

Land-Water-Food Nexus and water shortage in Central Asia and Aral Sea

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Outline

- **Water for irrigation**
- Countries and rivers in Central Asia
- Nexus of Land, Water and Food
- Solutions?

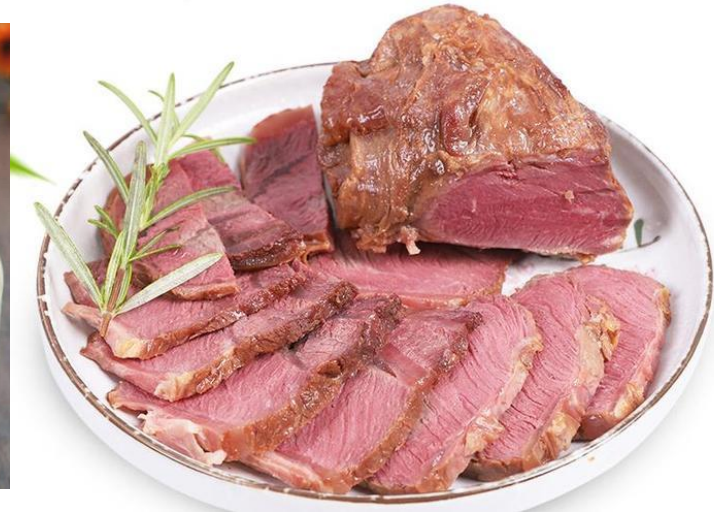
Can you image:
How much water you are eating everyday?



0.5 tons of water



0.5 tons of water

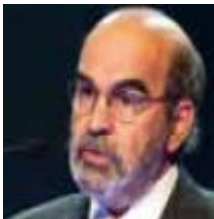
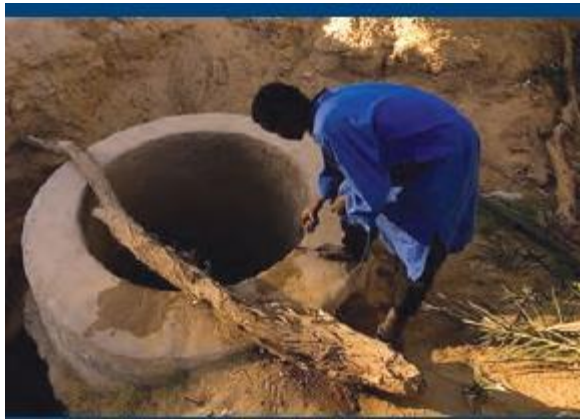


4 tons of water

Food production is the biggest water consumptive sector in the world.

Water Scarcity: The Real Food Crisis

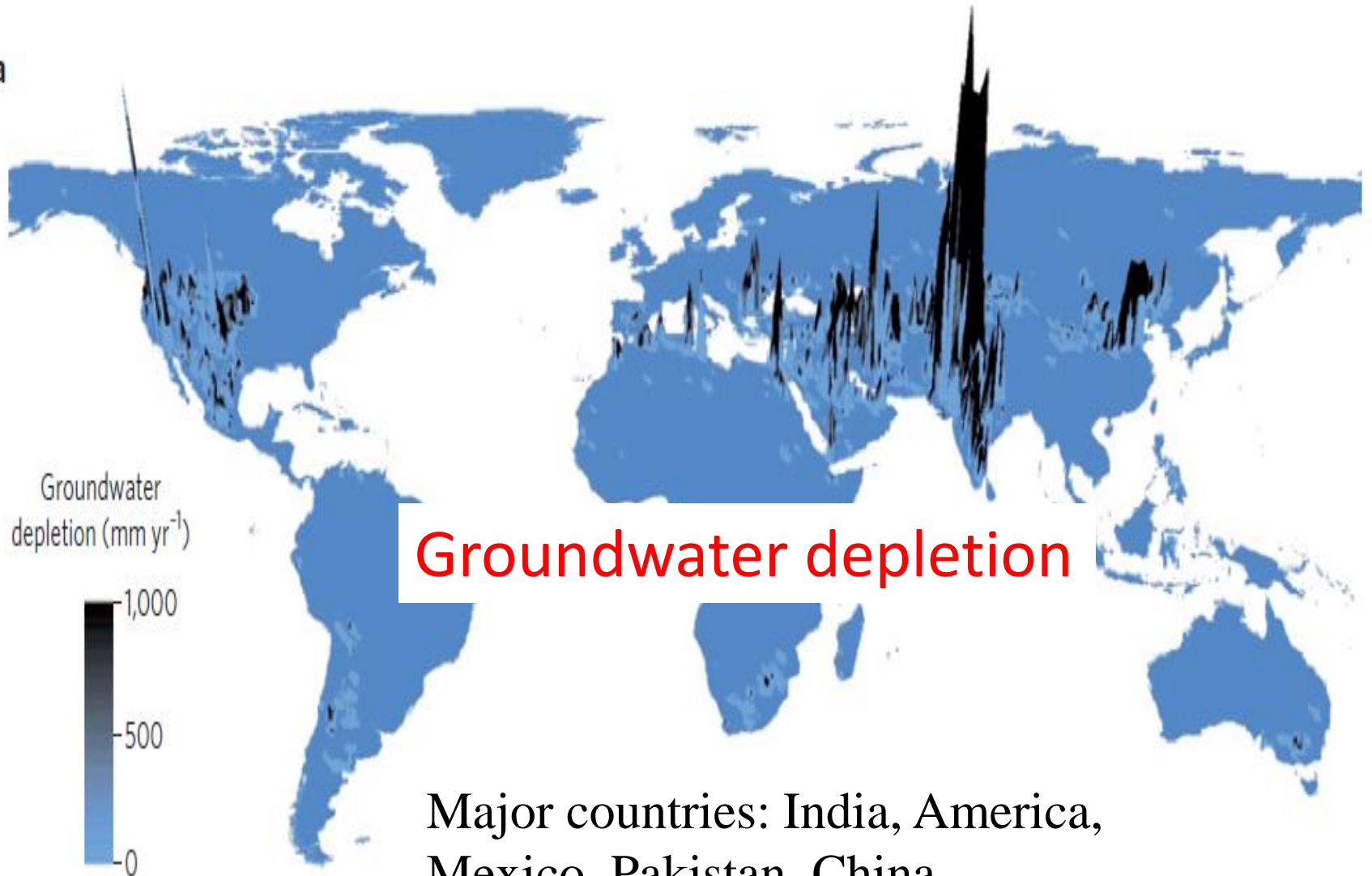
In the discussion of the global food emergency, one underlying factor is barely mentioned: The world is running out of water. A British science writer, who authored a major book on water resources, here explores the nexus between water overconsumption and current food shortages.



