WATER FOR A STARVING WORLD

some approaches since the 1977 warning

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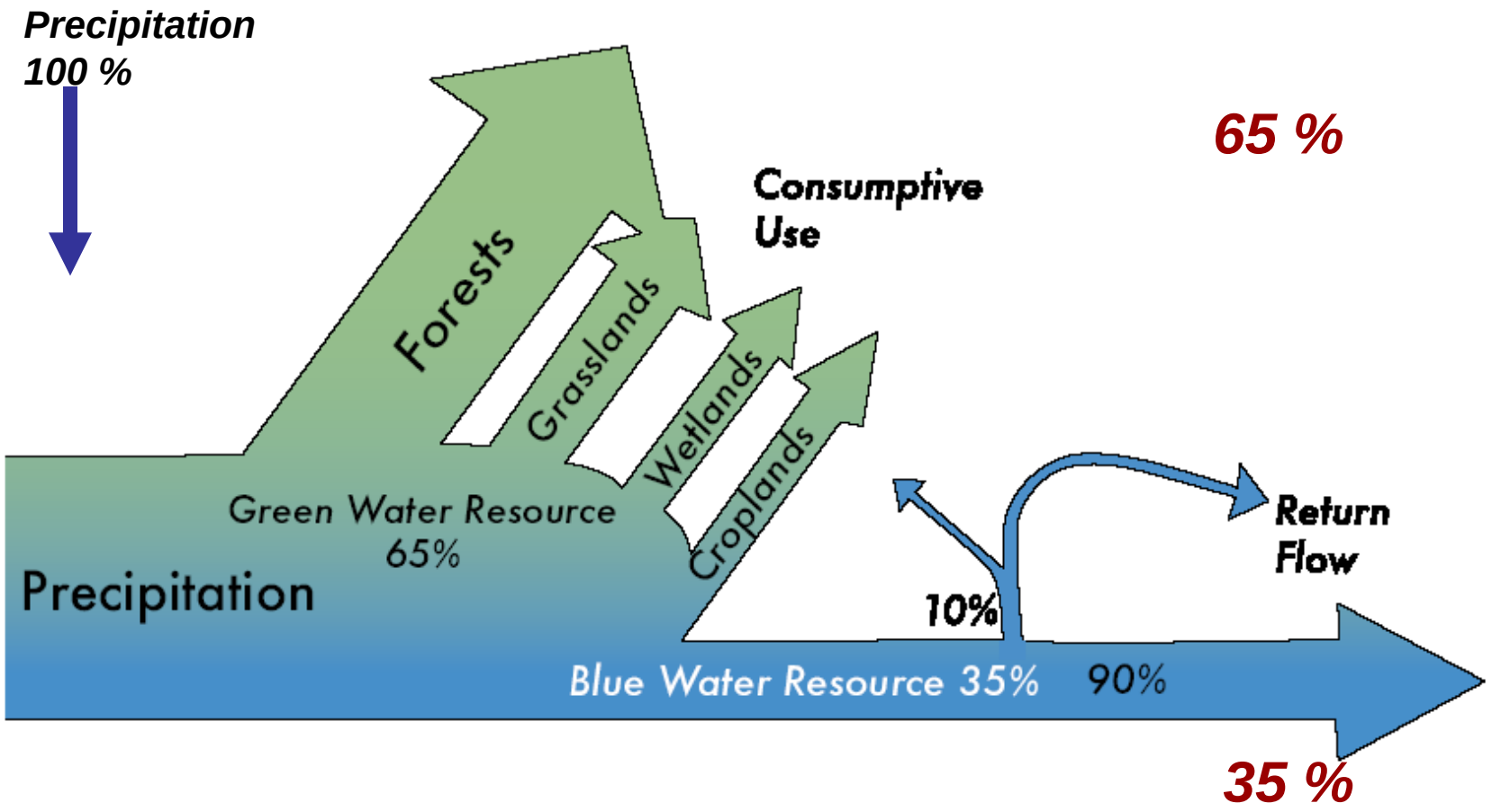
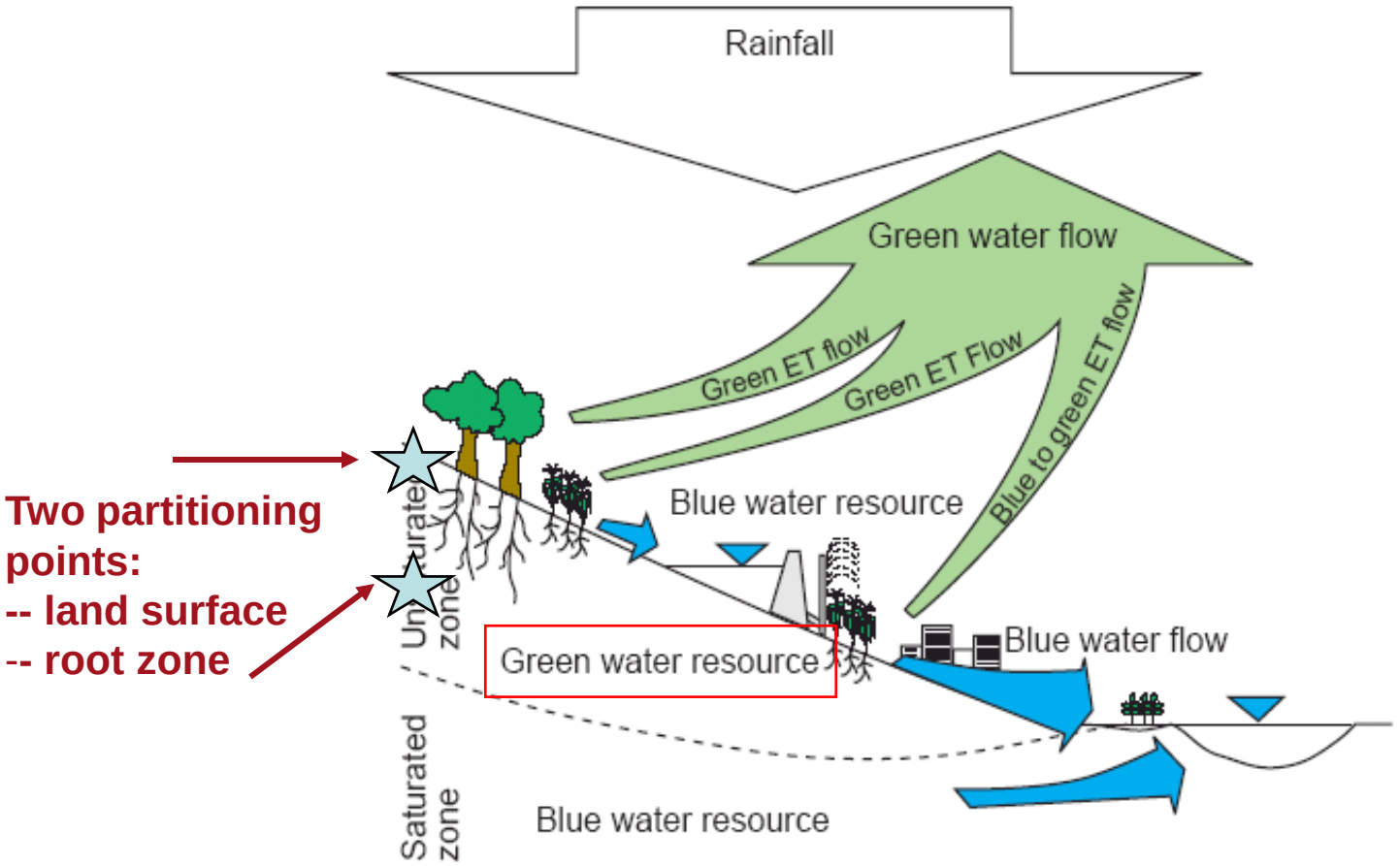
Past 30 years

