Water Footprint of FF&V

Innovating global fruit and vegetable food systems to help bring sustainable nutrition security

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31 July 2018

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Large quantities of water are required to grow fruit & vegetables

240 litres of water

600g of tangerines from S Africa

Blue and Green Water

- Water used at the point where rain falls – rainfed agriculture

- Water abstracted from rivers, lakes and groundwater – irrigated agriculture

Large quantities of water are required to grow fruit & vegetables

240 litres of water

600g of tangerines from S Africa

(Plus relatively small amounts associated with inputs, processing, retail and consumption)

Blue & Green Water

- **Green water**, by definition, can only be used in the place where the rain falls and is therefore tied to land
- **Blue water** is a shared resource with a **high opportunity cost**
  - **Large volumes** of blue water are used to irrigate FF&V
  - Irrigation is a **consumptive water use**
  - Using blue water to irrigate FF&V contributes to local **water scarcity**

Water Scarcity Footprint (WSF)

- An indicator of the potential impact of an activity on blue water scarcity

- Depends on
  - Mass of product produced in a given location (kg)
  - Volume of blue water required to produce product (l/kg)
  - Vulnerability of the water source

$$WSF_{i,j} = M_{i,j} x W_{i,j} x CF_j$$

M = Mass of product *i* grown in location *j* (t)
W = Water consumption of product *i* grown in location *j* (m^3/t)
CF = Characterisation factor for location *j* (-)

What does WSF tell us?

Potential impact of FF&V supply on other water users / uses

What does this tell us?

Exposure to drought / water scarcity risk

- Identify hotspots where water risks are greatest
- Engage with value chain to mitigate risk
- Policy changes to influence diet (?)

The WSF of the UK's supply of FF&V

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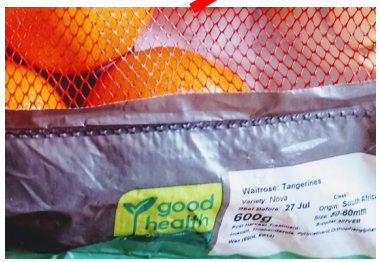
My trip to the supermarket …



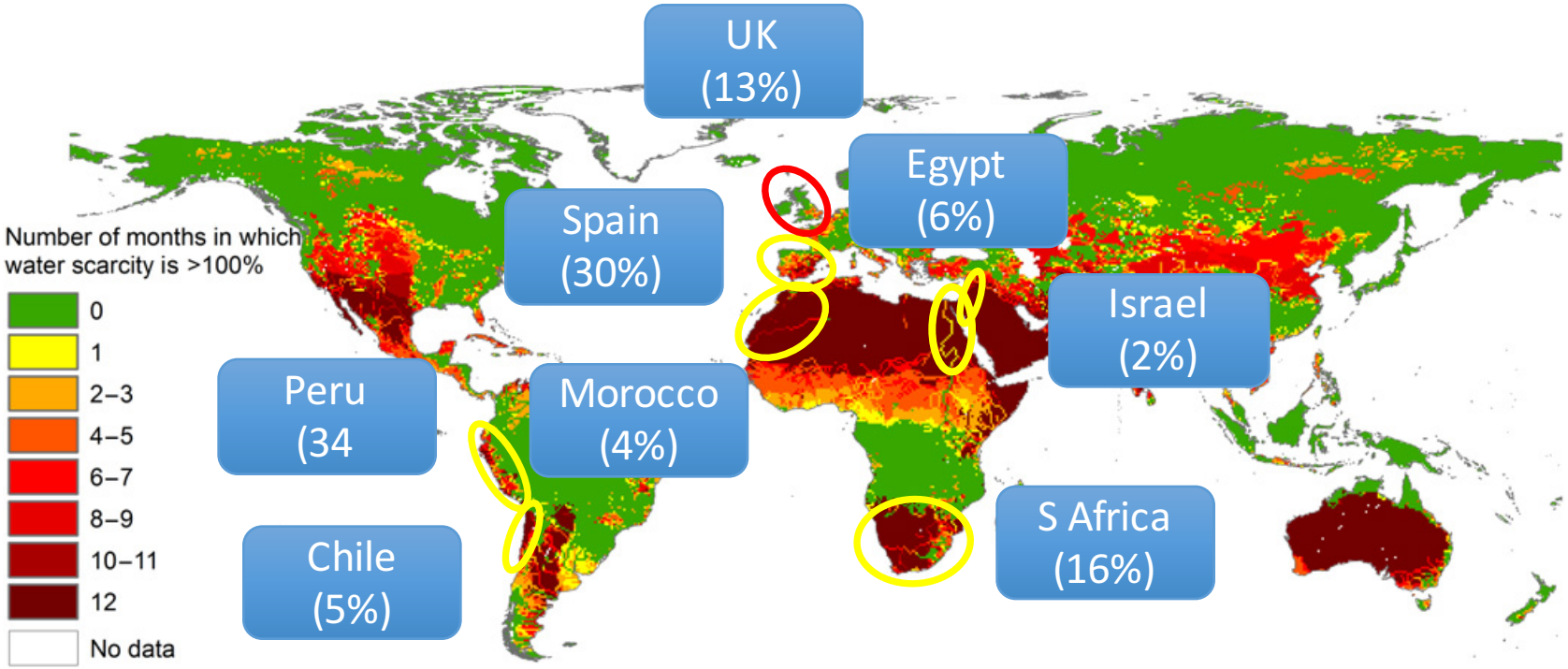
Where does UK's FF&V† come from?

Country	% by mass
UK	**34%**
Spain	**18%**
Netherlands	**8%**
Costa Rica	4%
South Africa	4%
Colombia	3%
France	3%
Dominican Rep	3%
Germany	2%
Ecuador	2%

† excluding potatoes. 97% of potatoes are domestically grown.