“There is no food security without water security” said José Graziano da Silva, Director-General, Food and Agriculture Organization (FAO) of the United Nations.

Groundwater: how hard to feed our people?

a



(From: Aeschbach-Hertig and Gleeson, 2012)

Disappearing Aral Sea

In 1960, the area of Aral Sea was 67,000 km², It is the 4th biggest world inland lakes

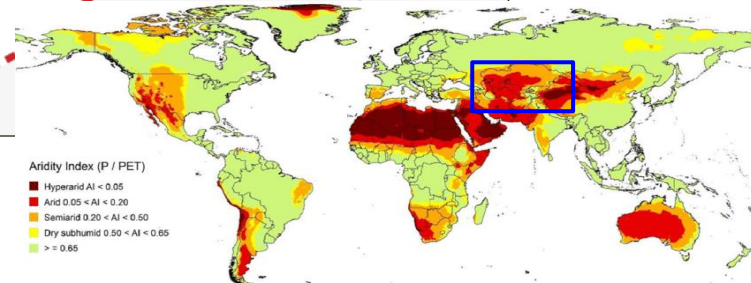
Syr River

Annual runoff 37km³

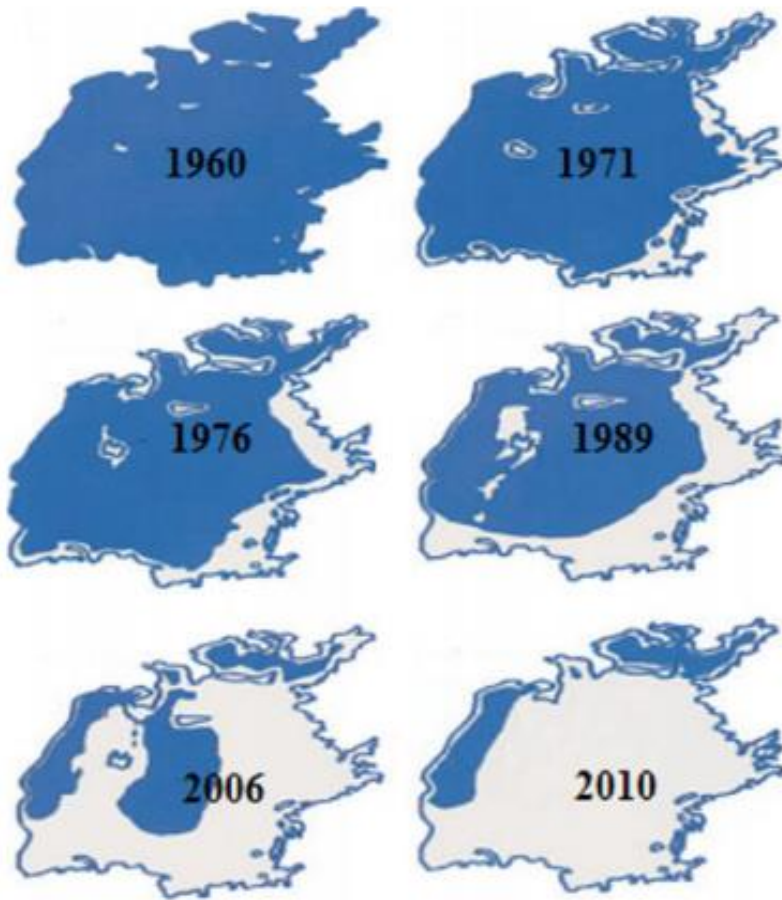


Amu River

Annual Runoff: 79km³

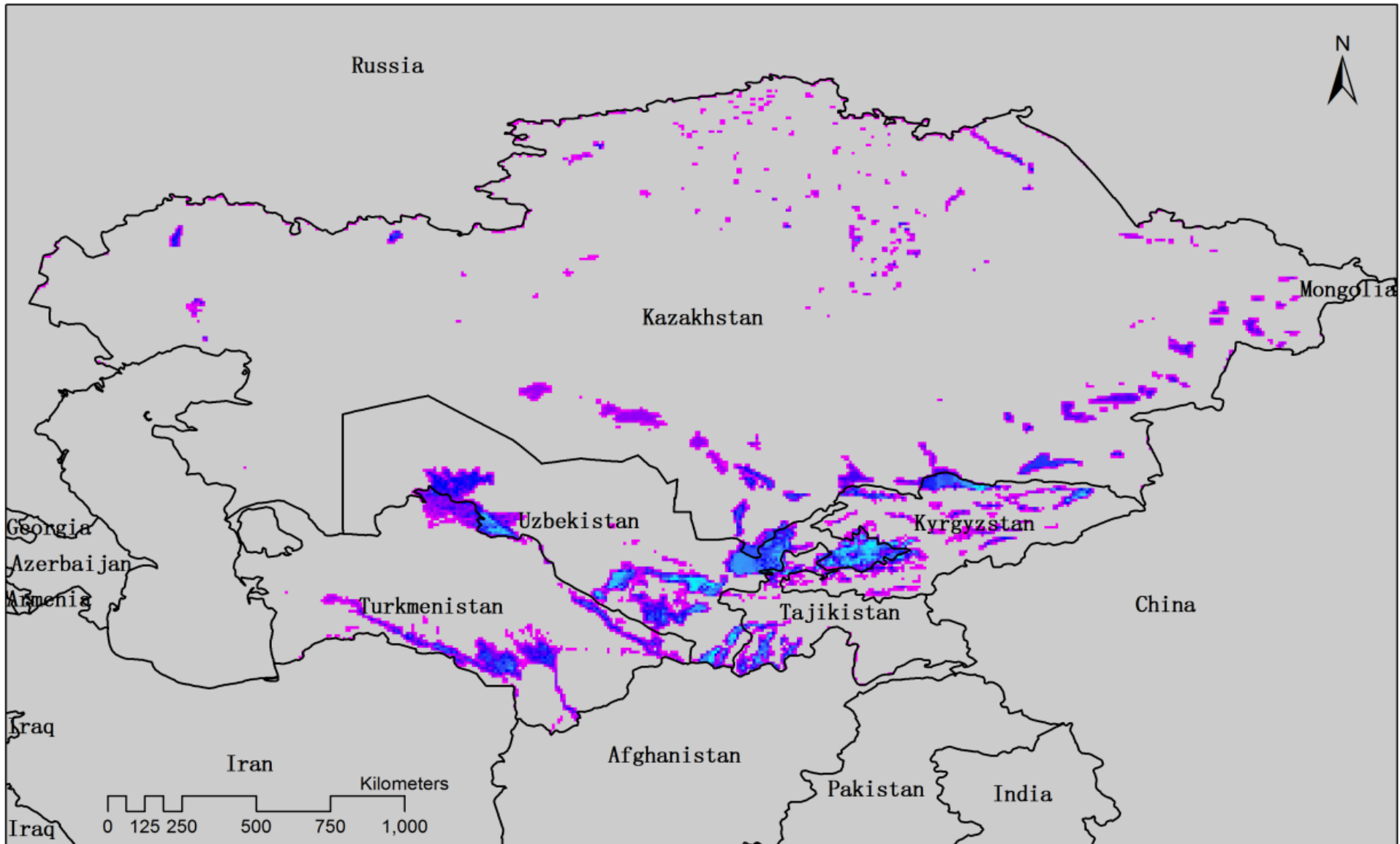


Changes in water area of the Aral Sea after 1960

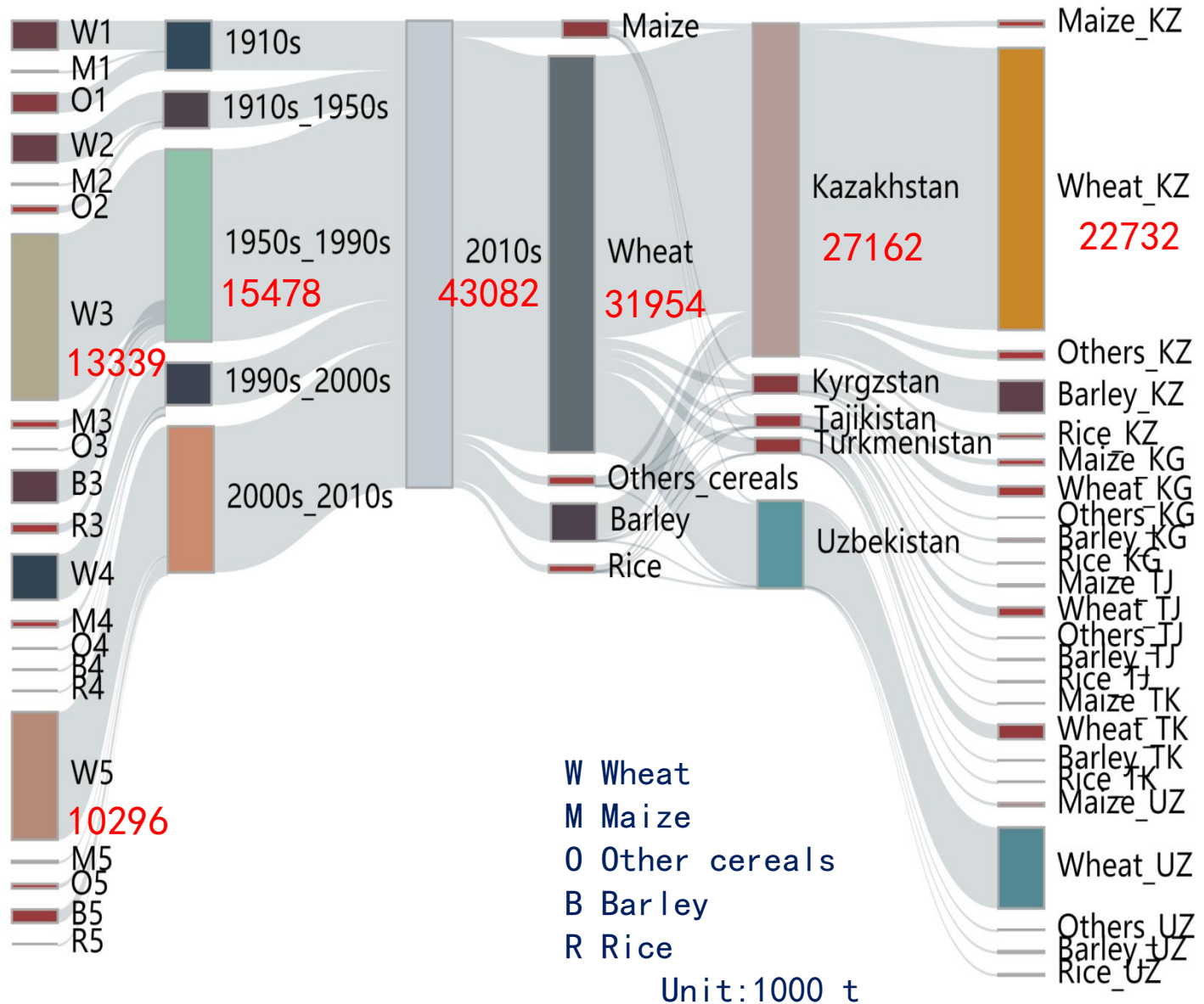


Changing profile of the Aral Sea 1960–2010
(UNDP 2007)

