September 29th - 30th, 2016
Palmeraie Golf Palace,
Marrakesh

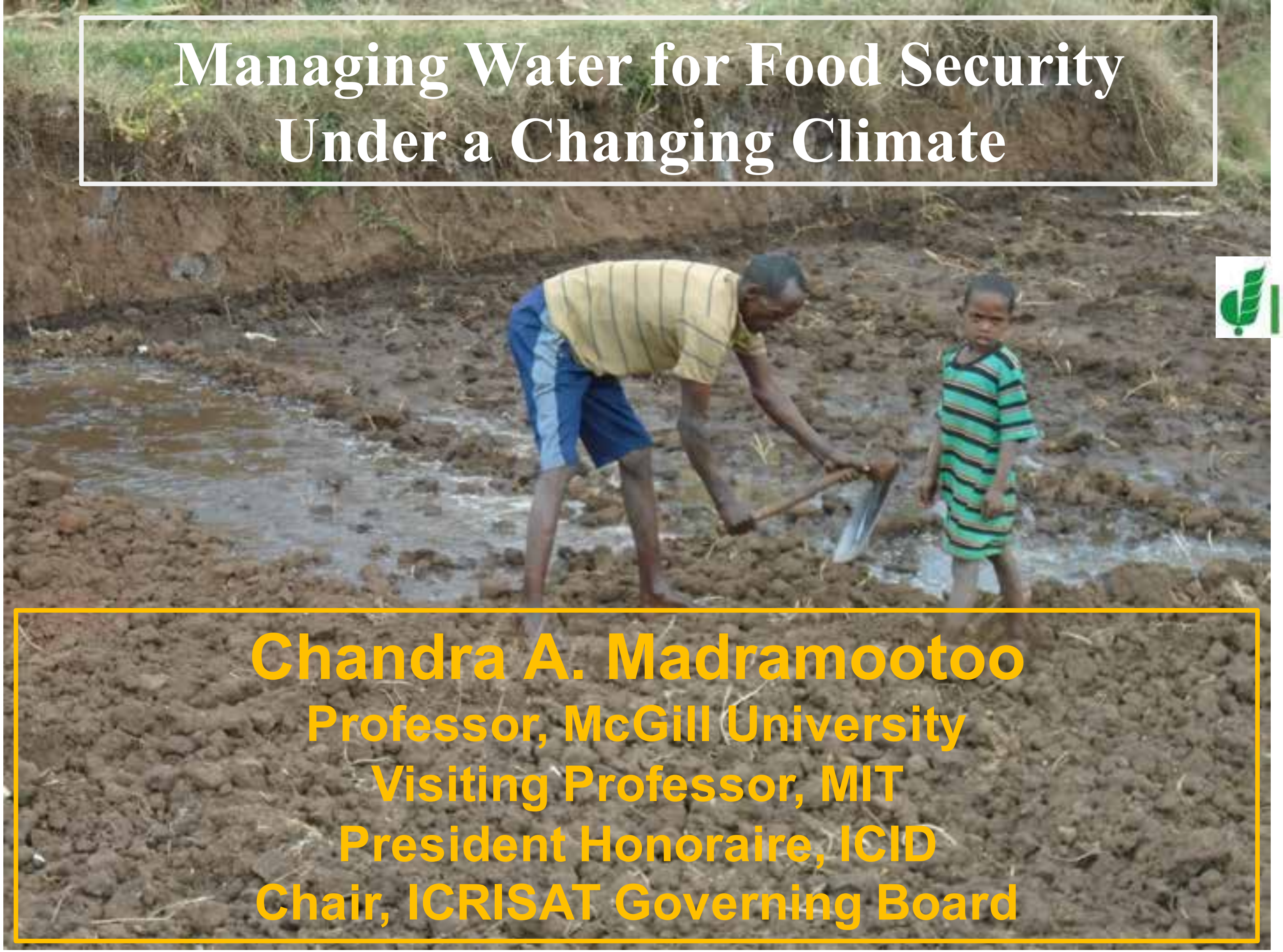
29 - 30 septembre 2016
Palmeraie Golf Palace,
Marrakech

HIGH-LEVEL MEETING ON THE INITIATIVE FOR THE ADAPTATION OF AFRICAN AGRICULTURE TO CLIMATE CHANGE "AAA"

RENCONTRE DE HAUT NIVEAU SUR L'INITIATIVE POUR L'ADAPTATION DE L'AGRICULTURE AFRICAINE AUX CHANGEMENTS CLIMATIQUES "AAA"