- **UN Conferences: water blind or blue only**
- **1980's: African drought dilemma, blue water scarcity**
- **1990's: virtual water, river depletion, green water**
- **2000's: MDG's/hunger alleviation, environmental sustainability/ecosystems, consumptive water use**

Globally available water
- the water paradigm



Rainfall partitioning



Backcasting/MDG's 2050

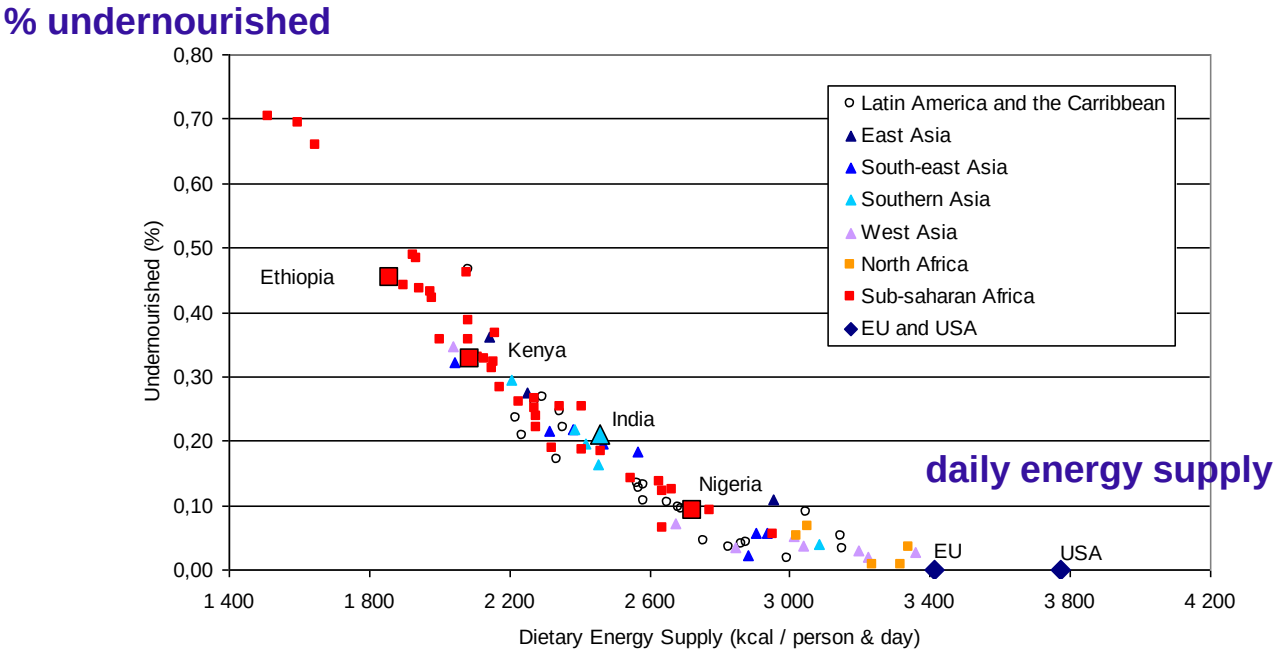
- **possibility to meet food water requirements to feed humanity?**
- **possible pathways to hunger alleviation?**
- **ASSUMPTIONS: protect ecosystems by production on current croplands**

Undernutrition vs food production

***no undernutrition -> 3000 kcal/p d**

- **2500 kcal/p d = 20 % undernutrition**
- **2000 kcal/p d = 40 % undernutrition**

*** assumed 20 % animal protein**



How much water is there to meet requirements?

- **requirement = 1300 m3/p yr-> enough to meet requirements?**
- **availability = 85 % of green water on croplands + 70 % of available blue (max + 15 % increase on irrig land)**

(rainfall partitioning based PIK-model/ LPJm: pixels, climate change SRES A2, UN medium population)