Irrigated areas in Central Asia

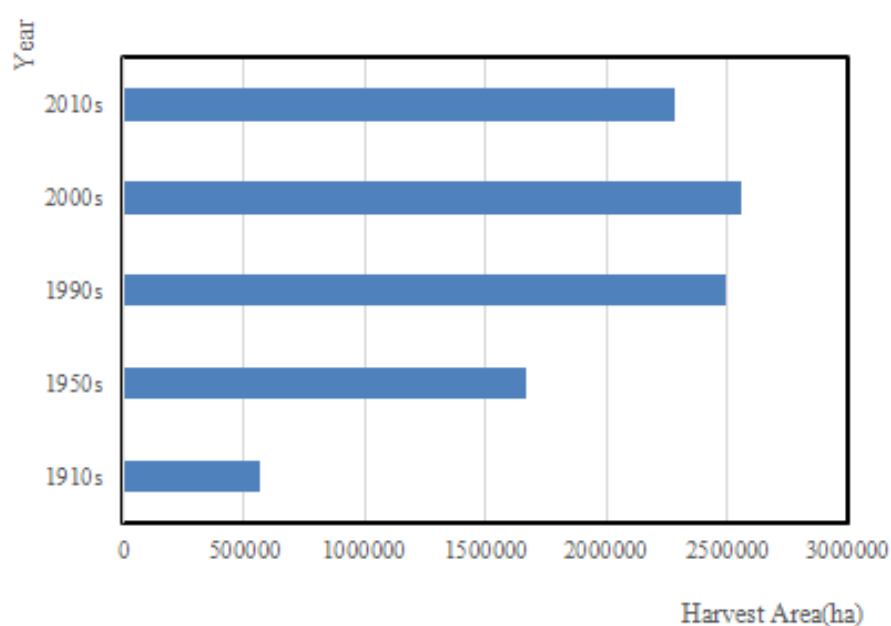


Food Production

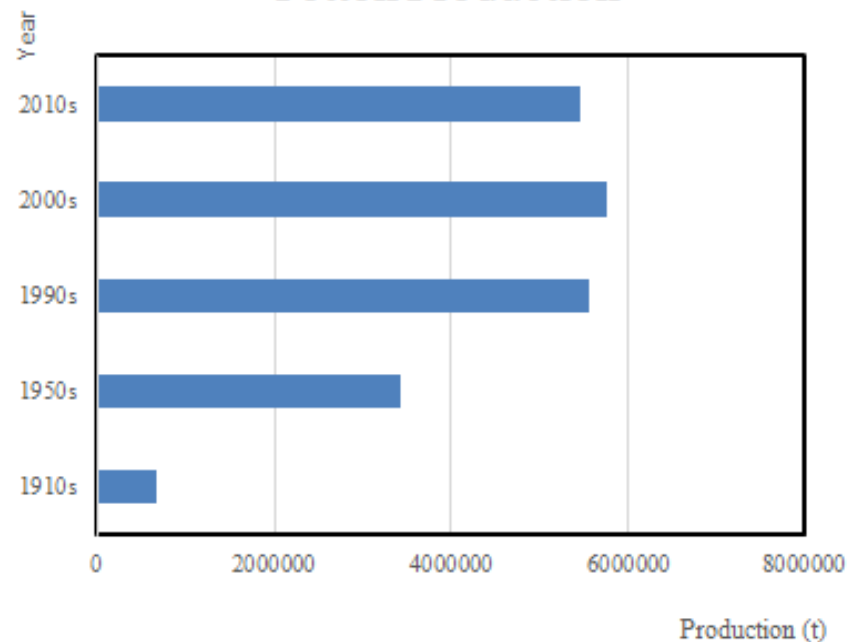


Case study: cotton

Cotton Harvest Area

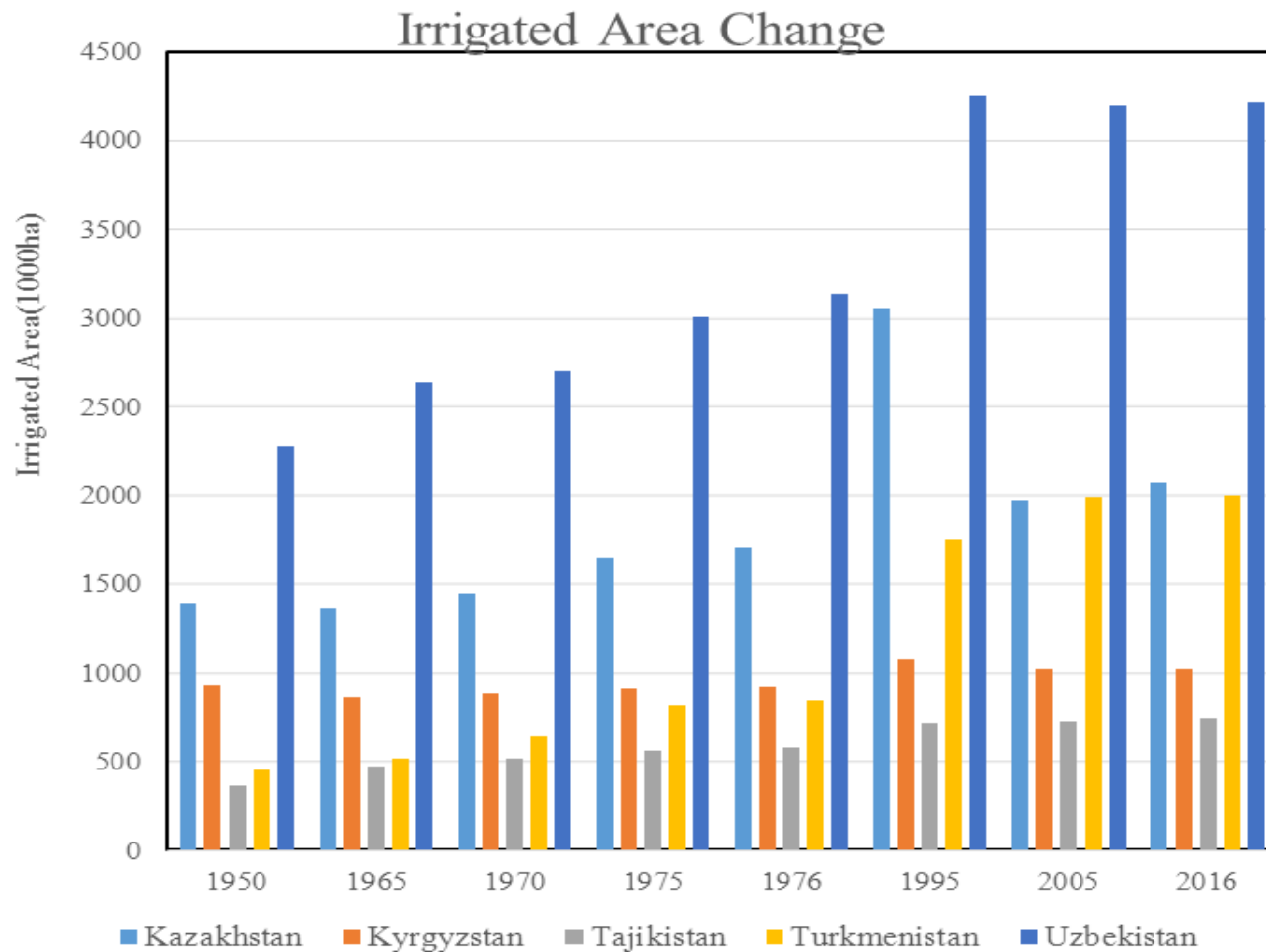