C. MADRAMOOTTOO

Honorary President of the International Commission of Irrigation and Drainage (ICID)



Managing Water for Food Security Under a Changing Climate

Chandra A. Madramootoo

Professor, McGill University

Visiting Professor, MIT

President Honoraire, ICID

Chair, ICRISAT Governing Board

Agriculture in Africa is Primarily Rainfed

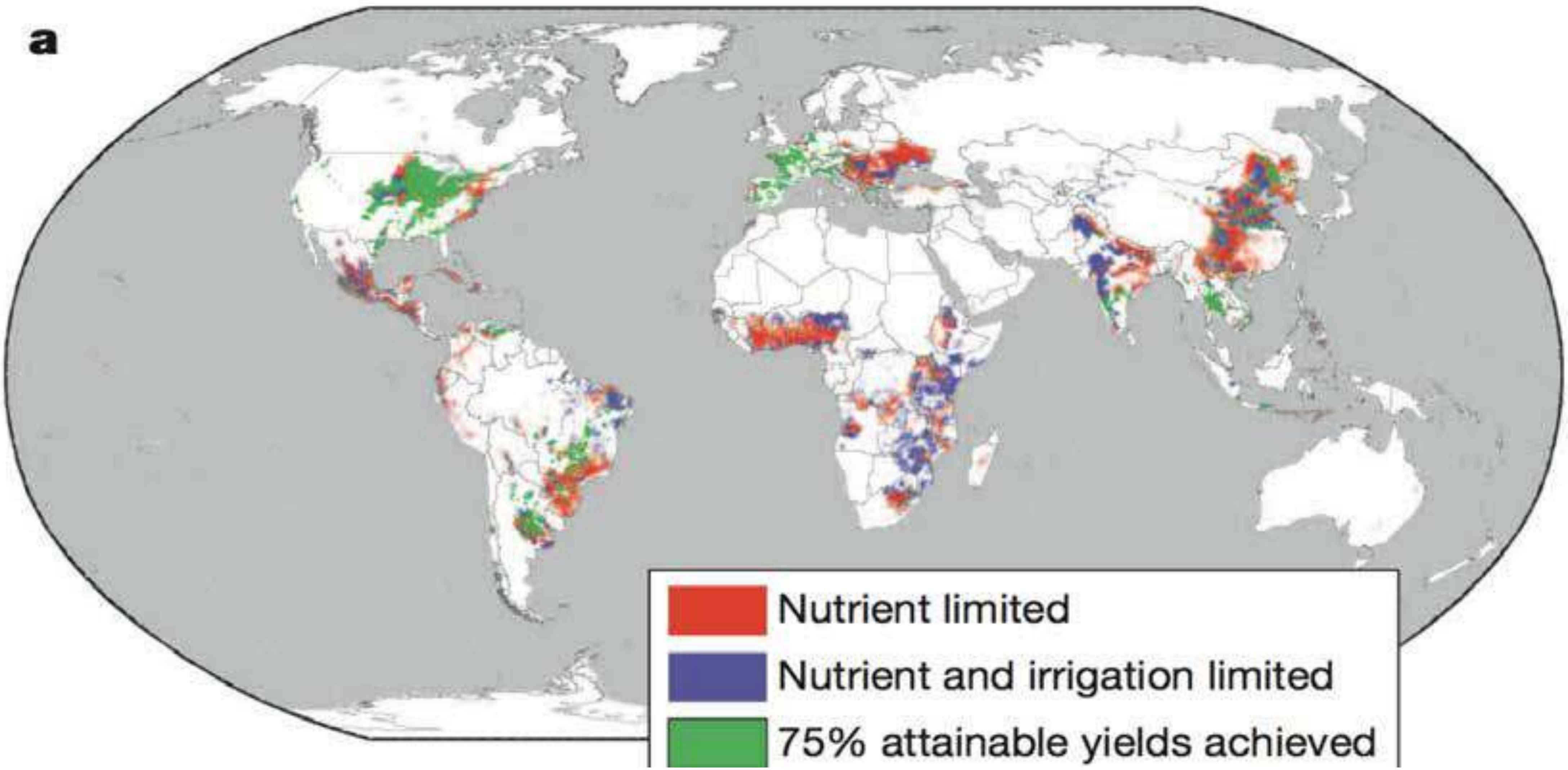


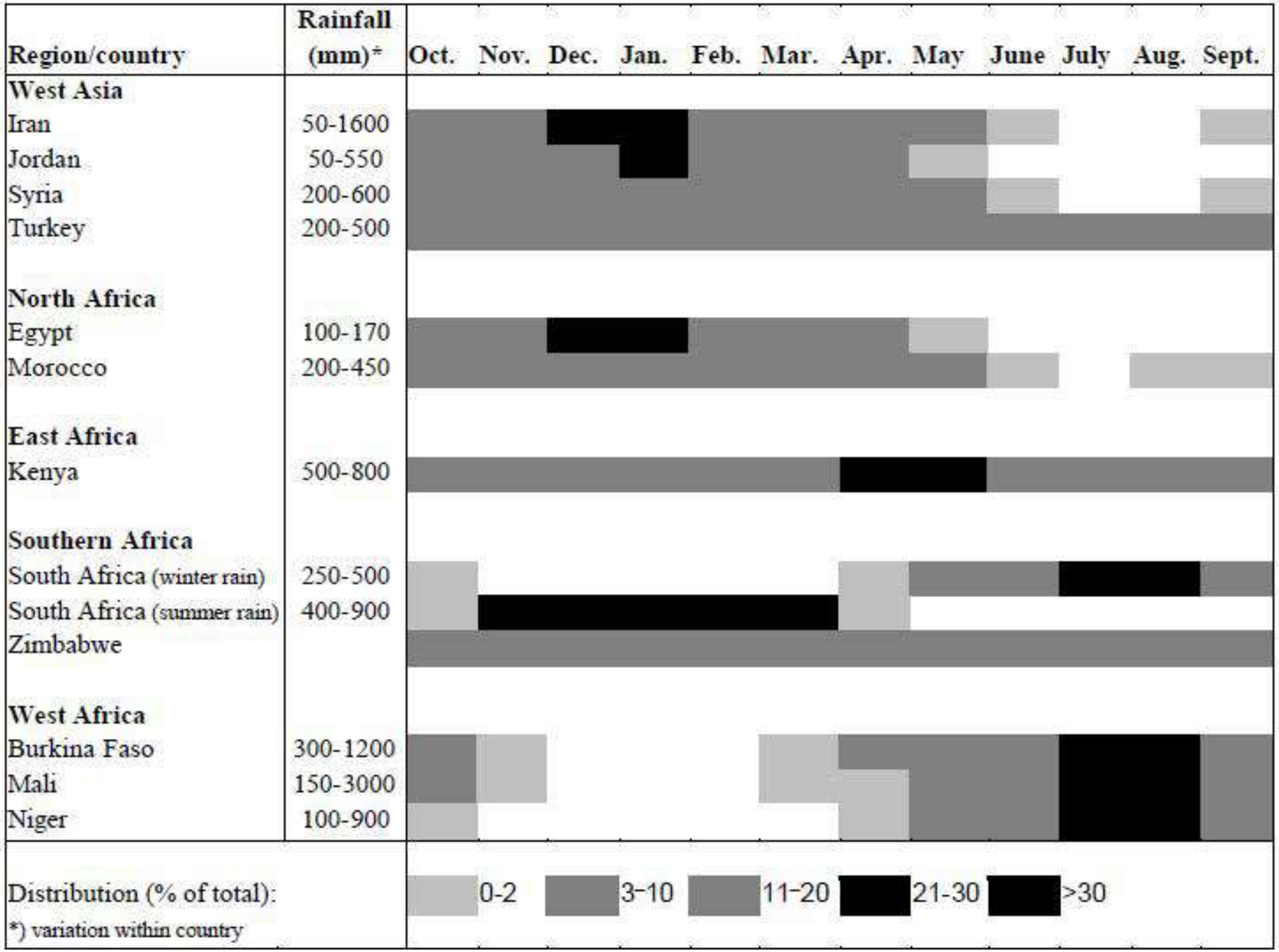
Table 4: Irrigation potential and actual development in major basins in SSA (2000)

