Agriculture land use and Wetland Interactions
Setting functional priorities and fostering multiple uses

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Multiple Ecosystem services

- Wetlands have multiple ecosystem services to offer (MA):
  - provisioning services (agriculture / food provision)
  - regulating services (flood protection, water retention, water purification, carbon sequestration etc)
  - cultural services (tourism, recreational, spiritual)
  - supporting services (nutrient cycles, pest control)
  - biodiversity

Demands for ‘e-services’

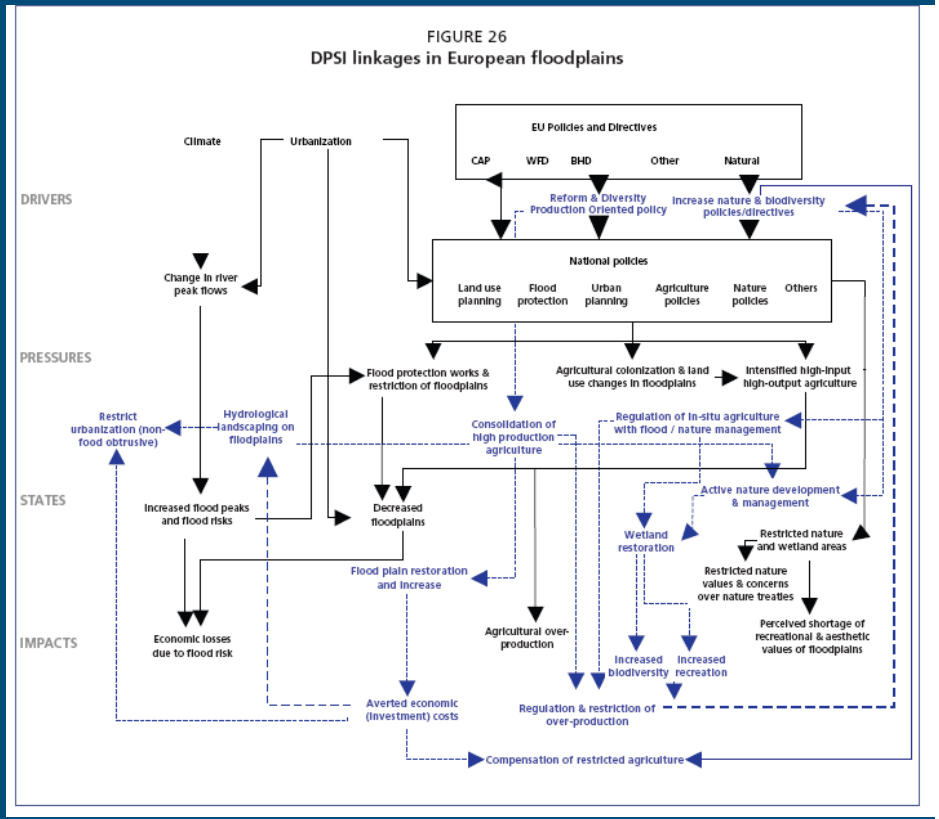
- Society’s demands for ‘e-services’:
  - preferential towards provisioning (e.g. agriculture)
  - differential
  - competing
- Agriculture tends to skew the ecosystems towards provisioning, and within provisioning towards mono-culture
  - →tradeoffs in ecosystem services (regulating, cultural, BD)
  - → tradeoffs in livelihoods (gainers and losers)
    - E.g. irrigation vs fisheries, commercial vs subsistence
  - → negative feedback drivers and pressures

Assessing society's demands through DPSIR

- Drivers and pressures for increase agriculture (CA, food/energy crisis, poverty) are set to increase
  - → primarily through markets (also in Africa)
  - Danger: rapid market responses = rapid skewing = accelerated degradation & transformation
- How can demands for regulating, cultural and supporting services effectively counter drivers and pressures for provisioning?

DPSIR Horrendograms

- Drivers:
  - Climate change, Global demand for biofuels, Food security, Ramsar Montreux record, Policies…
- Pressures:
  - River peak flows, estate biofuel production/"land grabbing", intensification/extension of subsistence agriculture, conservation measures…
- States:
  - Reduced flood regulation, land/vegetation/water loss, gazateering of resources, BD loss, reduced fish …
- Impacts:
  - Economic loss/cost of floods, economic differentiation, food insecurity…



Enhancing multiple ecosystem services

- Sustainable water use = assuring a balance in ecosystem services
  - diminishing/mitigating negative water interactions of agriculture
  - fostering non—provisioning services and focus on positive water interactions for agricultural uses
- Diversify Agriculture & diversify e-services
  - ➔ diversify livelihoods, diversify benefits obtained from e-services

