(ii) invest in flood (recession) rice cultivation systems that can be combined with freshwater aquaculture along the floodplains of the rivers in order to maximize the flood retention capacity. Innovative trials for climate change adaptation will have to be initiated to bring these opportunities for productive adaptation to fruition.

Waste water use in agriculture

Irrigation infrastructure and water management practices in peri-urban areas provide multiple functions and services that go beyond the management of water for agriculture alone. These include, irrigated agriculture, urban drainage and urban & industrial waste water disposal. As wastewater effluent is a valuable additional water resource for agriculture, and set to significantly grow in future, there is a need to manage these multiple functions and services in an integrated and safe manner.

Irrigated agriculture can to all sense and purposes act as an effective waste water treatment facility, provided that safety standards in waste water use and management are met. In effect, agriculture can greatly benefit from waste water use – as an additional source of water, and as a free source of nutrients. Urban & industrial waste water sectors, on their turn, can benefit from this positive (waste) water interaction with agriculture through a significant reduction in waste water treatment requirements and associated costs.

To ensure that these positive interactions are indeed realized, it is essential that the wide spread practices of waste water use in peri-urban Vietnam are well regulated and informed according to the international safety standards set forth by WHO and FAO. For the urban & industrial sectors this entails the disposal of waste water according to minimum standards, in particular of heavy metal pollutants, which constitute grave food safety and health risks. For agriculture, these entail the training of farmers in safe handling of waste water, in particular with regard to pathogens, and crop nutrient management practices adapted to the waste water nutrient levels.

Fostering stakeholder collaboration

The WFE assessment has shown how important it is to view agriculture as an integrated multiple use system and as an agro-ecosystem that provides services to other (eco) systems and water uses. All sectors and water users share the same water sources, and face the challenges of increasing the productivity and sustainability of their water use. By jointly looking at current water use practices, and specifically the water interaction between sectors and stakeholders, options and criteria can be discerned on how each sector through innovation in its water use can contribute to the improvement of the overall agro-ecosystem and positively interact with other sectors – either as a water service provider or receiver. The WFE approach brings together the stakeholders to assess their water use practices and identify innovations to improve their water interactions with other stakeholders and sectors. This fosters the collaboration among stakeholders, with a growing awareness of their water interdependencies,to integrate their water use practices.

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Vietnam-Netherlands Partnership

Water for Food & Ecosystems

The Vietnam-Netherlands partnership on Water for Food and Ecosystems (WFE) reflects a shared concern over the need to strike a balance between the increasing demands for food production and the sustainable use and management of the natural resources base in Vietnam at a time of rapid economic growth, industrialization and urbanization. The WFE partnership seeks to promote innovative ways to manage water resources that balance agricultural production while securing the integrity of water-dependent ecosystems. The partnership is informed by the global Water for Food & Ecosystems program, which promotes an ecosystems approach to agricultural production and a productive services approach to ecosystems. This forms the basis to foster synergies between agriculture and aquatic ecosystems – the two largest water use sectors in Vietnam – within an integrated water resources management framework (IWRM).

Water for Food & Ecosystems

Focus on water uses rather than needs

Where IWRM approaches primarily focus on sectoral water allocations and their synchronization based on a summation of water demands by sector, the WFE approach compliments this by explicitly targeting the sectoral water uses. It focuses on how different and multiple sectors share a common water resource over space and time, and in effect pass on water, in quantity and/or quality, from one sector to another. WFE seeks to improve water use practices in terms of productivity, efficiency and sustainability, alleviating the pressures on the water resources base by fostering innovative water use and management techniques within sectors that:

- specifically target the water interactions between neighboring sectors up- & downstream and the independencies of water in- and outflows across sectors;
- enhance the sector's water use efficiency, improve the water quantity & quality interactions between sectors by accounting for other sectors' water needs, and facilitate the multiple (re)use of water.

Aligning water (re)uses across agriculture, aquaculture and coastal ecosystems

Irrigated rice, fresh & brackish aquaculture/fisheries and coastal mangroves are primary water use sectors in coastal Vietnam. Rice and aquaculture have intensified strongly over the years, with general detrimental effects on water quality, salinization and degradation of aquatic ecosystems and mangrove forests. To the extend that intensified mono-culture of shrimp is starting to decline as a consequence of deteriorating water quality in the brackish coastal zones. The WFE assessments conducted in the Mekong delta, Tam Giang Cau Hai lagoon and Red River delta showed that ample opportunities exist to better align the water uses within the sectors so as to produce beneficial water interactions across sectors.