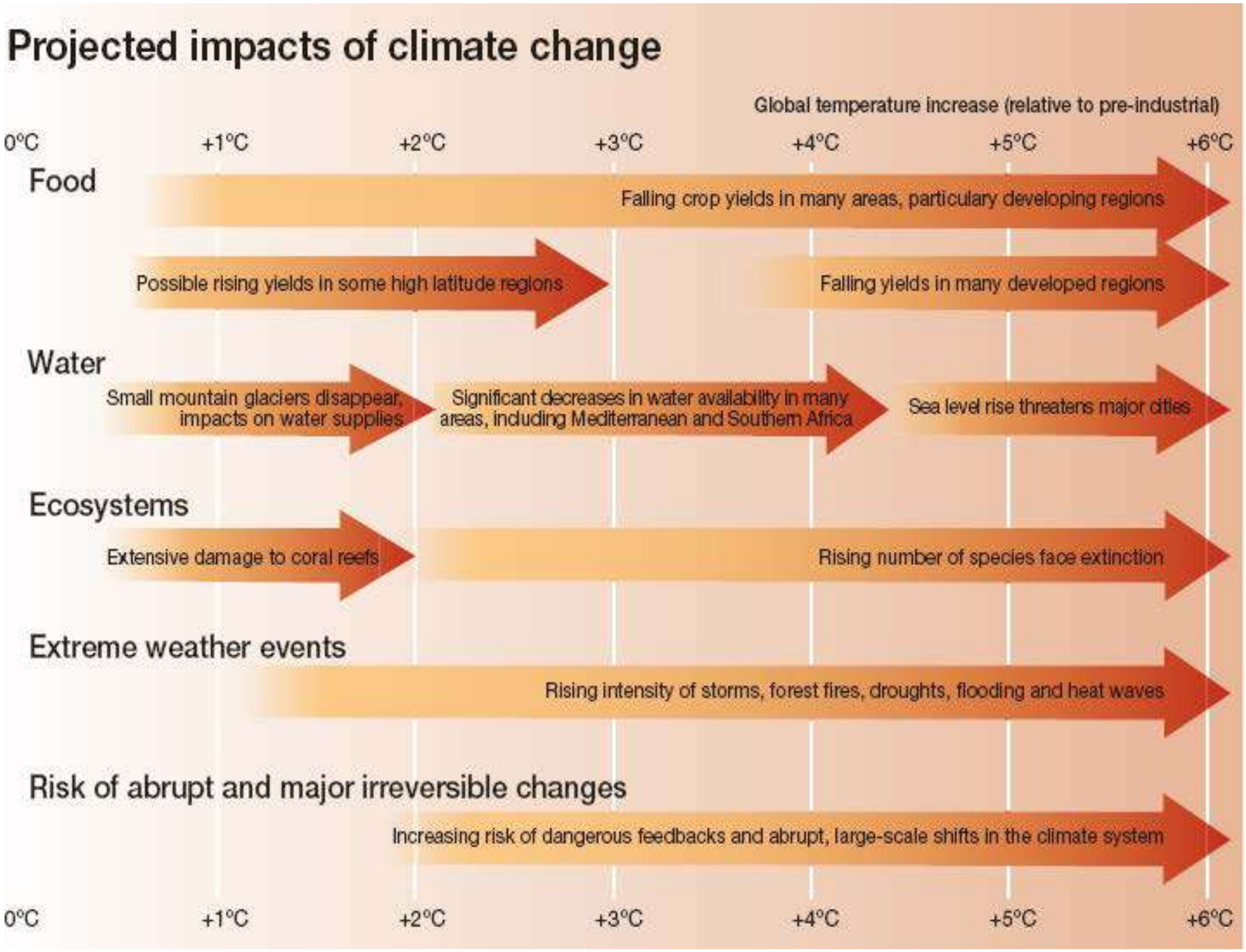
Basin	*Irrigation potential* (m ha)*	*Irrigated area** (m ha)*	*Percentage of potential realized*	*Depletion in km^3***	*Percentage of total water resources ***
Lake Chad	1.16	0.15	13%	1.1	12%
Senegal	0.42	0.13	31%	2.9	19%
East African Coast		0.23		2.6	1%
Volta		0.24		5.3	6%
Zambezi	3.16	0.25	8%	3.8	1%
Limpopo	0.30	0.27	90%	2.8	53%
Orange	0.39	0.37	95%	2.5	40%
Horn of Africa		0.46		9.2	11%
Niger	1.68	0.64	38%	11.9	5%
Madagascar	1.50	0.94	63%	7.8	2%
Total SSA	36	6.2	16%	69	2%

* based on FAO (1997) ** from Watersim database

Data by country given in annex.

