

Integrating agricultural water use with the global water budget

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Concerns

* **climate change + popul growth**

--> **food supply problems**

* **water in dominating mental image**

= **irrigation focused**

--> **severe river depletion + groundw overexploit**

closing basins = 1.4 bln people

---> WHAT ARE THE OPTIONS?

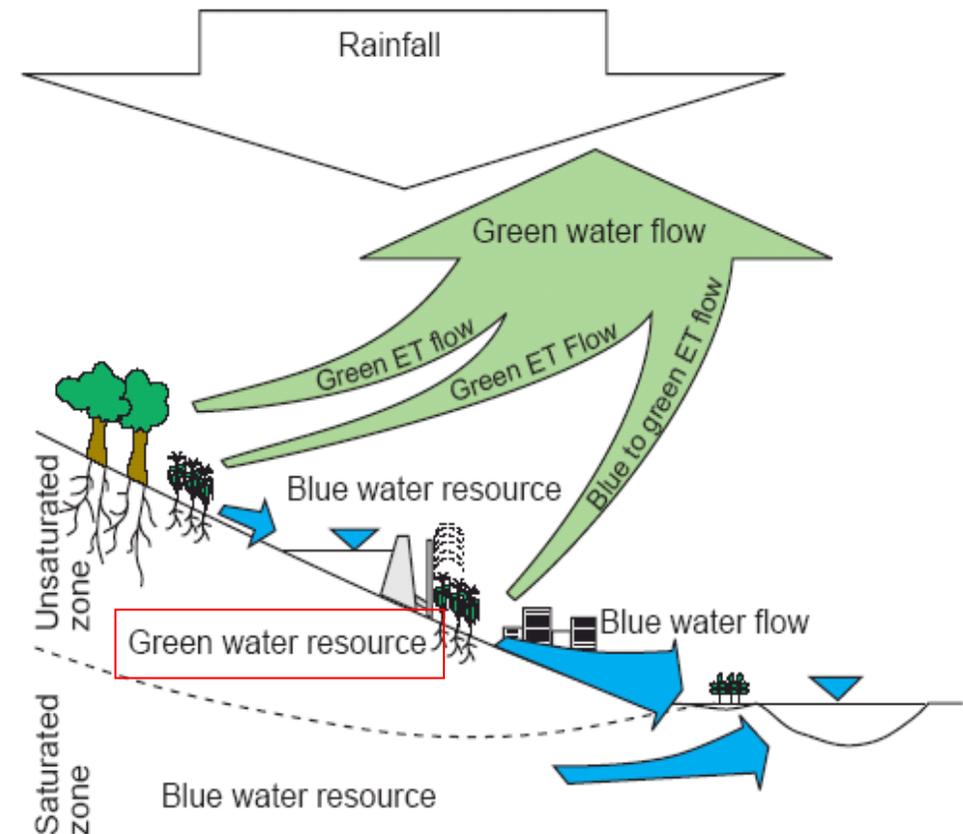
Crops feed on soil moisture

Water resource = rain

→ two types of water

*green water in the soil

*blue water in rivers
and aquifers



Aim and method

Aim:

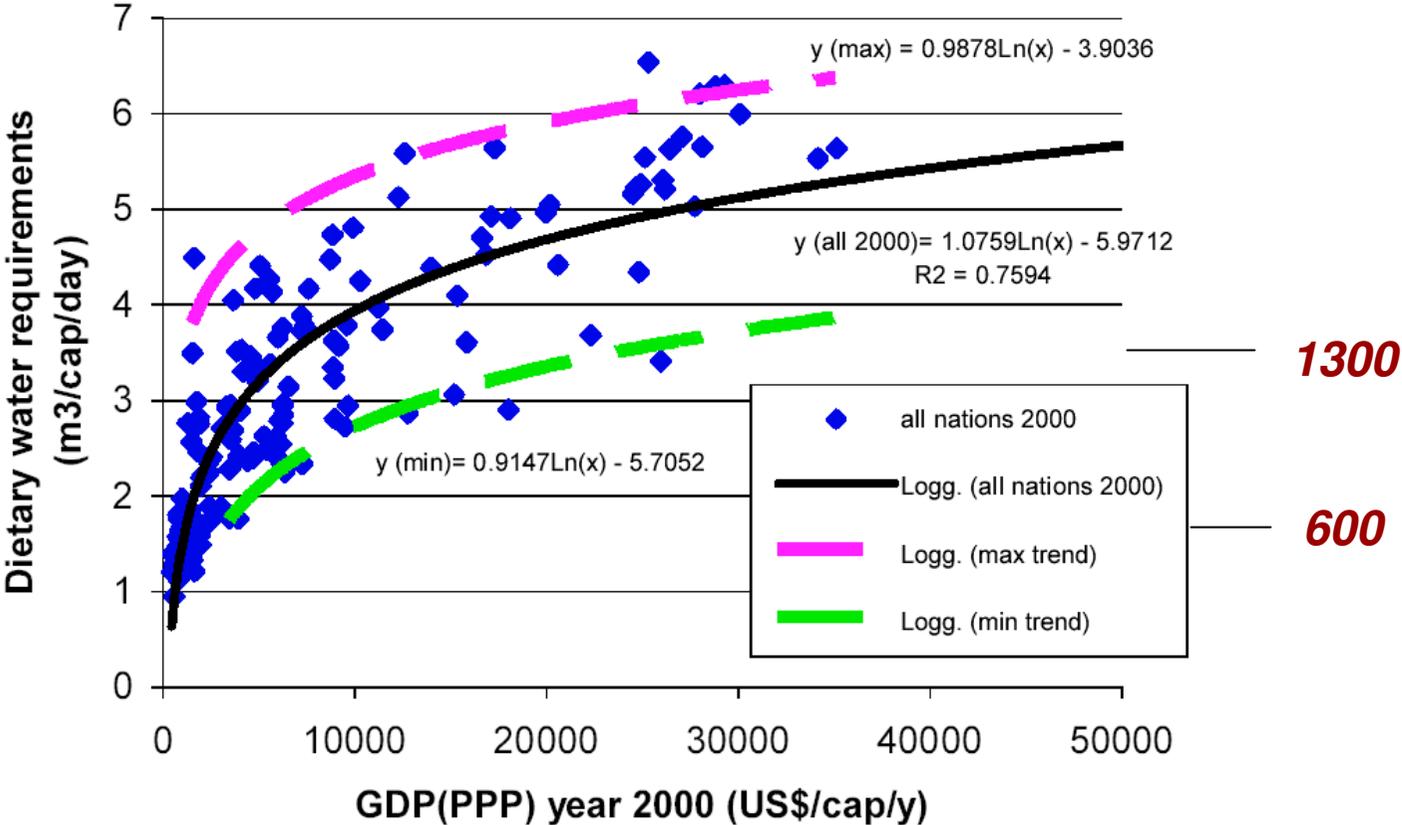
- * put future **food water requirements** in a global perspective
- * categorize countries for **water shortages**

Method

- * **pixel-based global modeling 2050**
 - = LPJ-model+climate change+population growth A2
 - current water productivity
- * **food selfsufficiency as politically preferred policy**
- * **standard diet 3000 kcal/p d (FAO 2030) --> 1300 m³/p yr**
also mini-diet 600 m³/p yr