The fresh water drainage effluent from irrigated rice can play a critical beneficial role in improving the water quality of the brackish coastal environment. In particular with regard to the attainment of desired salinity levels and the maintenance of water circulation and refreshment rates within the brackish zones. Both of which provide direct benefits to the aquaculture and nature sectors. These benefits can be exploited by specifically managing the drainage effluent of rice on its beneficial effects on brackish water.

Within the aquaculture sector innovations in culture techniques are starting to appear that reduce the sector's negative impact on the brackish aquatic environment. In particular shifts from mono- to poly-culture (i.e. cultivation of multiple species) are effective innovations to improve the sector's waste and disease management. In intensively cultured (and polluted) coastal zones the economic returns of poly-culture are already starting to surpass those of mono-culture, thus providing economic incentives for better aquaculture practices. Research & development is initiated that specifically targets the aquaculture interactions with mangrove forests. Promising results are being obtained in devising sequential poly-culture systems that utilize mangroves as natural filters – in effect regenerating mangroves on shrimp and poly-culture waste.

Opportunities for improved WFE interactions are thus derived from a focus on current water use practices and interactions, and the setting of system wide criteria for enhanced water productivity and multiple use of water. These provide the leads to optimize the water productivity within sectors while accounting for the criteria of multiple use and services of water at the agro-ecological system.

Accommodating climate change adaptation

The Intergovernmental Panel on Climate Change has placed Vietnam in the top five countries in the world most affected by climate change. Coastal Vietnam is particularly vulnerable to rising sea levels, typhoons and associated storm surges, high-intensity rainfall and higher peak river flows. Although this may threaten coastal agro-ecological systems, is also offers opportunities to accommodate these effects through adaptive water use & management strategies and put them to productive use.

Adaptations that will need to be made are principally the strengthening of the coastal defense, and increasing the fresh and brackish water retention capacity. Each of which can be accommodated within the nature, aquaculture and rice sectors. Regenerating mangroves for coastal defense can be paired with sustainable aquaculture exploitation of brackish water zones. Whereas a dual strategy for fresh water retention can be pursued within the rice sector: (i) adapt agronomic and water management practices within irrigation schemes to maximize rainwater retention;

The Vietnam-Netherlands Partnership on Water for Food & Ecosystems was established as a follow-up to the FAO/Netherlands conference on water for food and ecosystems in The Hague in January 2005. In 2006 the Vietnam Ministry of Agriculture and Rural Development (MARD) and the Netherlands Ministry of Agriculture, Nature and Food Quality (LNV) agreed to implement the WFE partnership in Vietnam.

The partnership was implemented by the inter-ministerial and inter-departmental WFE Working Group, comprising of members from MARD, Ministry of Natural Resources & Environment (MONRE), Ministry of Industry and Trade (MOIT), Electricity of Vietnam (EVN) as well as NGOs.

The working group steered the WFE assessment studies, as well as the appointment of the multidisciplinary assessment teams comprising of national policy makers, provincial/district governors and academia.

The International Union for Conservation of Nature (IUCN) in Vietnam coordinated and facilitated the partnership. Wageningen University and Research centre (WUR) provided technical and process support to the entire partnership.

WFE Partnership outputs

- Water for Food and Ecosystems Strategy for Vietnam
- IWRM & Ecosystem conservation in Xuan Thuy National Park, Red River Delta (2 reports)
- Sustainable waste water use in irrigation, North Duong River Irrigation scheme, Hanoi & Bac Ninh Province
- Impact of Participatory Irrigation Management on local communities and environment in Dong Hy District, Nam Dinh Province
- Integrating rural water supply with livelihoods and environmental services, Nam Truc District, Nam Dinh Province
- Economic water valuation and multiple use operational strategy for Hoa Binh Hydropower dam and command area, Hao Binh Province
- Integrated use & management of water resources for aquaculture and agriculture in the Mekong Delta, Ben Tre Province (2 reports)
- Economic analysis & environmental impact assessment of water uses in Tam Giang – Cau Hai Lagoon, Thua Thien Hue Province
- National level review of policies and issues in relation to water for food and ecosystems interactions.

Documents and reports are available at:
www.kennisonline.wur.nl/BO/BO-10/006/059.01/producten.htm