Cotton Production



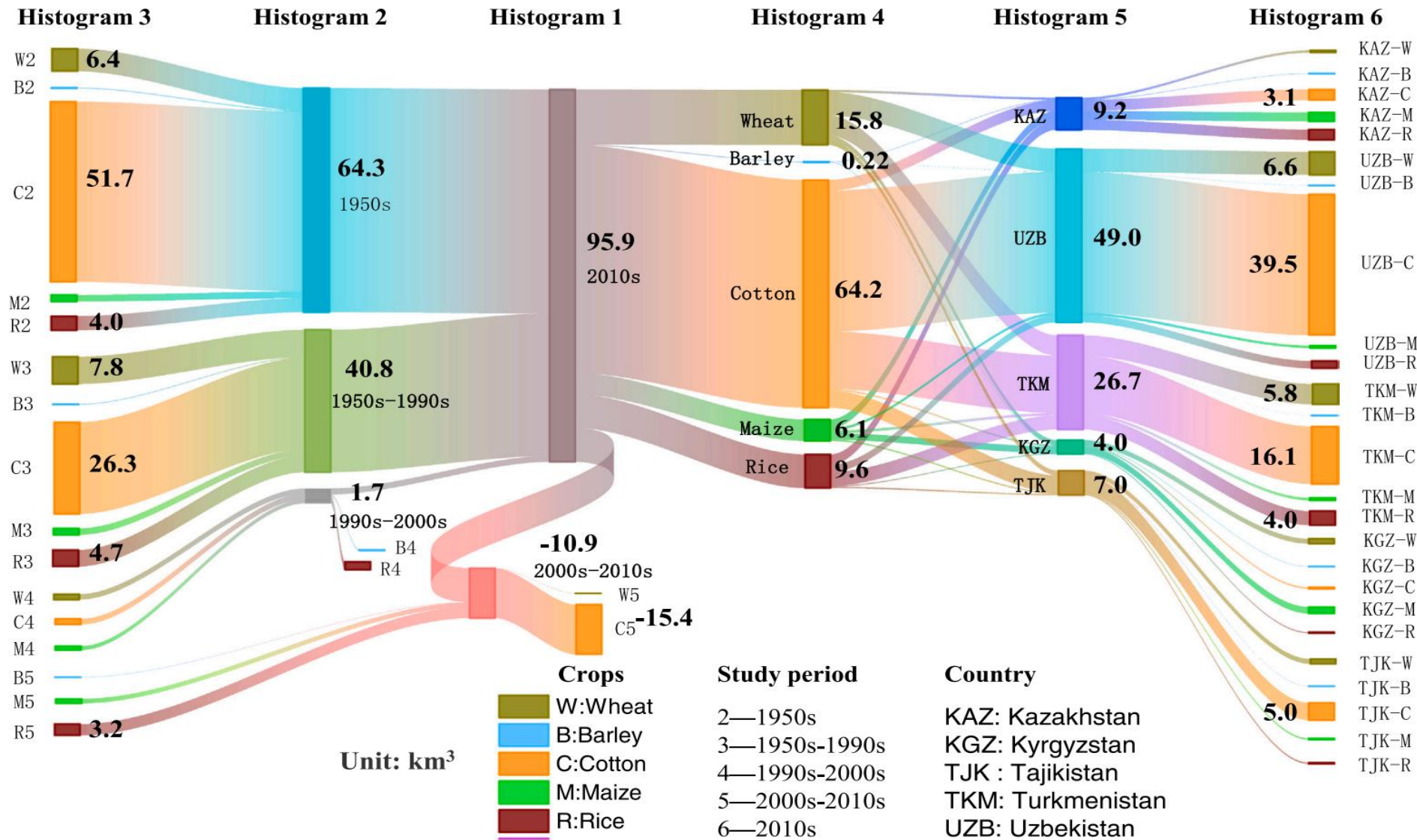
From 1910s to 2000s, the enlarged area and the increased yield contributes **45%** and **55%** to the increase of production, respectively.