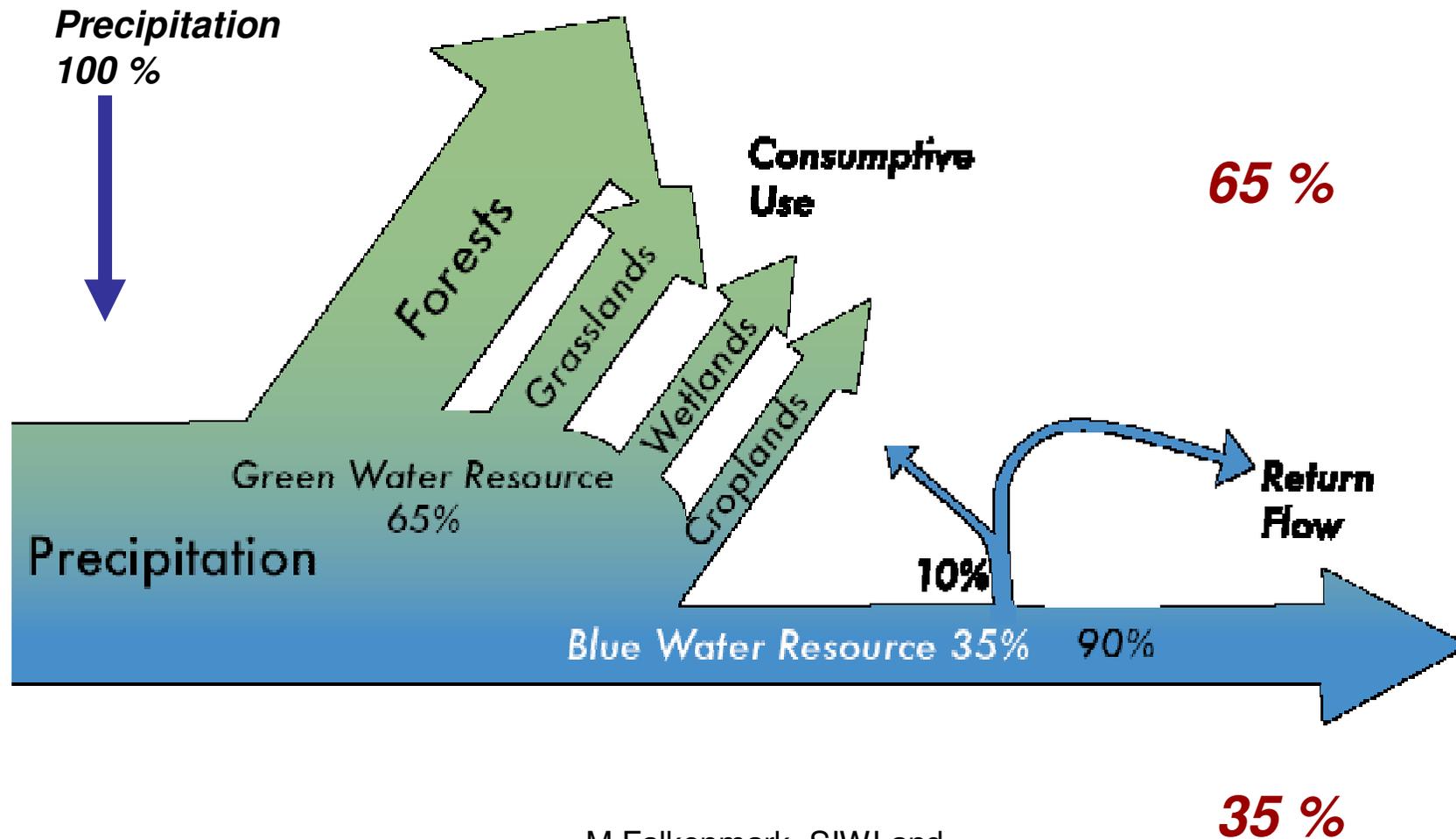
Food water requirements vs income

m3/cap day