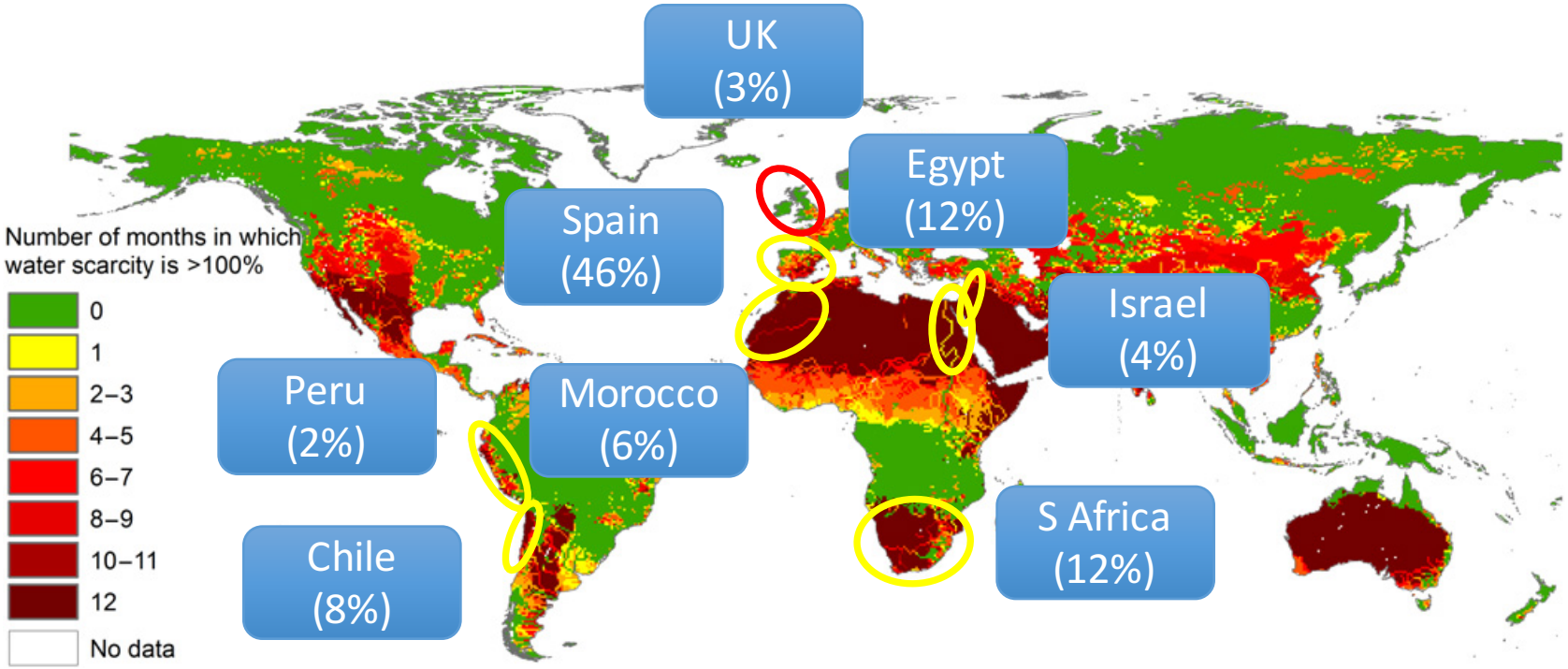
Where does the water come from?

- Growing FF&V† for the UK consumes 510 mil m^3/year of freshwater
- 21 litres/person/day



† excluding potatoes

Where does the footprint fall?