Case study: cotton



Irrigation has large contribution for the yield increase

Crop Irrigation Water Use



Changes in river runoff and water to Aral Sea

Table 1

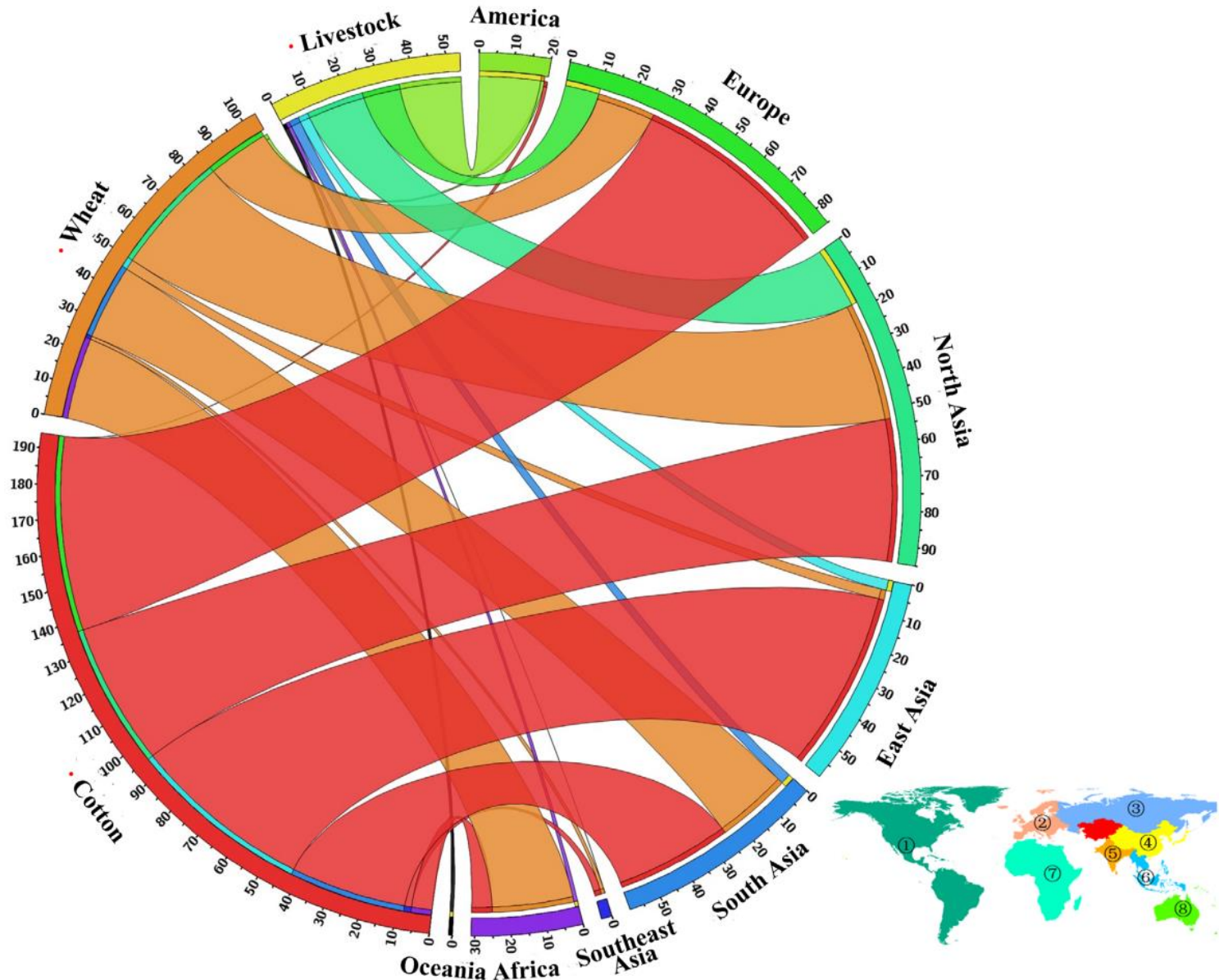
Runoff loss during river flow through the Aral Sea basin and the contemporaneous irrigation area and the Aral Sea surface area.

Period	River runoff in upstream mountain area (km ³ /year)			River inflow into Aral Sea (km ³ /year)			Runoff difference (km ³ /year)	Irrigated area (10 ³ km ²)	Aral Sea surface area (10 ³ km ²)
	Amudarya	Syrdarya	Total	Amudarya	Syrdarya	Total			
1930s	67.1	28.2	95.3	45.8	13.8	59.6	35.7	24.2	66.0
1940s	71.7	29.4	101.1	49.3	14.3	63.6	37.5	29.9	64.9
1950s	71.6	33.9	105.5	46.0	16.5	62.5	43.0	33.3	67.2
1960s	69.4	31.6	101.0	36.8	6.7	43.5	57.5	48.4	64.1
1970s	65.2	24.6	89.8	16.2	2.3	18.5	71.3	58.0	55.1
1980s	61.9	27.0	88.9	5.5	1.6	7.1	81.8	68.3	42.5
1990s	73.5	34.1	107.6	10.4	5.1	15.5	92.1	77.1	31.2
2000s	70.1	37.5	107.6	7.3	7.1	14.4	93.2	81.3	16.7
2010s	67.8	30.9	98.7	4.7	4.3	9.0	89.7	80.5	8.3