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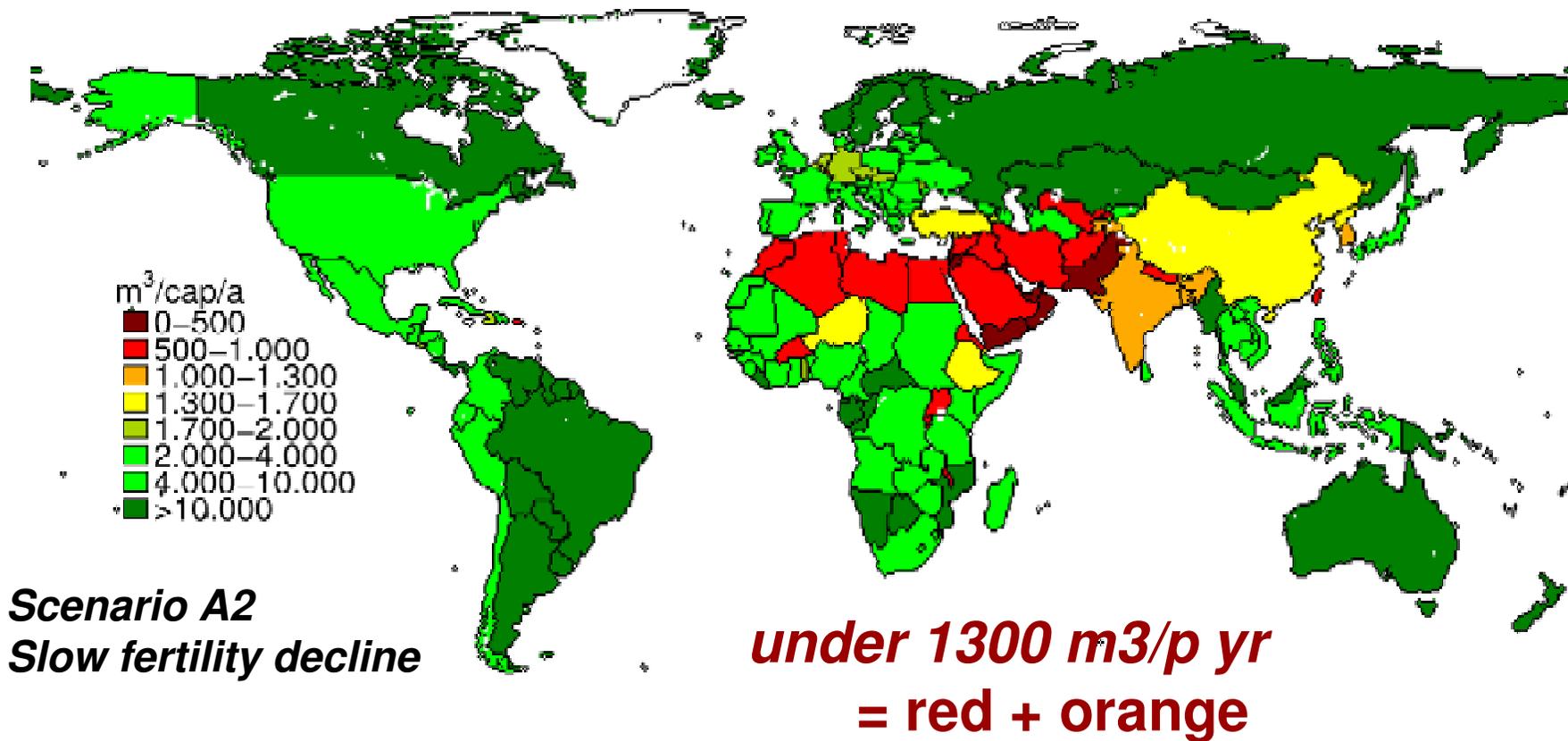
Global water budget



