The future of irrigated agriculture under environmental flow requirements restrictions

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My background

• Double Master degree in agriculture engineering (EIP, Toulouse and Wageningen, NL) - Internships in farms, research institutes and public government

• Research Assistant organic agriculture (Wageningen, NL)

• Project coordinator land degradation for ICARDA (Morocco) and Wageningen (NL)

• Since 2012: PhD at ESS, Wageningen (NL)

• YSSP 2014 – IIASA (AT)

• Since Sept 2015: research assistant ESM-WAT (IIASA, AT)
35 % loss in global freshwater species (Living planet index report, 2010)
Environmental flows describe the **quantity, quality and timing of water flows required to sustain freshwater and estuarine ecosystems** and the human livelihoods and well-being that depend on these ecosystems (The Brisbane Declaration, 2007).

* Fig. 1. VMF method (Pastor et al. 2014)
- High flow requirements = 30% monthly flow
- Intermediate flow requirements = 45% monthly flow
- Low flow requirements = 60% monthly flow

Food production  

Environmental flows
Previous land-use assessments

Agriculture = 70%

Household & Industries = 30%

Leftovers for Nature or “Environmental flows”
Previous land-use assessments

“Environmental flows”

Agriculture

Household & Industries
Population GDP Consumer preferences

- Climate
- Soil
- Land use

Water availability/EFR simulated by LPJmL (Lunt-Potsdam-Jena model)
- Limited irrigation supply from surface waters
- Restricted by “environmental flows”

INPUT

GLOBIOM (Global Biosphere Optimization Model)

INPUT

Expected OUTPUT

Land-use scenarios for agriculture
(including water availability and “environmental flows”)
a) Irrigated area in 2000

Relative change by 2050:

b) +23% without EFRs

c) -20% with EFRs
Total agriculture area expansion (Mha)

- + 20% increase
- + 100Mha more rainfed area with EFRs

In 2000, food prod coming from 40% of irr. Area vs 20%
Conclusion

- Rivers have been heavily altered
- Environmental flow are not satisfied in many part of the world during dry periods and conflict with irrigated agriculture
- With EFRs implementation, irrigated area would have to be reduced by 20%