Monthly rainfall amounts are more erratic
- Difficult to predict onset of rains



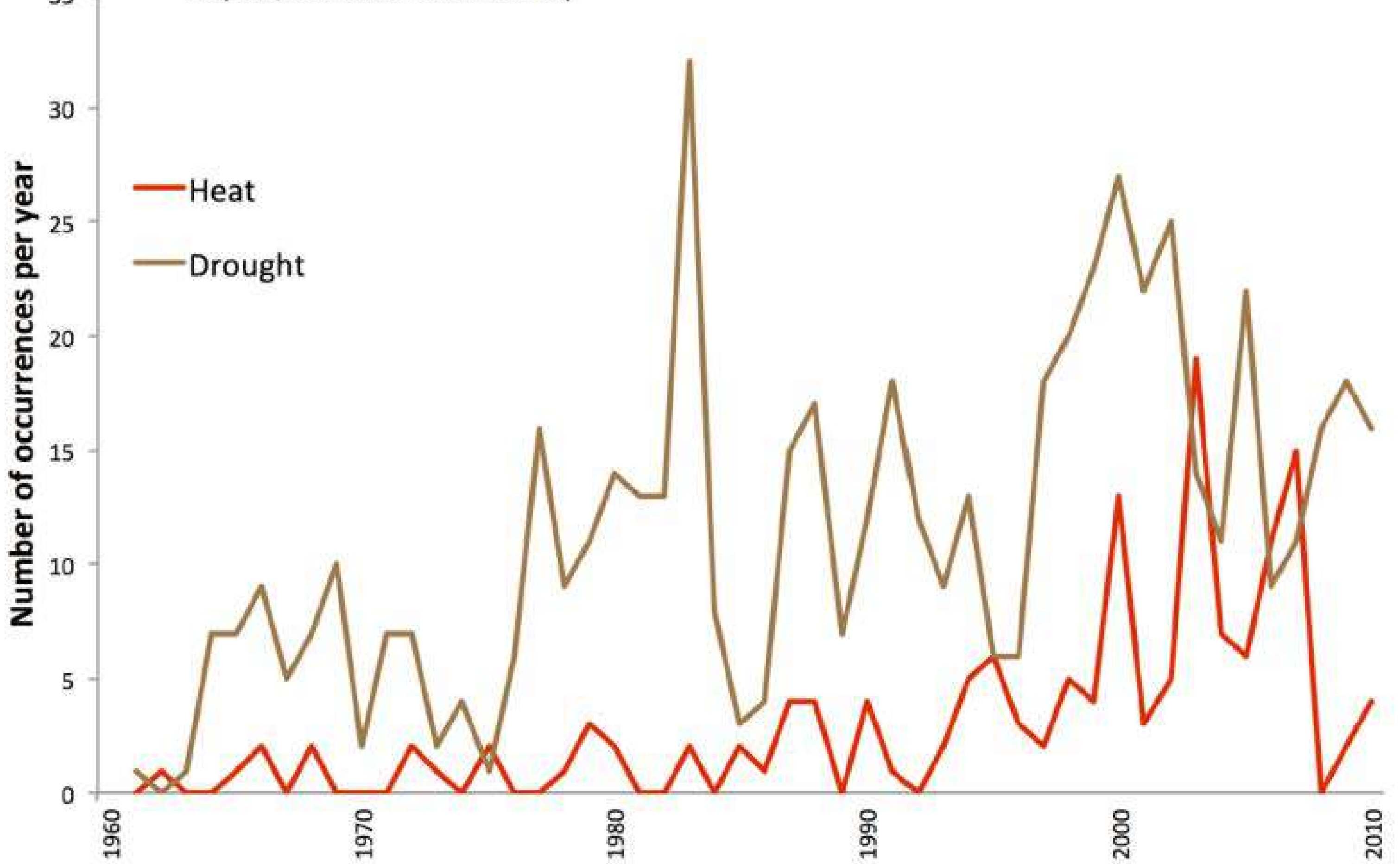


Source: Stern Review (2008)

doi:10.1038/nature16467

Influence of extreme weather disasters on global crop production

Corey Lesk[1], Pedram Rowhani[2] & Navin Ramankutty[1,3]



Extended Data Figure 4 | Time series of the number of extreme heat and drought disasters per year from the EM-DAT database. The EM-DAT database is based on a compilation of disaster reports gathered from various organizations including United Nations agencies, governments and the International Federation of Red Cross and Red Crescent Societies. The time series of reported disasters per year exhibits an increasing trend, probably the result of more complete disaster reporting in more recent decades with a possible contribution from increasing disaster incidence. There is also large inter-annual variability in the number of disasters.