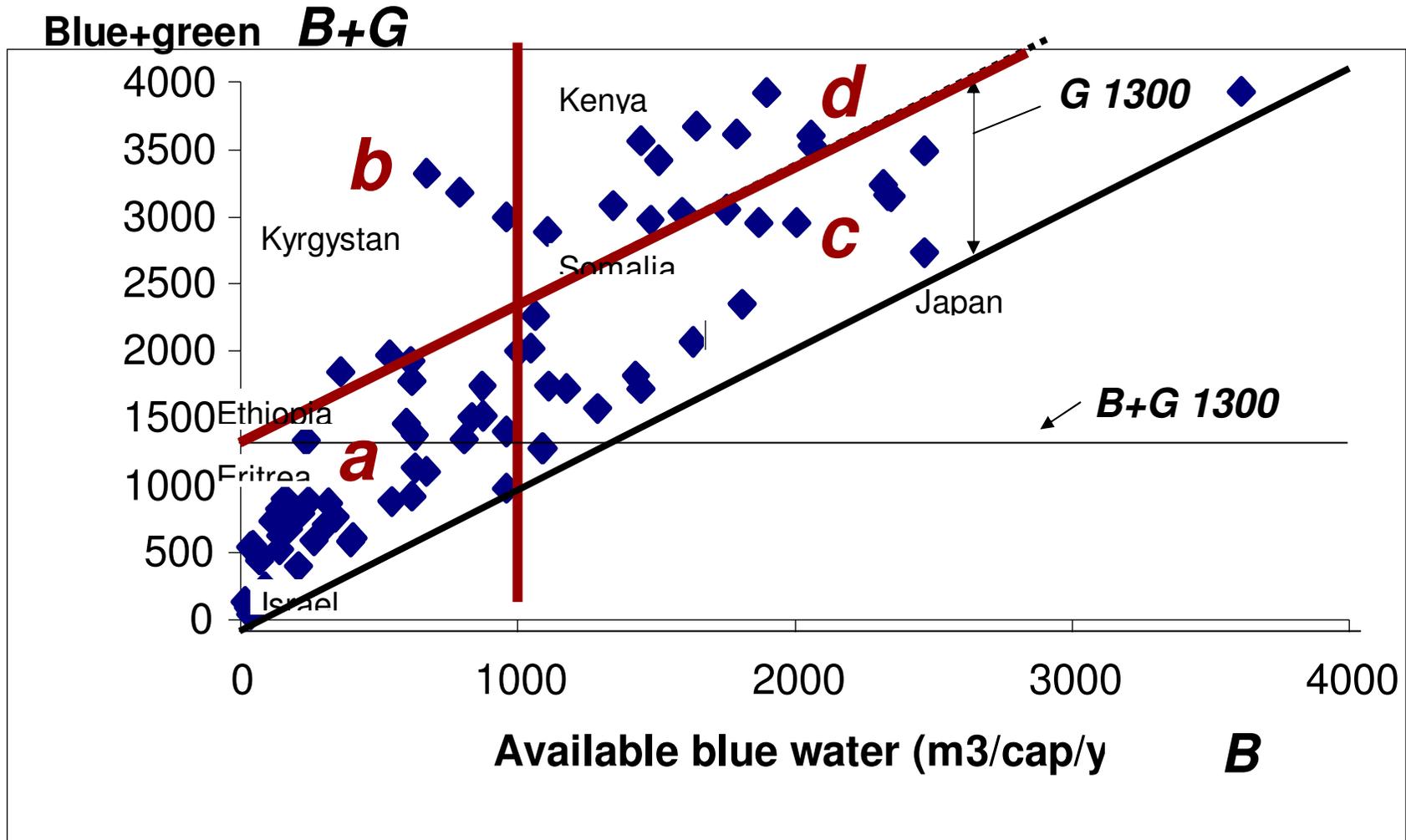
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2050: Total water availability

