

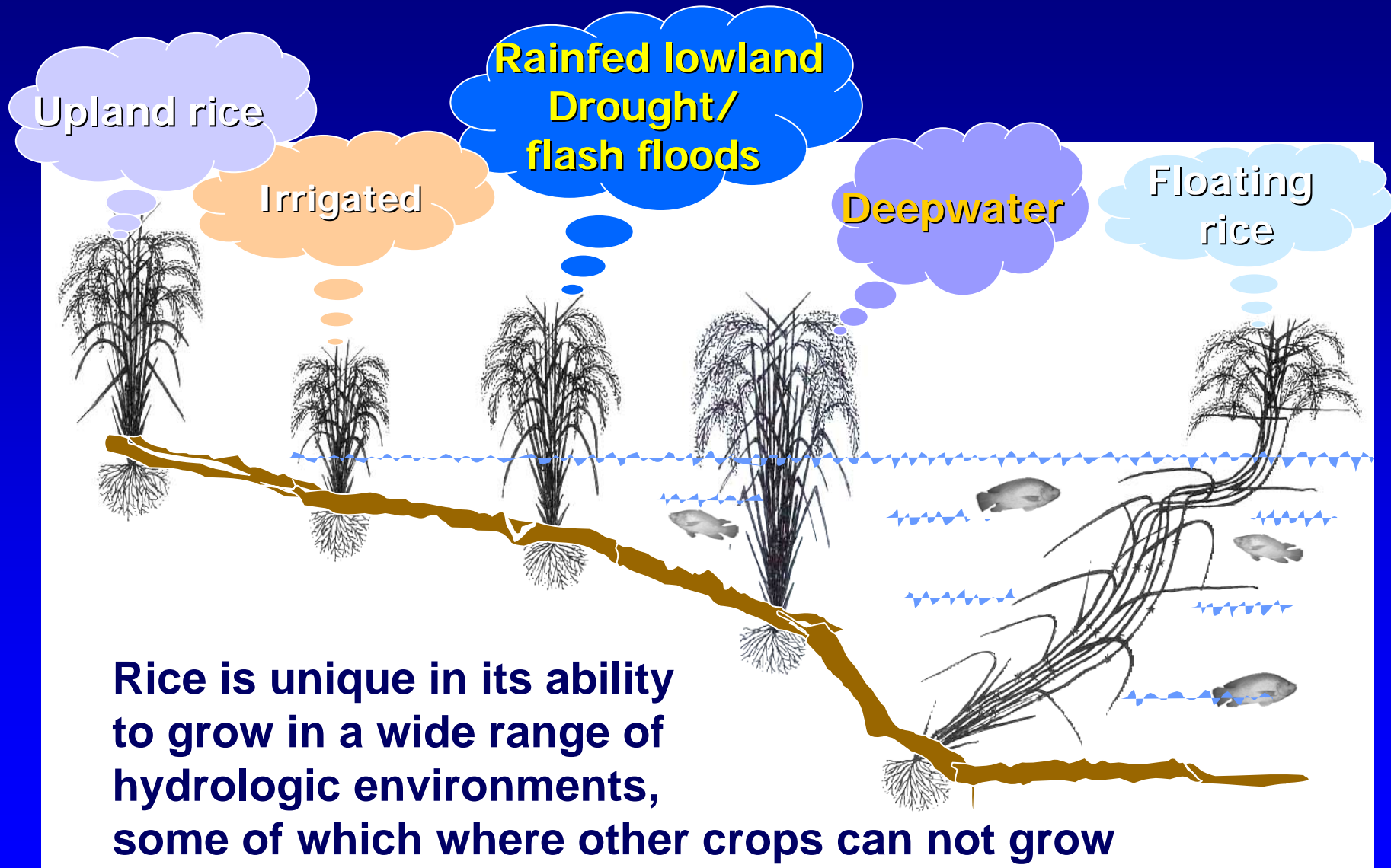
Rice and the environment

**Crop and Environmental Sciences Division
International Rice Research Institute
Los Baños, Philippines**

- **RICE: most important staple food in Asia**
Annually 550-600 million ton => 3 billion people



Rice ecosystems



Irrigated lowland rice (paddy)