LETTER

doi:10.1038/nature16467

Influence of extreme weather disasters on global crop production

Corey Lesk[1], Pedram Rowhani[2] & Navin Ramankutty[1,3]

1964–2007. We show that droughts and extreme heat significantly reduced national cereal production by 9–10%, whereas our analysis could not identify an effect from floods and extreme cold in the national data. Analysing the underlying processes, we find that production losses due to droughts were associated with a reduction in both harvested area and yields, whereas extreme heat mainly decreased cereal yields. Furthermore, the results highlight ~7% greater production damage from more recent droughts and 8–11% more damage in developed countries than in developing ones. Our

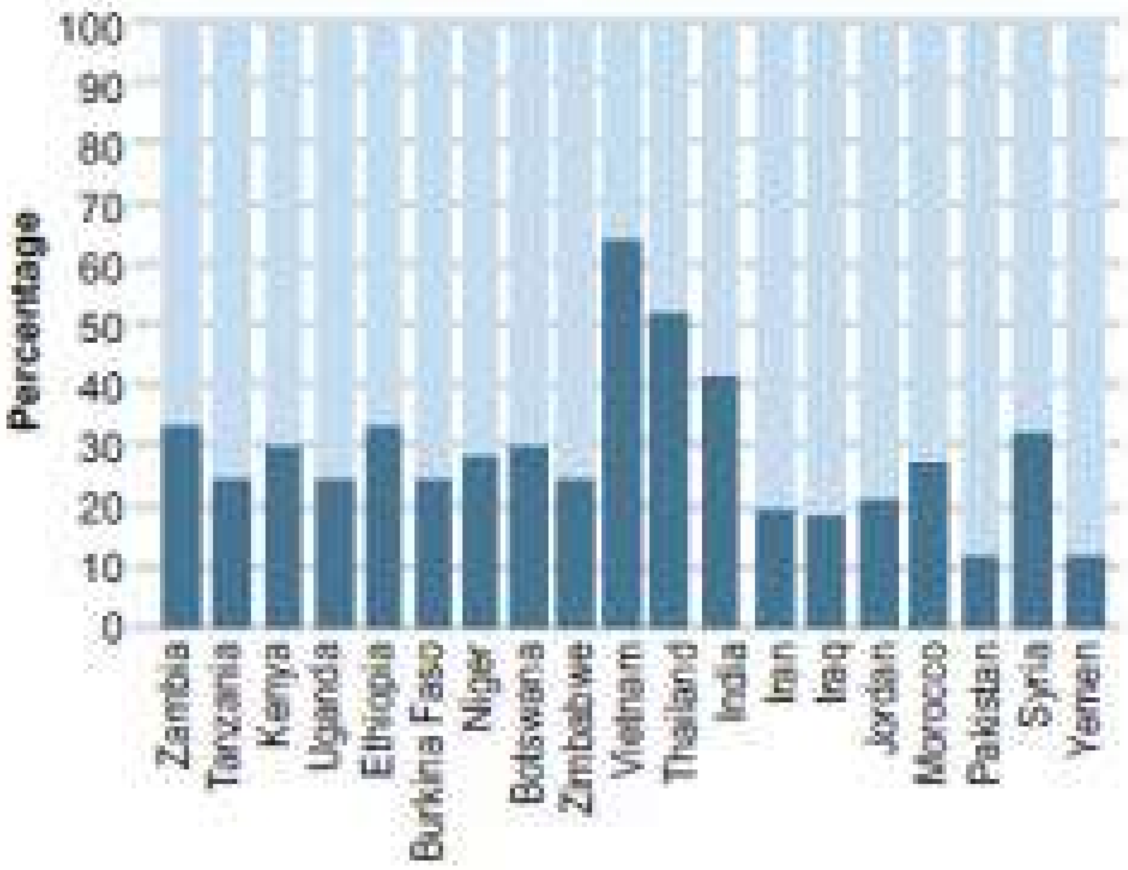


Figure 6: Examples of observed yield gap (for major grains) between farmers' yields and achievable yields (100 per cent denotes achievable yield level, and columns actual observed yield levels). (After Rockström et al., 2007