Blue + green water



Blue water may be inaccessible due to chronic water shortage

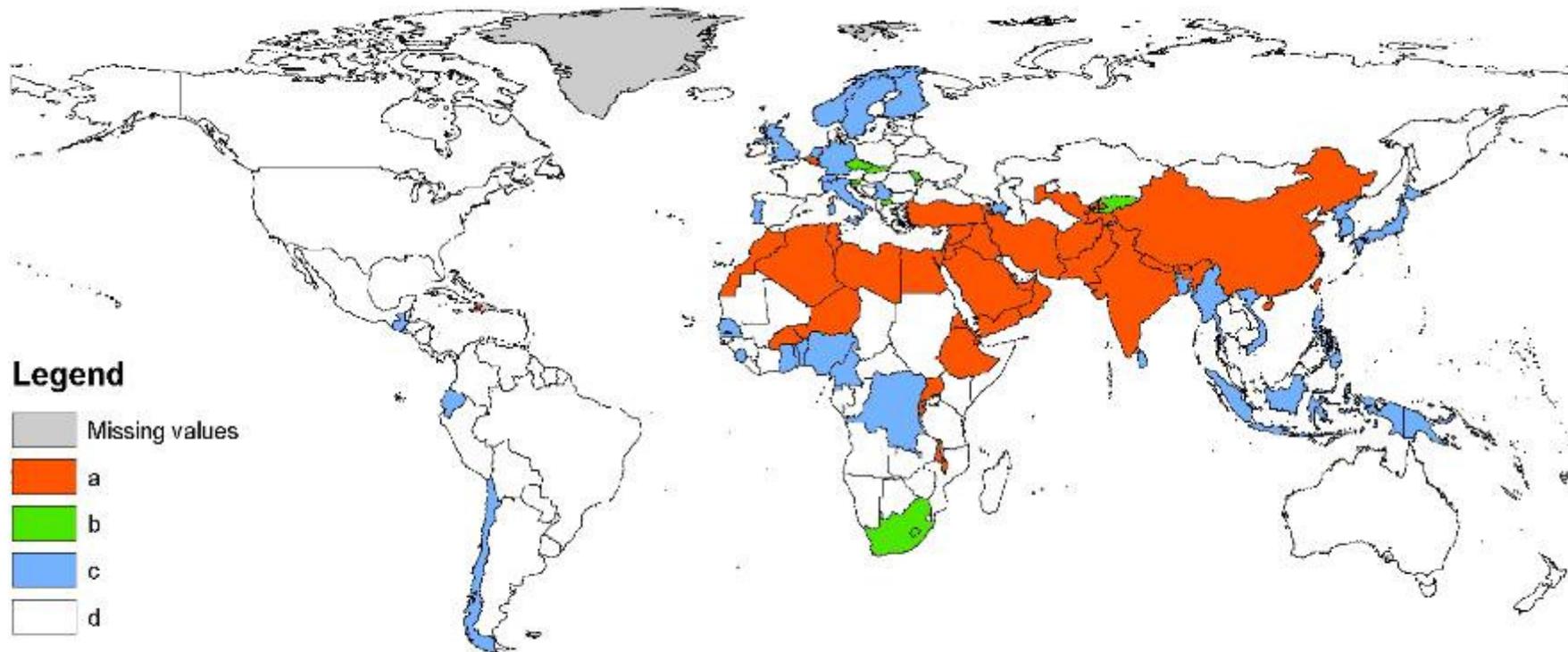


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Water scarcity combinations 2050