- **country based calculations**

-> water surplus countries, water deficit countries

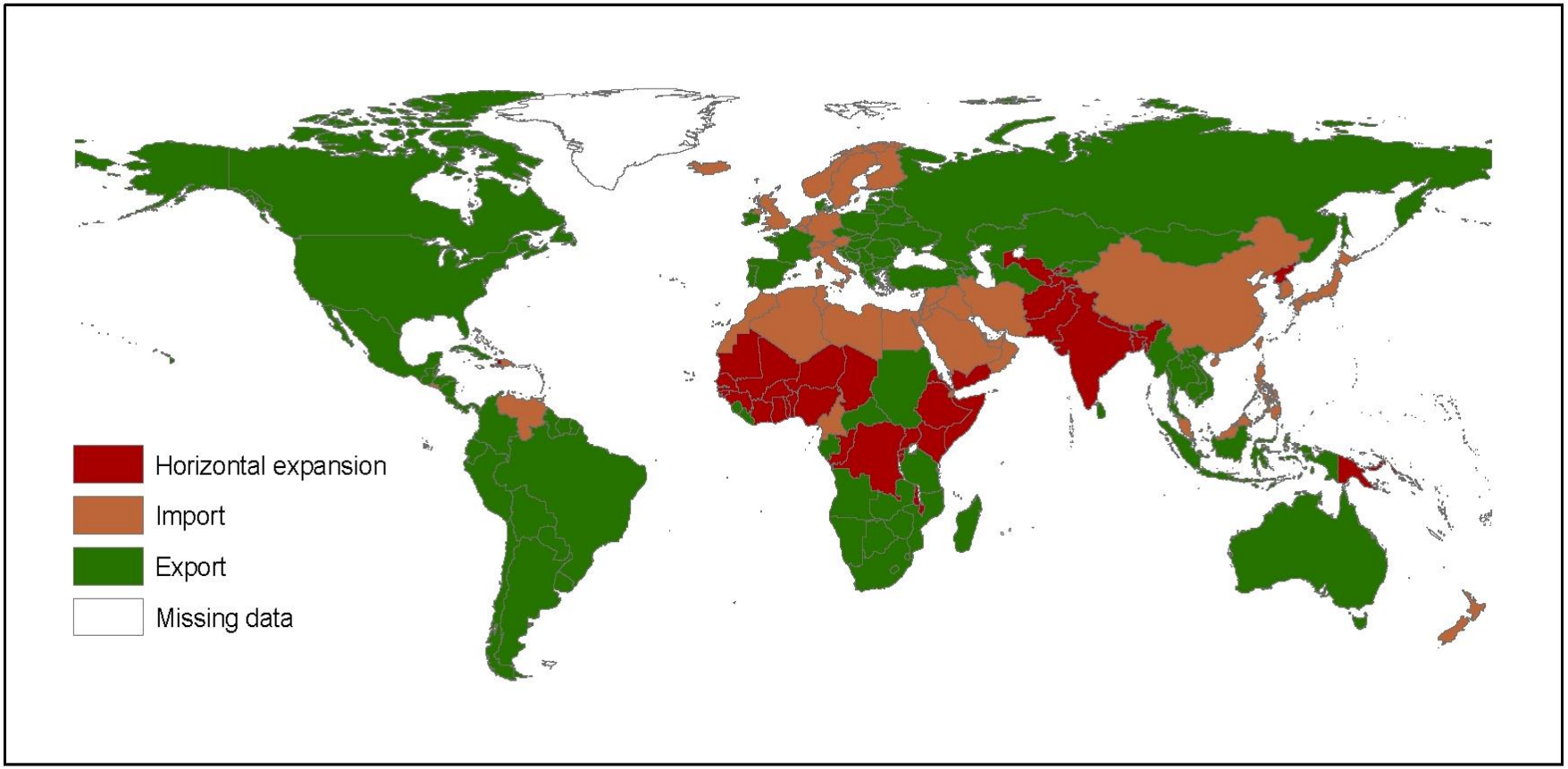
Country based water deficits/surpluses and agricultural improvements

	Deficit (km^3yr^{-1})	Surplus (km^3yr^{-1})
Current water productivity	4471	2052
WP improvements	-1973	532
Irrigation expansion	-348	1379
Net deficit / surpl (round numbers)	-2150	3960

Compensate deficit by import??

income	deficit km3/yr	population bln	H O W ?
LOW	**1404**	**3.8 bln**	*national solutions*
MEDIUM	**487**	**2.1 bln**	**import**
HIGH	**259**	**0.5 bln**	**import**

Food water deficit geography 2050

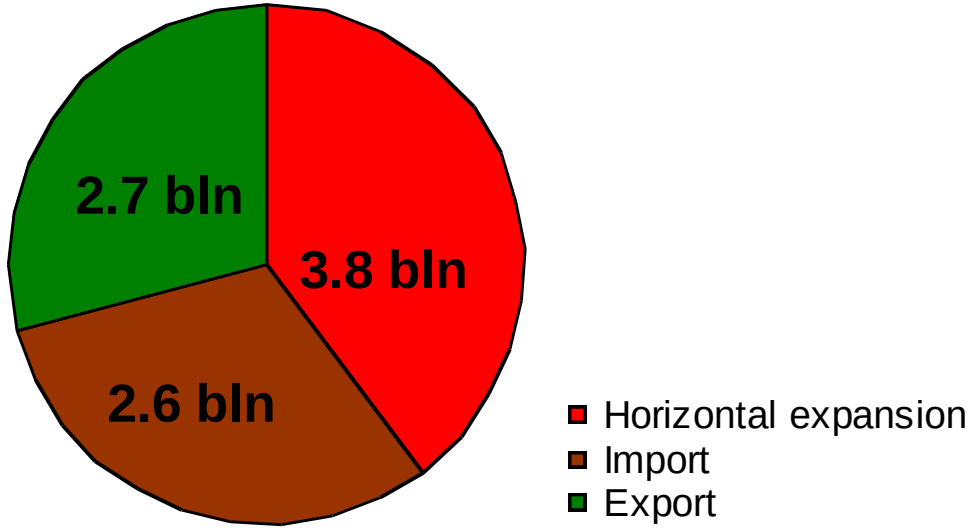


Can the food security goal be achieved?