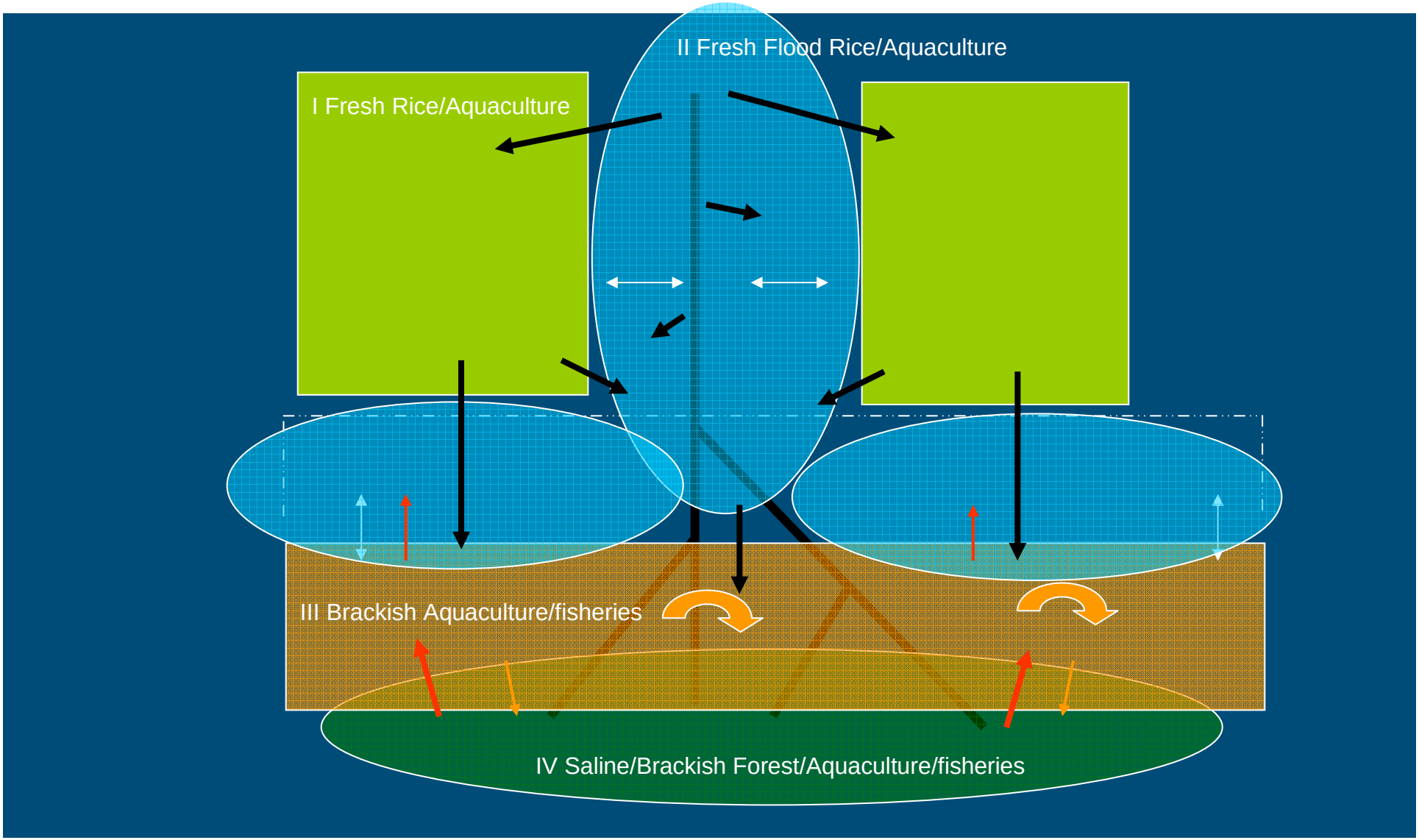
Enhancing multiple ecosystem services

- Functional & strategic approach to ecosystem services at the landscape level
  - assign primary functions to ecosystem services (agriculture, flood control, biodiversity)
  - devise criteria for multiple use of “secondary” ecosystem services (within ecological boundary of primary function)

Enhancing non-provisioning e-services

- Make regulating & cultural ecosystem services a counter balance to agriculture
  - Acknowledging general values and (global) benefits of regulating and cultural services is not enough to effectively counter the economic and livelihood drivers and pressures for agriculture
  - Benefits need to be made tangible for stakeholders (governments and communities)
    - Averted investment cost (flood control, water purification)
    - PES
  - Little evidence so far outside OECD