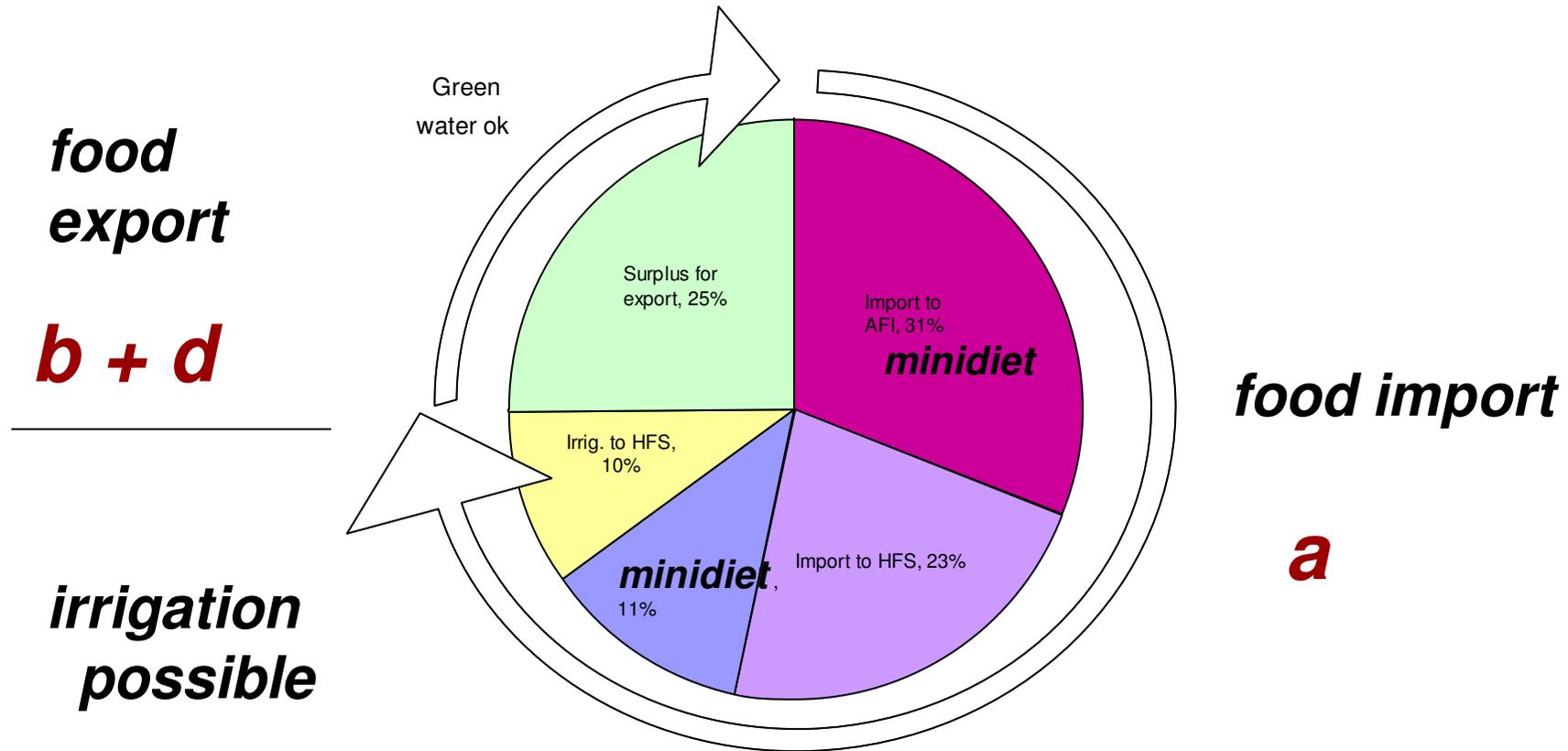
	<i>GR EEN</i>	Gr een shortage <1300m ³ / p yr	Gr een freed om >1300m ³ / p yr
<i>BL UE</i>			
Blue shortage <1000m ³ / p yr	a Iran ,Pak,Jordan Eg,Eth, Indi a, China	b Kyrg, Czecko sl, Les, S Afr	
Blue freedom >1000m ³ / p yr	c Jap,Bang l,N+SK or, Nga. T o,	d Zimb,Ghana , Ang,Bots w, Chad ,Ke,M ali,Na mib, Sud, Ta ,Za ,Zimb	

Green/blue water shortage by 2050



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Global food supply 2050



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Policy implications

<i>BLUE</i> \ <i>GREEN</i>	Green shortage <1300m ³ /pyr	Green freedom >1300m ³ /pyr
Blue shortage <1000m ³ /pyr	a 53 % of world pop * horisontal expansion • radical water productivity increase * FOOD IMPORT	b * upgrading rainfed agric
Blue freedom >1000m ³ /pyr	c 21% of world pop * irrigation	d * rainfed agric * irrigation * FOOD EXPORT

Conclusions

- **popul growth disastrous --> 53 % of pop into food import dependence**
- **only 21 % of world popul in irrigable countries**
(except for **river depletion phenom**)
- **hot spot region = ribbon Morocco -> China**
- **green water has to be better used**
--> drought resilient rainfed agric by developing soil/water integration
- **prepare water rich regions for food export**