30 % have surplus
- 2.7 bln = **can export**

70 % have water deficit
-2.6 bln = **can import**

-3.8 bln **too poor**
= national solutions/
reduced diet
expectations
+ **food aid**



Water shortage driven food trade

- **altogether 750 km3/yr**

out of overall water deficit of 2150 km3/yr

ca 30 % only

Options for 3.8 bln poor

1) **modernise agriculture/reduce water losses**

2) **produce what is possible/reduce diet expectations**

0.6 bln: reduce meat

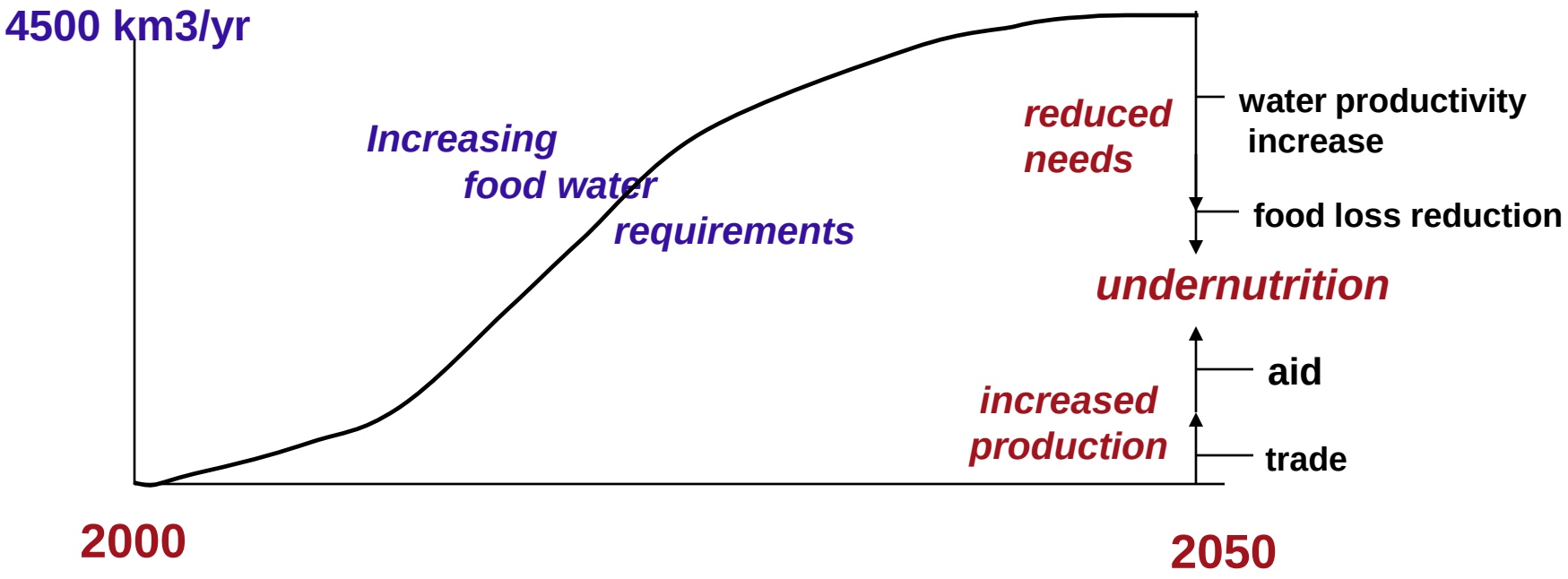
1.9 bln: to 2500 kcal/p d + food aid to poorest

1.3 bln: try to manage on 2000 kcal/p d

+ food aid to poorest

Pathways to the 2050 goal

ways to meet the food water requirements



Implications

- ***most food production can take place on current croplands***

- ***loss reduction will be essential:***

  - water losses by agricultural modernisation in all developing countries - 2400 km3/yr to gain;

  - food losses in the food chain - might reduce food production needs by some 20 %

- ***essential to generate economic development in poor countries to get purchasing power***

Hot issues

- realism of huge virtual water flows in a carbon free world?
- realistic options for food loss reduction?
- realism of production explosion in surplus countries?
- maximising crop per drop

  = loss of return flow = increased river depletion

Thankyou!