 2. Quantifying GHG emissions: direct and indirect effects of FLW are measured and impacts of crop and postharvest operations are calculated
 3. Best intervention: a loss-reducing measure will be identified and customized
- 1-3. Tunnels opportunities to enable quick scoping of opportunities and customization of interventions

Thank you very
much for your
attention!

For more information:
Xuezhen.Guo@wur.nl