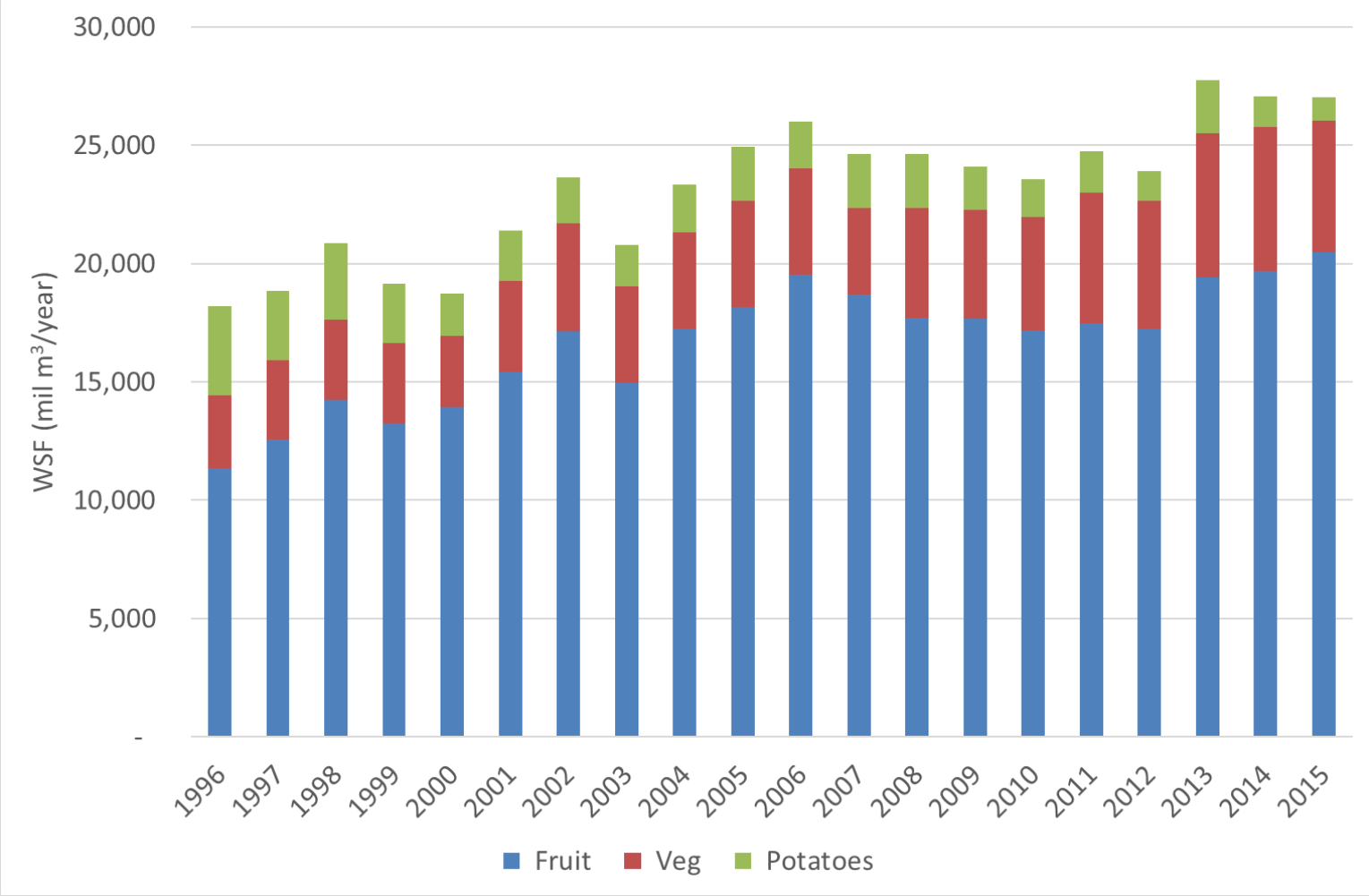
† excluding potatoes

Blue water scarcity footprint

Region	Fruit	Vegetables	Potatoes	Total
Europe	**30%**	**17%**	1%	48%
Africa	**27%**	3%	2%	32%
Americas	**10%**	1%	0%	10%
Asia	5%	1%	2%	8%
UK	0%	1%	2%	3%
Total	**72%**	**22%**	**6%**	**100%**

Relative blue water scarcity footprint of fresh fruit and vegetable supply to the UK (2011 – 2015) by region (Hess & Sutcliffe, 2018)