Agro-ecosystems in Coastal Vietnam



Multiple e-services in Coastal Vietnam

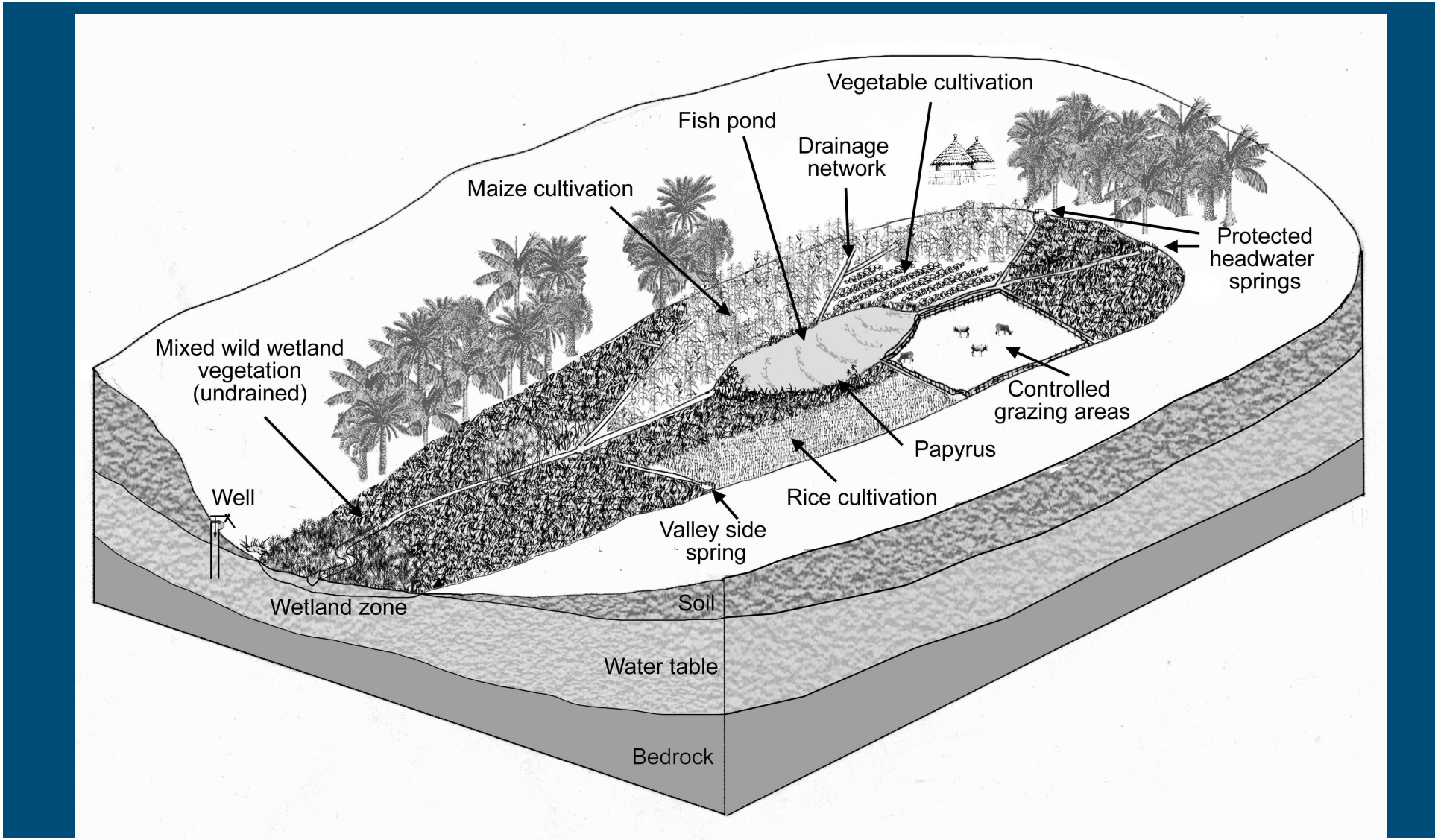
Four strategic functional sub-systems with multiple use:

- Irrigated rice:
  - 1st: food (rice & fresh fish culture)
  - 2nd: fresh water supply brackish zone (salt & circulation)
  - 3rd: rainwater retention
- Fresh floodplains:
  - 1st: flood protection
  - 2nd: food (rice & fresh fish culture)
- Brackish zone:
  - 1st : food (aquaculture through poly-culture and mangrove filters)
  - 2nd : salt water retention
  - 3rd : biodiversity
- Coastal forest:
  - 1st : coastal protection
  - 2nd : biodiversity
  - 3rd : food (fishery and polyculture)

Advancing Multiple e-services

- Focus on the water interactions between the uses/functions
  - manage as a whole;
- BUT: innovate multiple water use techniques & practices that support the water interactions
- Service multiple drivers, pressures and impacts within society.

MUFS in Malawi wetlands



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R.J. Bakema, G.W. Howard and A. P. Wood