Adapting to climate change

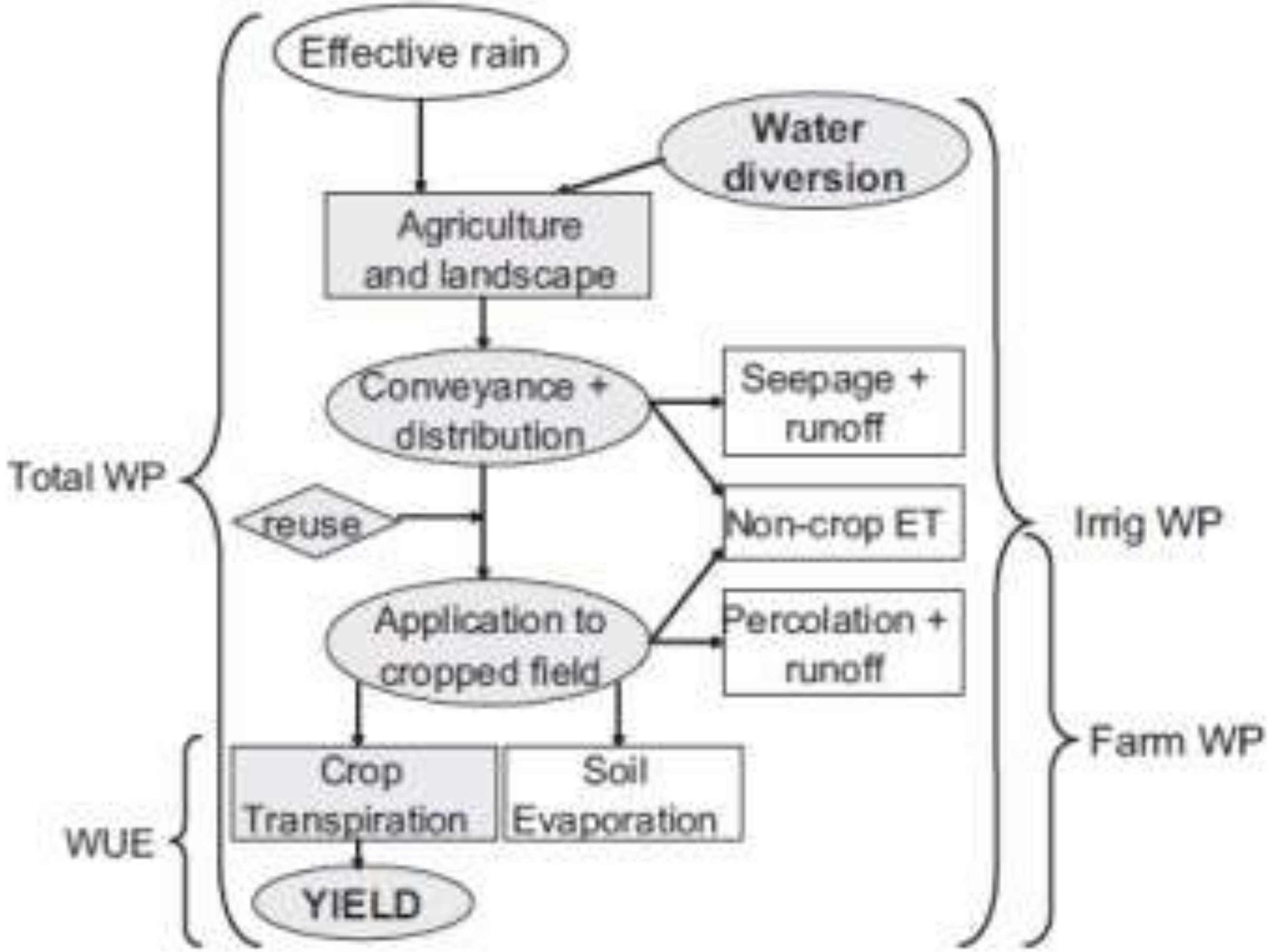
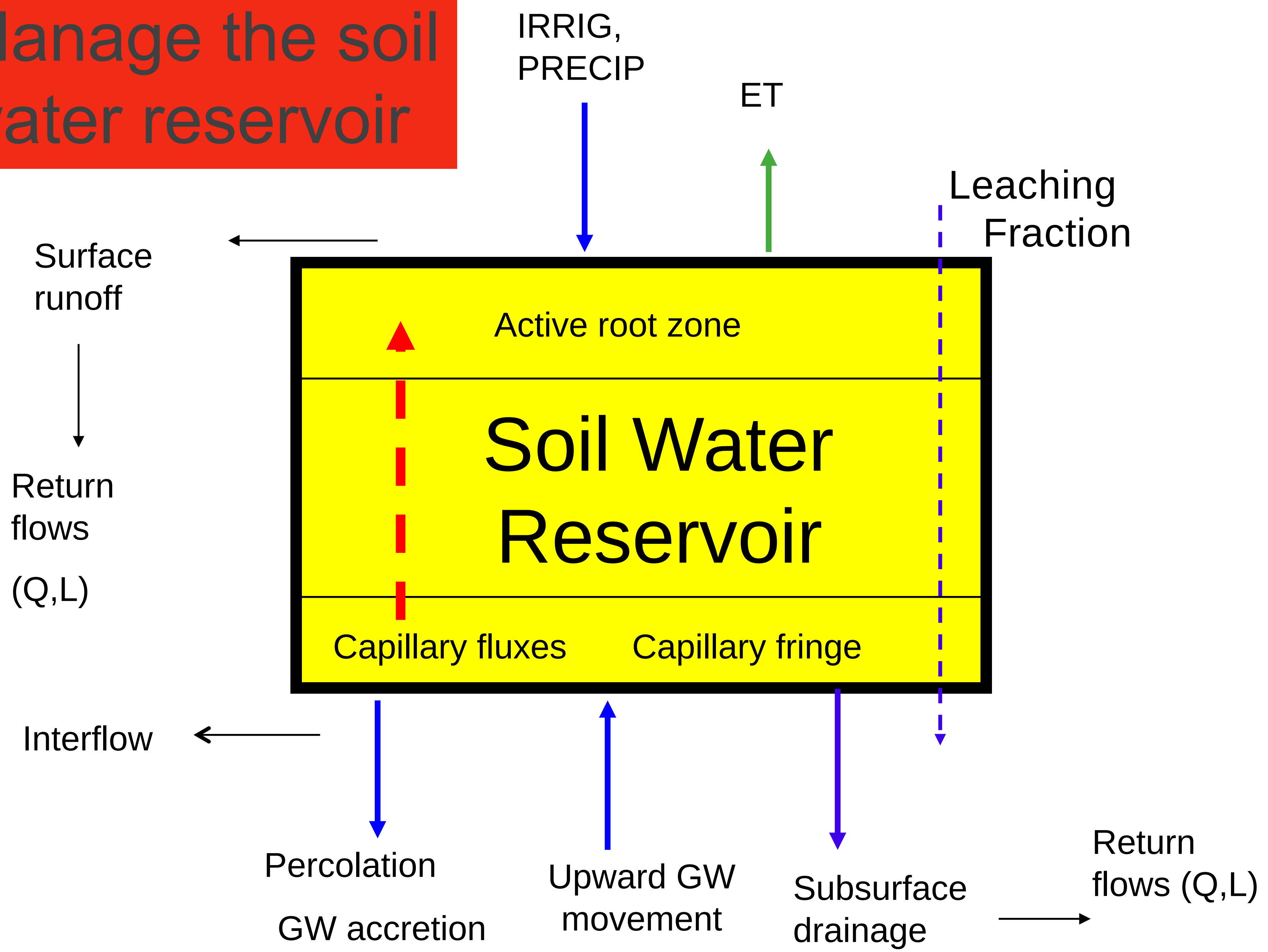


Fig. 6. Water productivity in agriculture at various scales: (a) the plant, through the water use efficiency WUE; (b) the irrigated crop at farm scale (Farm WP); (c) the irrigated crop, at system level (Irrig WP); and the crop including rainfall and irrigation water (Total WP).

Manage the soil water reservoir



Improving On-farm Water Management

Less water, Less energy

Re-engineer the canal systems from supply to demand driven based on crop requirements

Application of environmental sensor technology and precision irrigation

Renewable energy and low lift pumps for abstracting shallow ground water from rainfall recharge


Ground Water Exploitation

- **Has expanded irrigation**
- **Boosted local food production**
- **Increased small holder production systems**
- **Contributed to inadequate management of the resource**

Ground water irrigation:

- on demand
- individual use and not constrained by institutional management and variability in supply
- user flexibility in irrigation scheduling and water management
- overcomes temporal variability in soil moisture in order to stabilize crop production
- drought proofing in times of climate change

An invisible and diminishing resource

- when abstraction exceeds recharge
- depletion
- multiple pumping points – difficult to manage without legal framework
- lack of monitoring and permits
- energy costs – used to be cheap/subsidized

Soil, Water, Crop Productivity – Integrated Watershed Management
An Environmental Framework


Thank you!