WSF is increasing



Trends in WSF of fruit supplied to the UK

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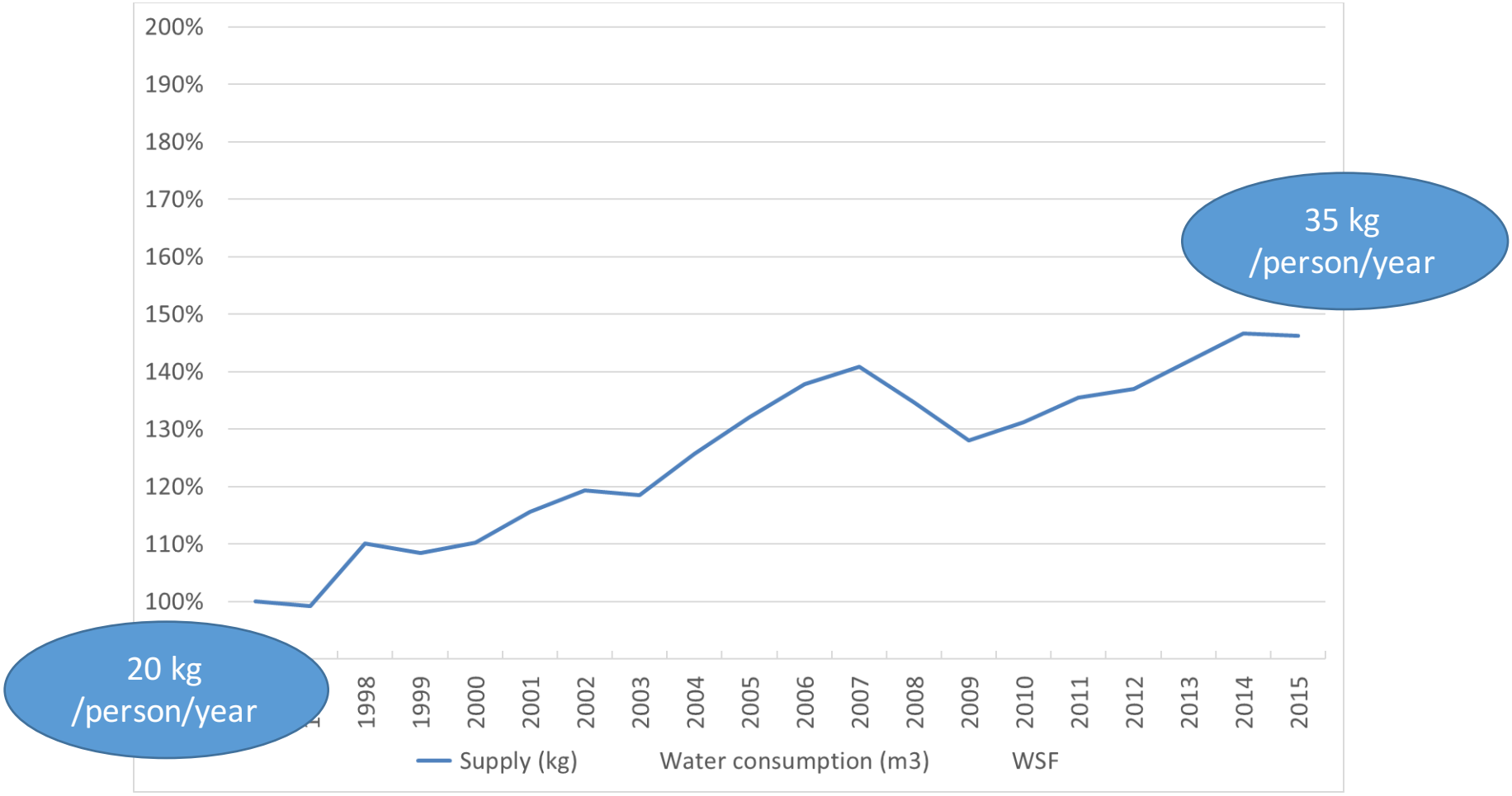
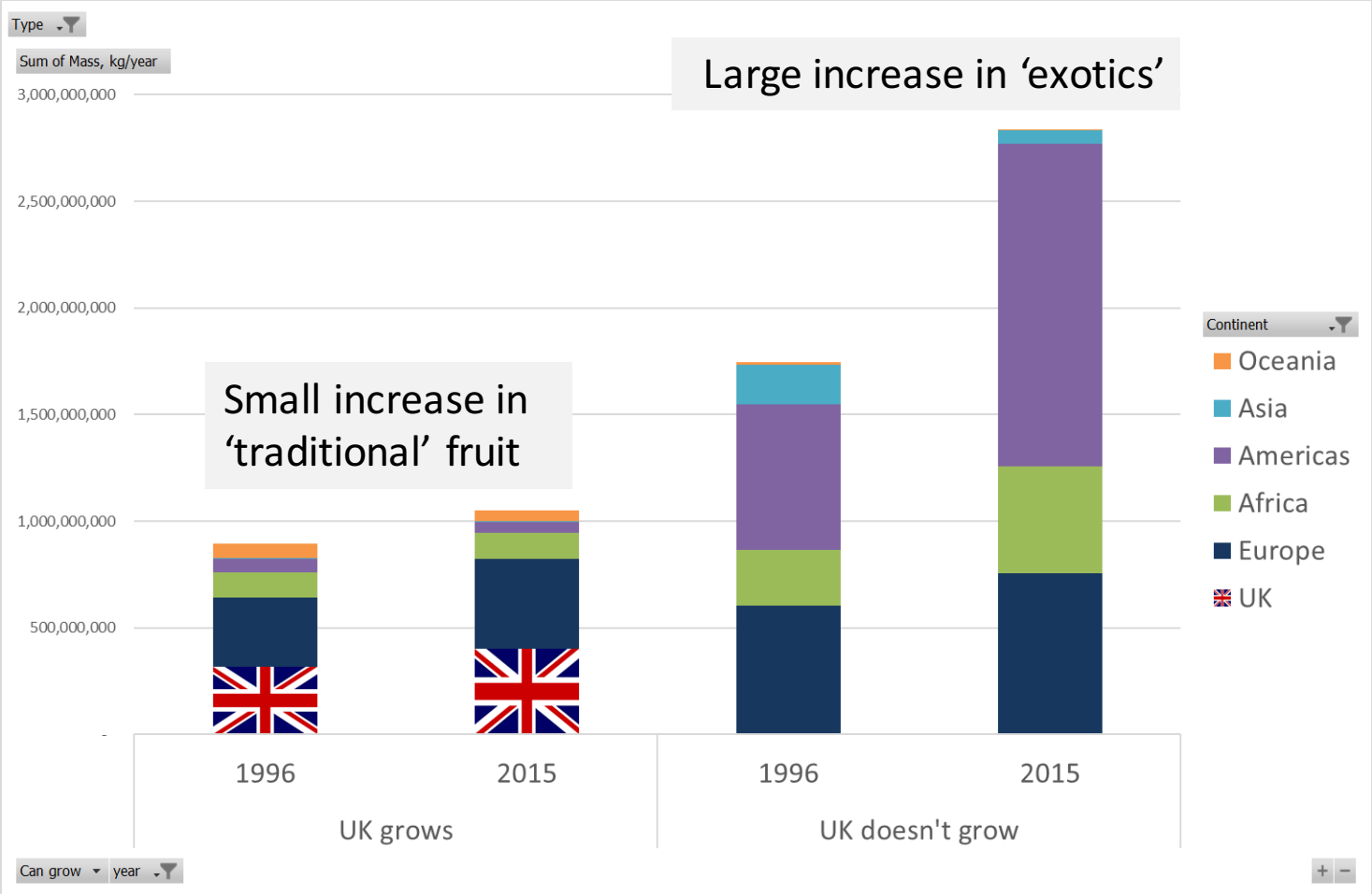
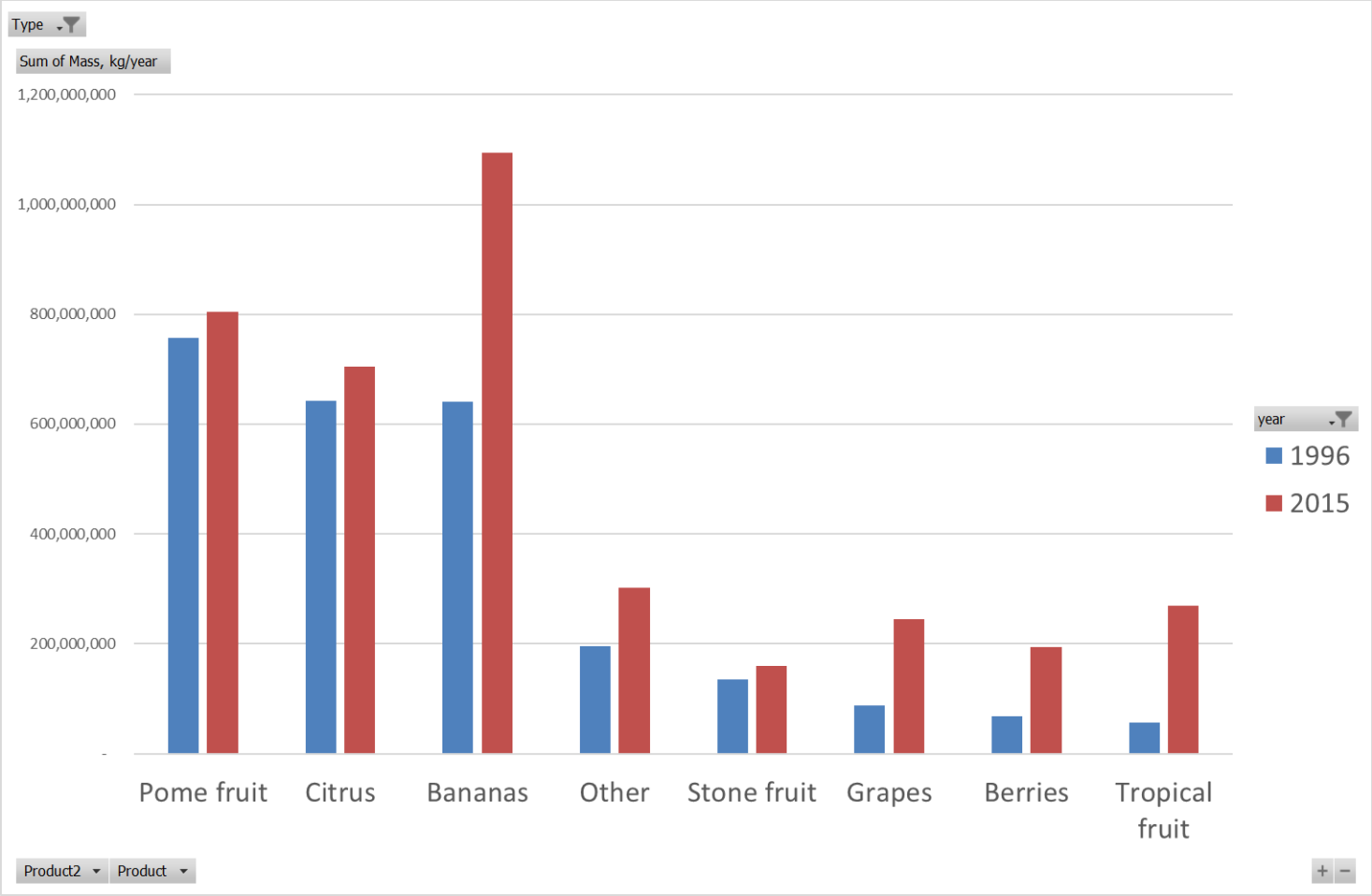
Increased fruit supply per capita (1996 – 2015)