Lowland rice



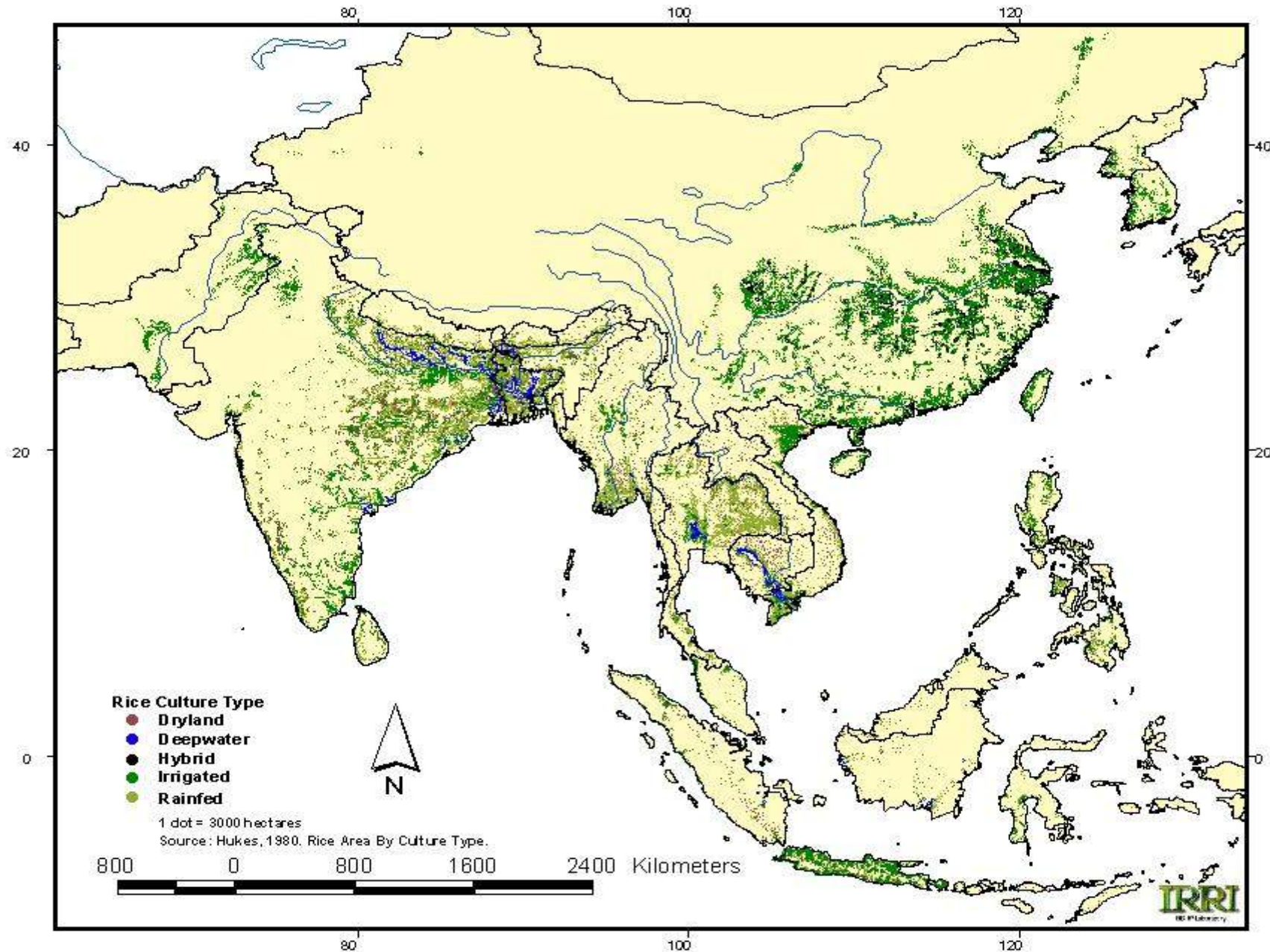
Upland rice



Floodprone rice



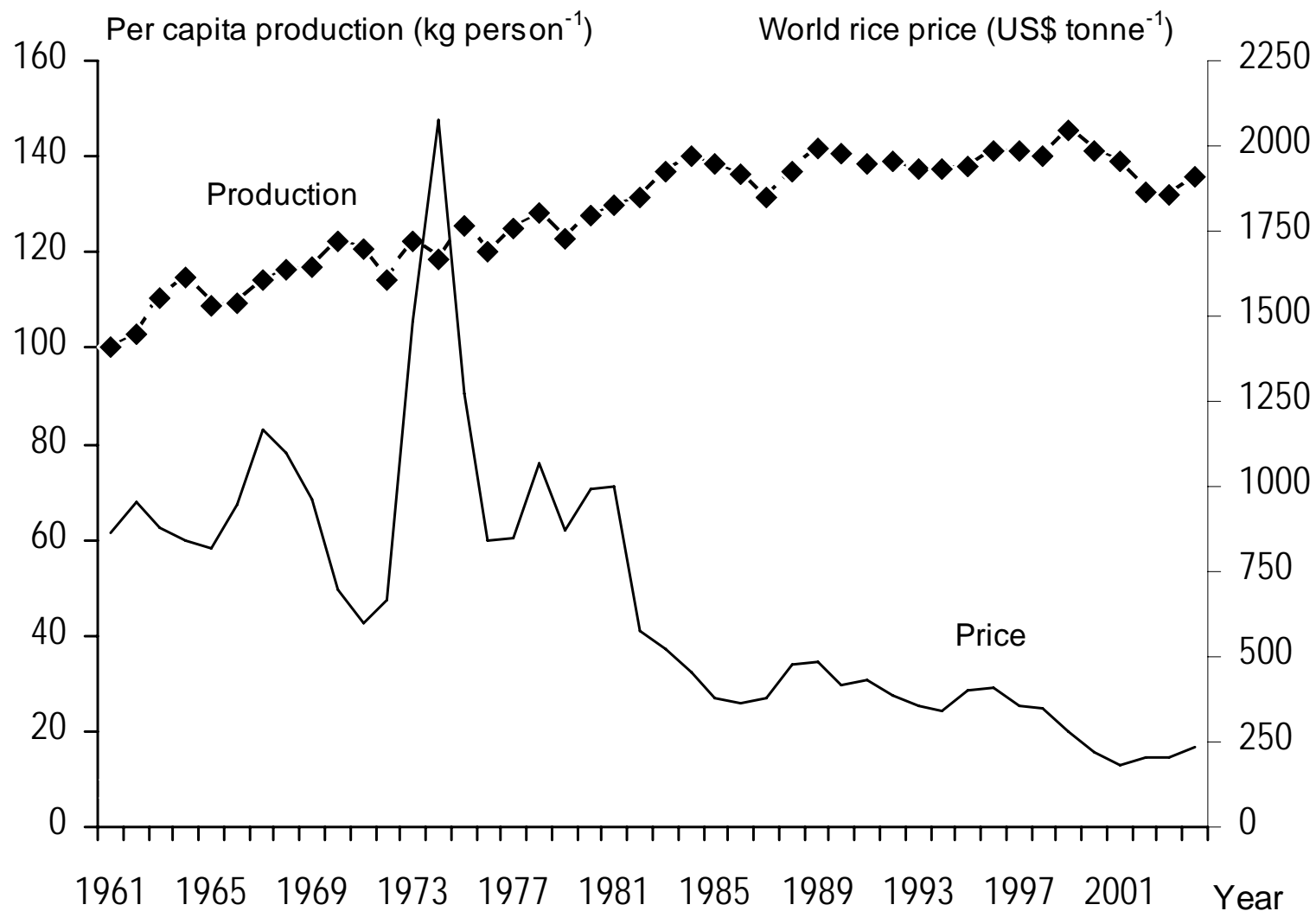
Rice production in Asia



Rice environments and production

	Area (10 ⁶ ha)	Production (%/10 ⁶ ton)	Yield (t ha ⁻¹)
Irrigated Lowland	79	75%	3-9
Rainfed lowland	54	19%	2.3
Upland	14	4%	1
Deepwater	11 (overlap)	} 2%	1.5
Salt-affected	9-12 (overlap)		1
Total	150	550-600	

World rice production and price



Irrigated lowland rice (“paddy”):

- Land soaking
- Puddling
- Levelling
- Bunded fields
- Transplanted or direct seeded
- “Permanently” flooded