Increase 56.3

decrease 57.7

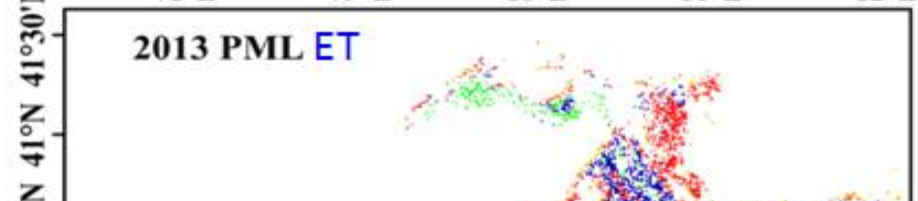
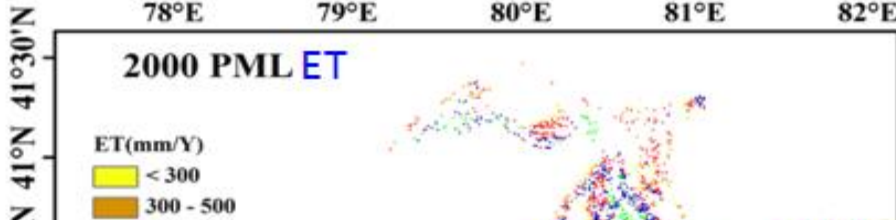
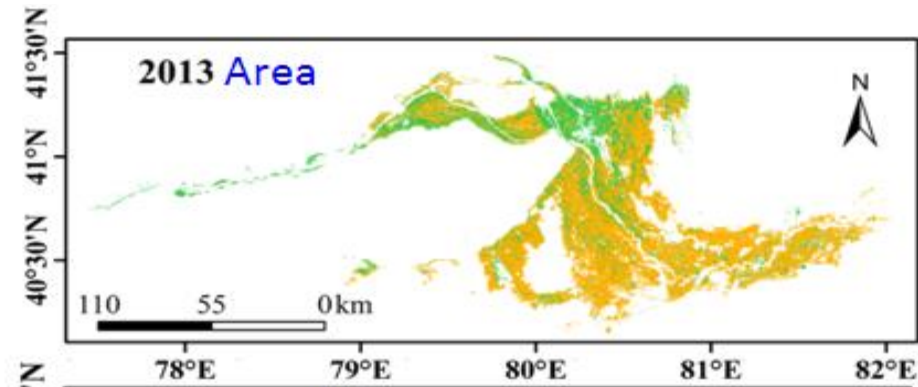
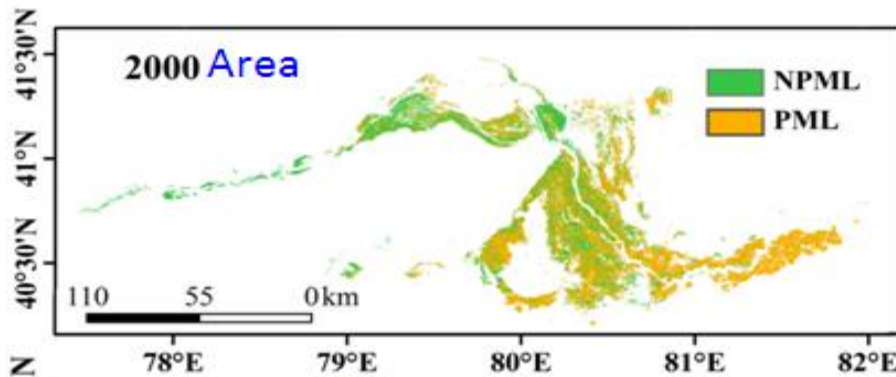
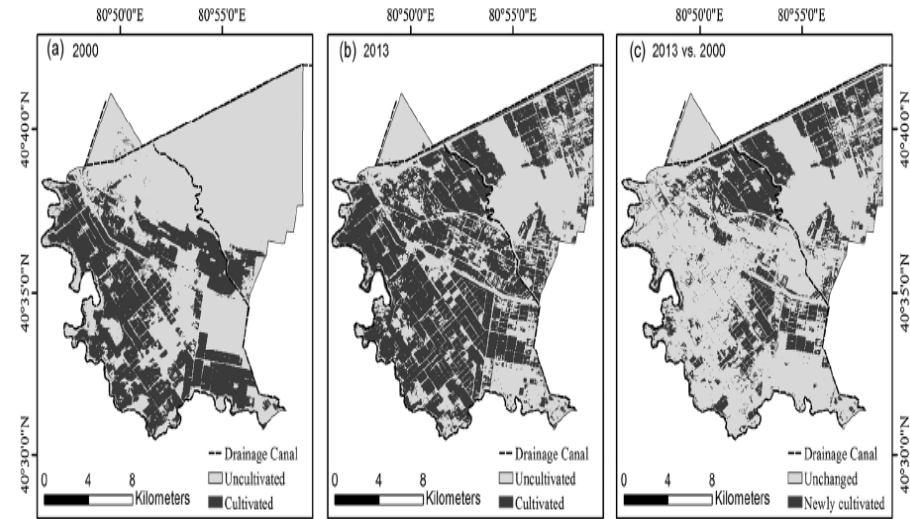
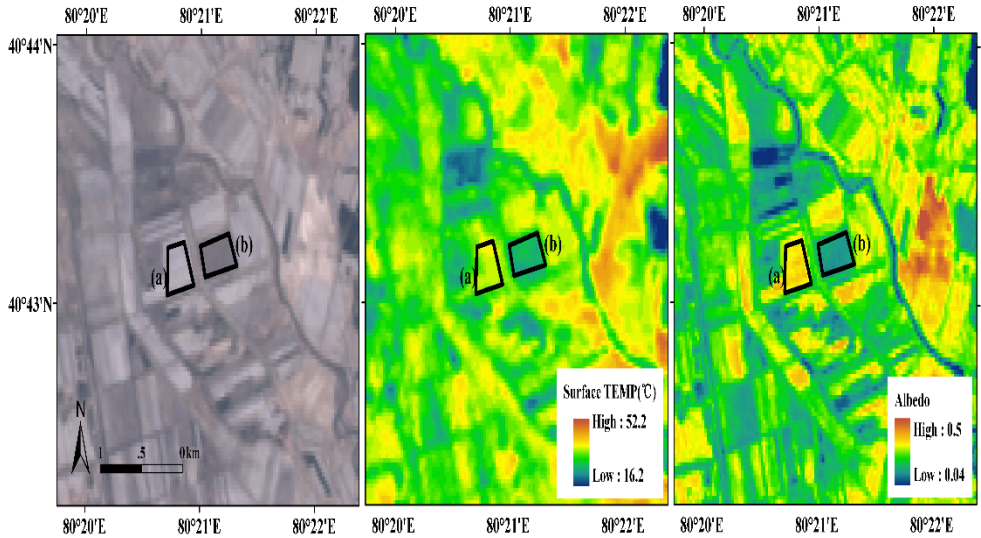
Virtual water outflow through wheat and cotton export



Solutions

- Water right or water entitlement among 5 countries
- Water saving, for instance drip irrigation ;
- Most important: **no land expansion** among 5 countries.

Changes in crop water use and land area



- Total cropland area increased by about 84%.
- Total ET increased by 50.0%



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**Thanks for your attention,
suggestions and comments!**

Water for prosperity and peace