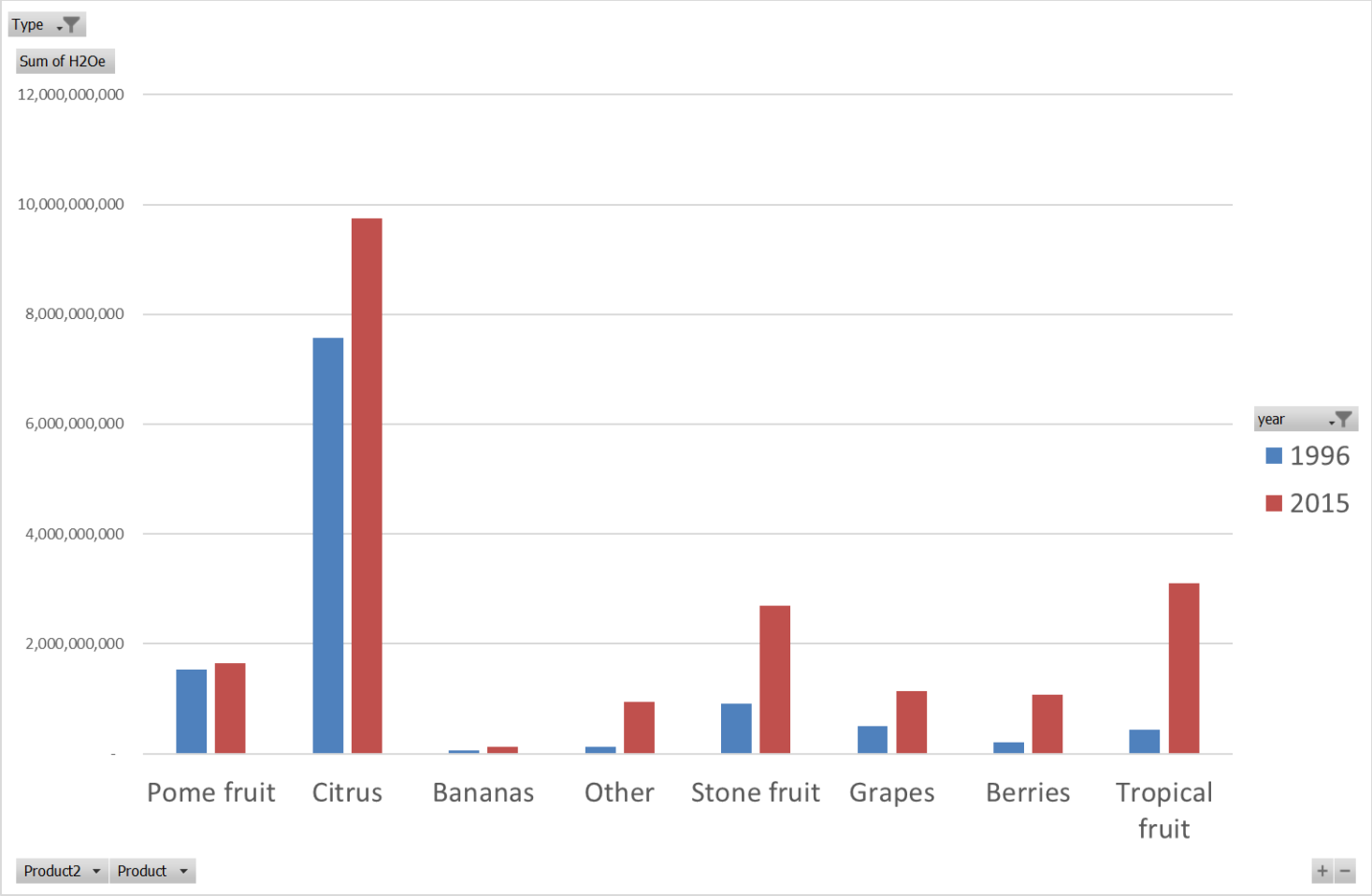
What fruit we eat and where it comes from