Soaking and puddling



Puddling







Land levelling

Bund construction



Seed bed in main field





Ready for transplanting



Transplanting



Just transplanted fields



Direct (wet) seeding



Direct (wet) seeding using drum seeder



Wet-seeded rice



Lowland rice landscape

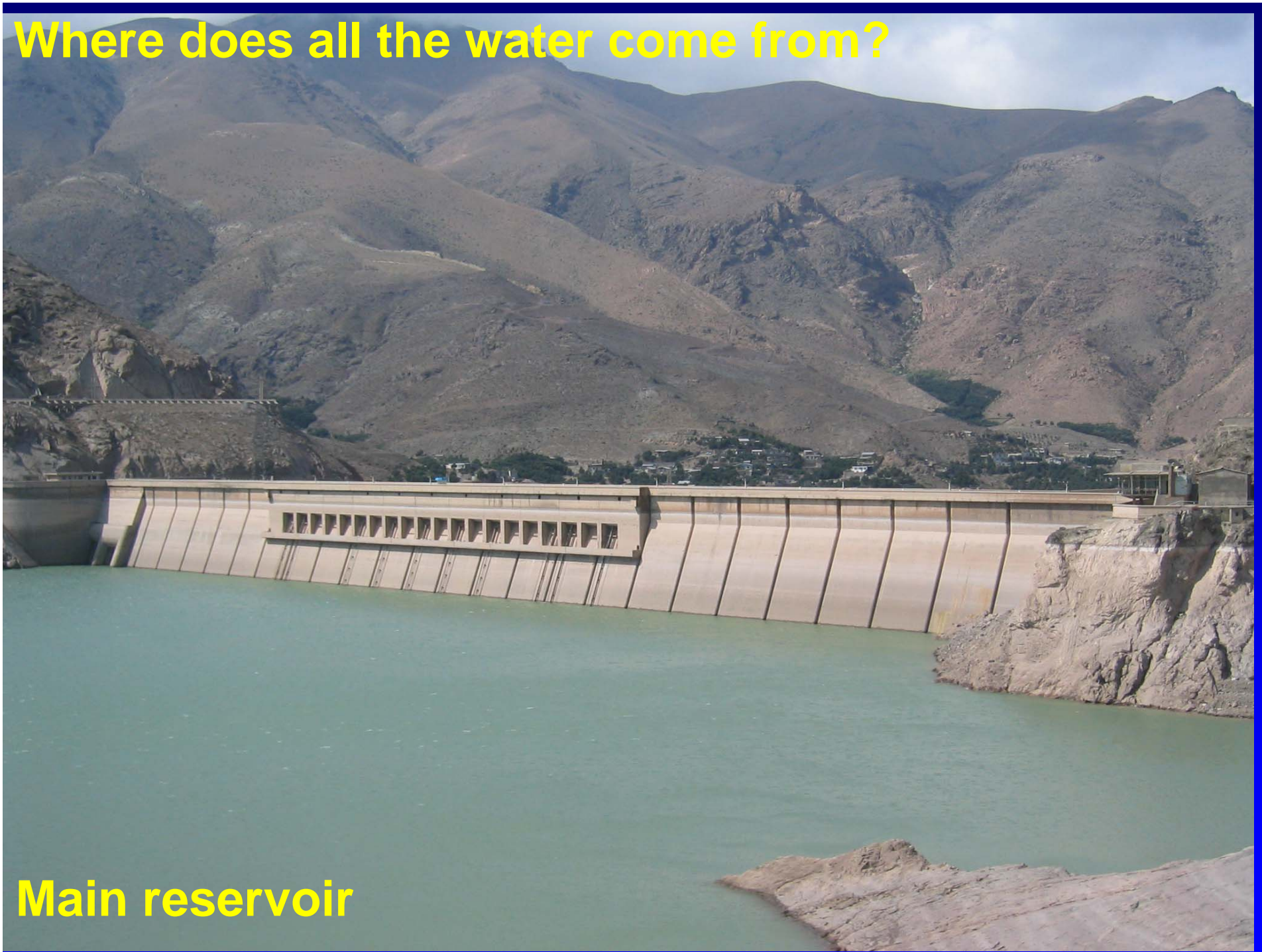


Lowland rice landscape



Where does all the water come from?

Where does all the water come from?



Main reservoir

Spilling





Water tunnels



“Natural” main canal



Lined main canal



Water control



Aquaduct



Water distribution



Smaller and smaller canals...



Finally at farmers' fields



**Plot-to-plot irrigation
after water gets delivered
to farmers**





Scooping water

Smaller scale: pumping from canals, creeks,..





Pumping from small reservoirs to store water



Millions of Asian farmers now use shallow tubewells to pump from groundwater



**Harvest time:
Finally dry land**



Environment and ecosystem services

Irrigated lowland rice

- 75% of the world's rice production
- Highly sustainable in terms of yield
- Environmental impacts (traditional systems):

Methane (3-6% globally) Ammonia volatilization (acid rain)	Little N ₂ O
Danger chemical outflow in surface water	No/little Nitrate leaching Pesticides degrade rapidly Low herbicide use
Raise groundwater table => risk salinization	Efficient to leach salts
	Acts as wetland in removing N and P

- Ecosystem services: fish, snails, groundwater recharge, flood buffer, biodiversity, temperature buffer, prevent soil erosion and landslides, cultural aspects,..

Fish in irrigation ponds



Ducks



Fish in irrigation canals



Food production: fish and ducks

Lowland rice landscape: specific biodiversity?





Mountain terraces

- Ground water recharge
- Mitigate erosion
- Mitigate run-off, floods



Deltas: flood buffer with production potential



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