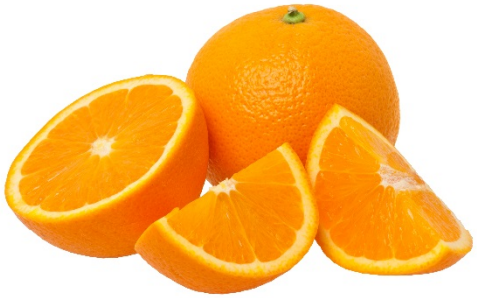
Change in what fruit we eat (kg/year)

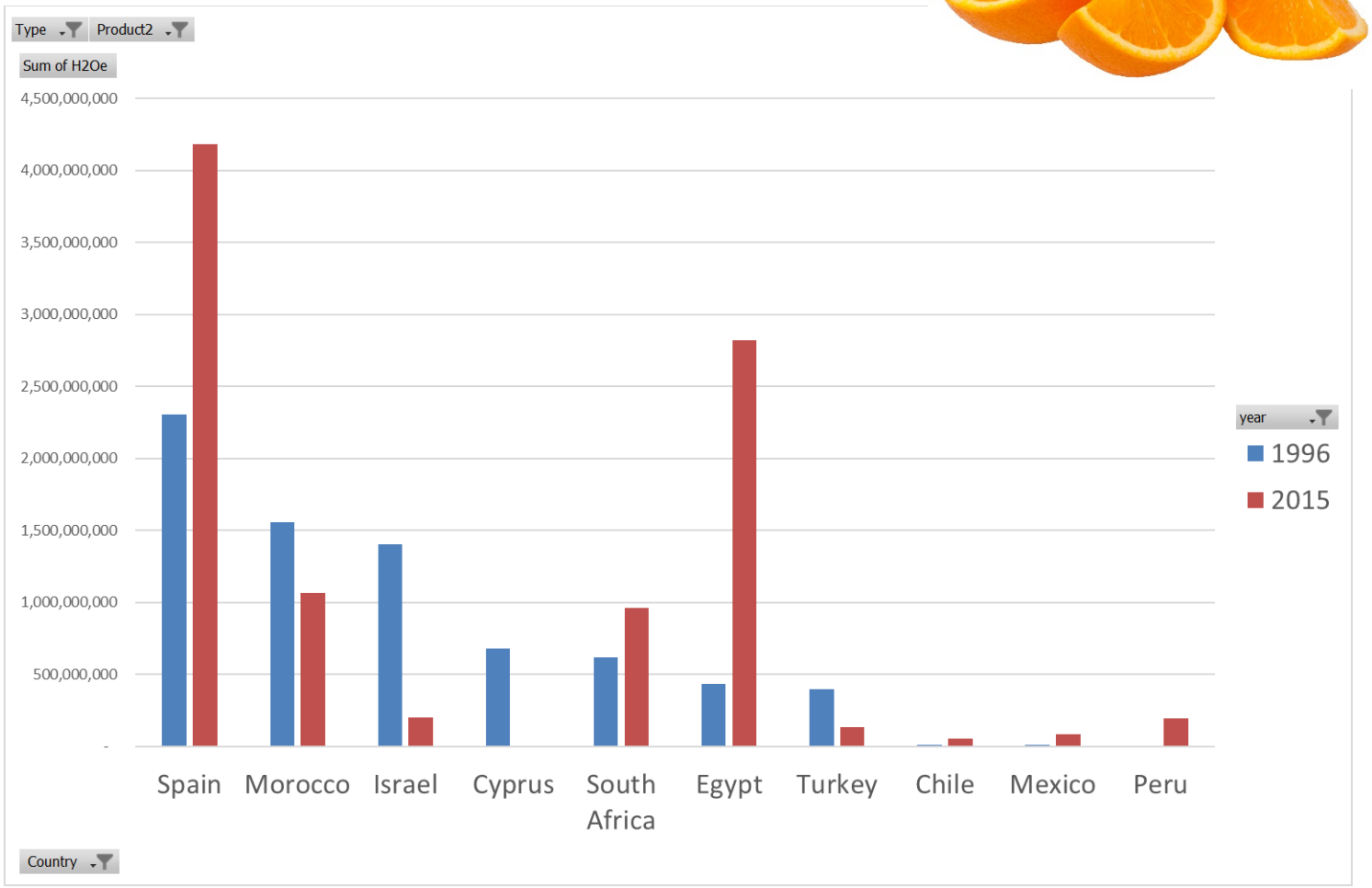


Impact of what fruit we eat (WSF)

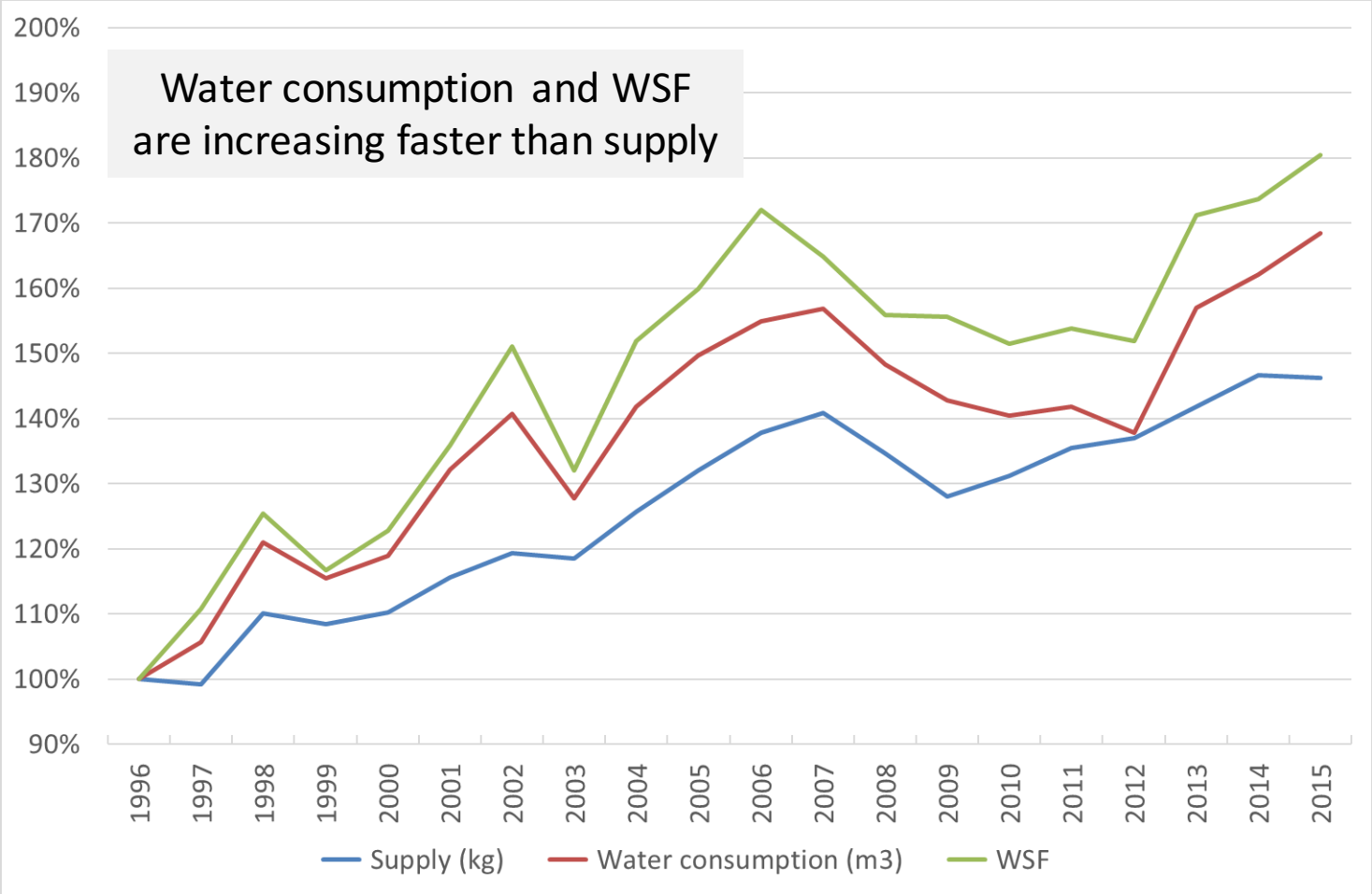


Impact of where it comes from (WSF)





WSF per capita



Future changes?

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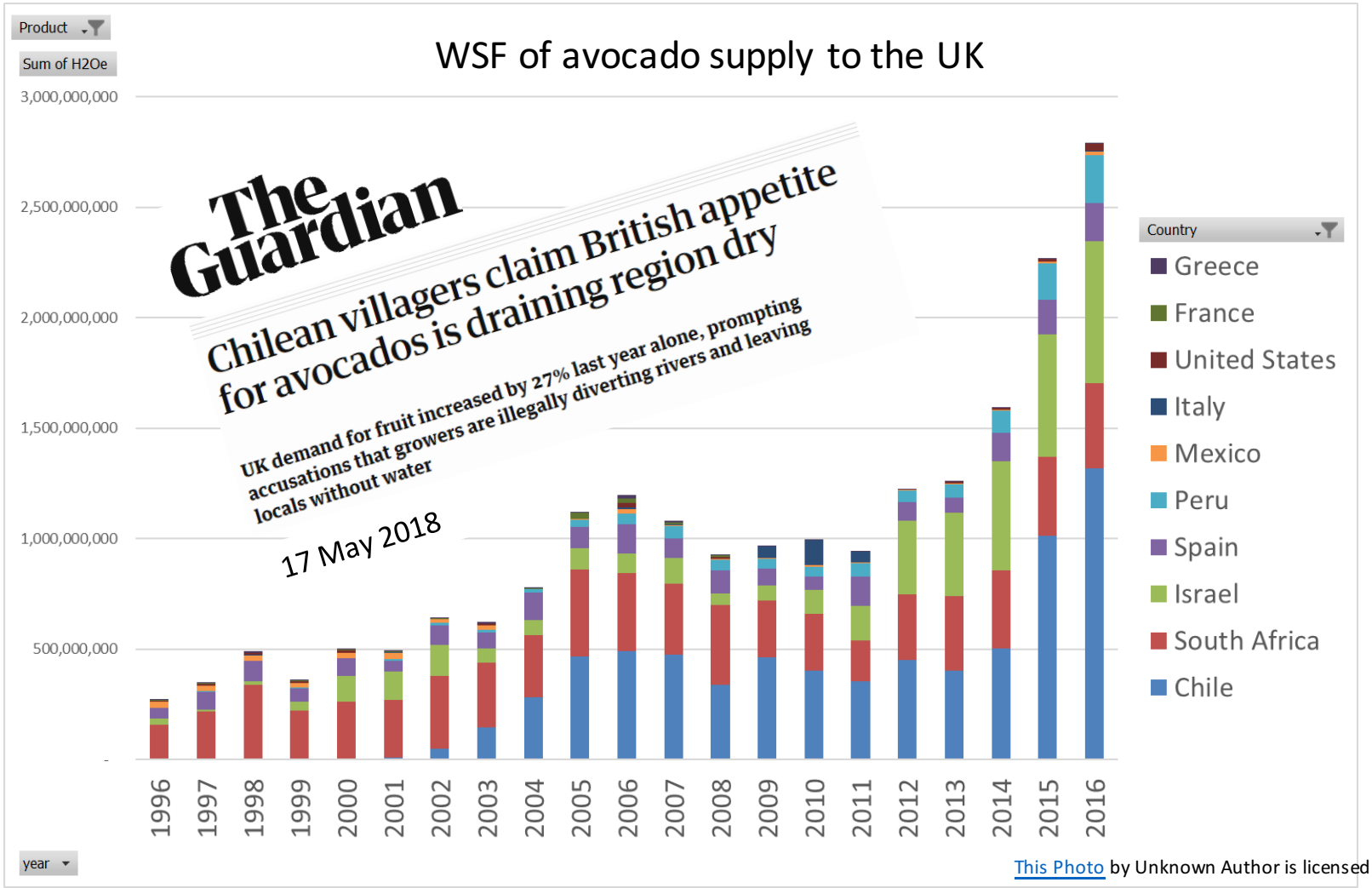
Increased FF&V consumption

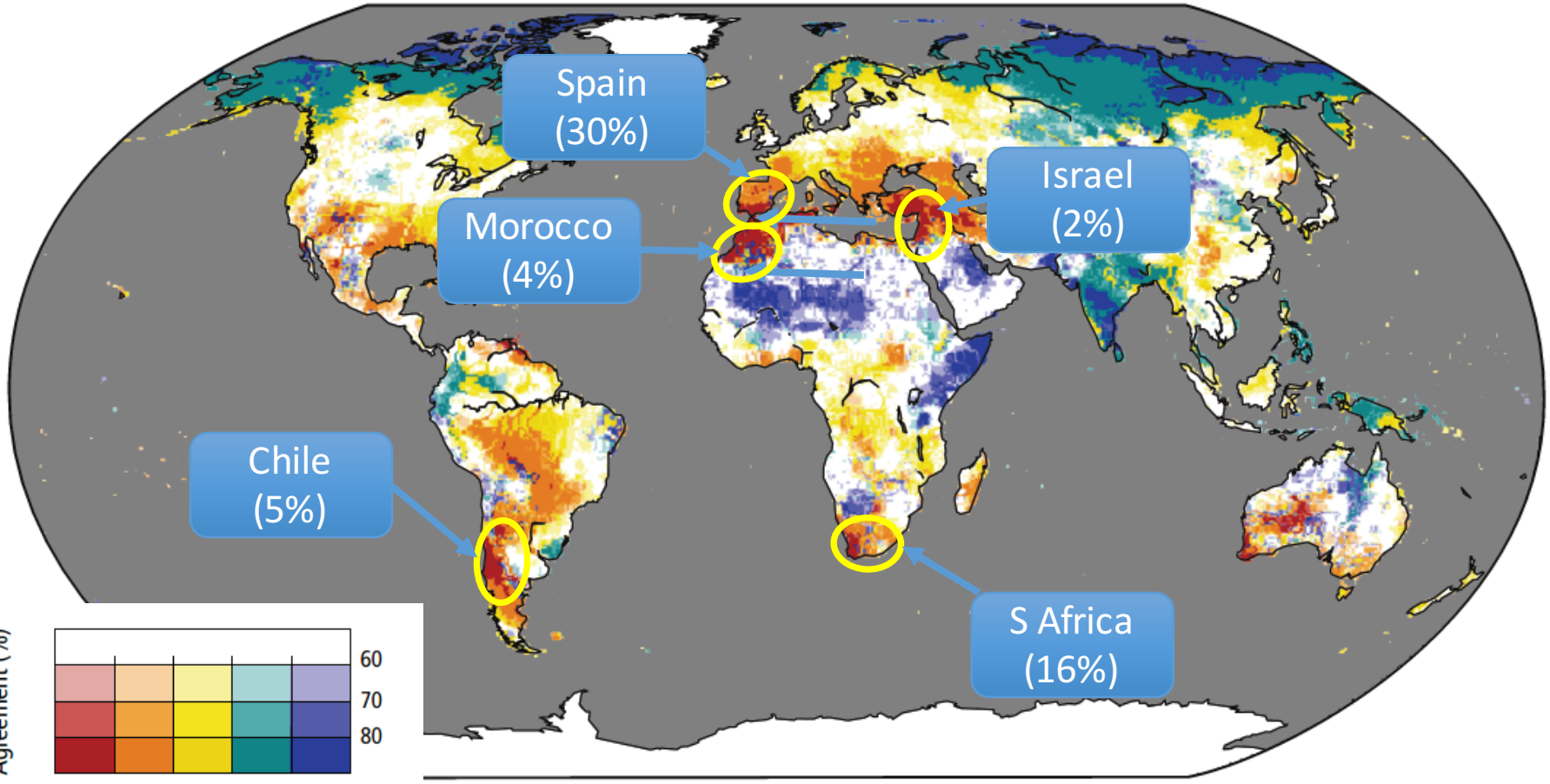
FF&V as part of a healthy diet

- A range of “healthier” UK diet scenarios tested (assuming same F&F mix and sourcing)
  - Small increase in total diet WSF
  - Significant increases on off-shore WSF

Changing preference



Changing global climate



Projected change in mean annual streamflow (2°C)

Jiménez Cisneros et al. (2014) IPCC Fifth Assessment Report

Conclusions

- Growing fruit & vegetables (F&V) consumes large volumes of freshwater
- F&V are often grown in water scarce locations
- F&V has a high, and growing, water scarcity footprint (WSF)
- Global trade in F&V has the potential to exacerbate water scarcity in distant locations. Are we
  - 'Out-sourcing' our environmental impacts?
  - 'Importing food & exporting drought'?
- In the UK, increasing consumption of F&V, especially exotic fruits is increasing the country's WSF
- Projected dietary and climate changes will intensify water risks and offshore environmental impacts of F&V production

Acknowledgement

This work is funded through the Global Food Security's 'Resilience of the UK Food System Programme', with support from BBSRC, ESRC, NERC and Scottish Government

Hess, T.M. and Sutcliffe, C. (in press) The exposure of a fresh fruit and vegetable supply chain to global water-related risks. Water International.

Hess, T.M., Andersson, U., Mena, C. and Williams, A. (2015) The impact of healthier dietary scenarios on the global blue water scarcity footprint of food consumption in the UK. Food Policy, 50: 1-10.