THE GAWI FRAMEWORK DOCUMENT

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Introduction

The GAWI group takes its title from the project it has agreed to collaborate on "Guidelines on Agriculture, Wetlands and Water Resource Interactions (GAWI)". The group consists of the Ramsar Secretariat, IWMI, FAO, Wageningen University and Research Centre (WUR), (MedWet,) Wetlands International and Wetland Action.

The overall goal of the GAWI project is

> "To promote synergies between agriculture, wetlands and water resources management, through the development and implementation of guidance on the joint management of agricultural and wetland systems for food production, poverty reduction, livelihoods support and environmental sustainability."

This supports the request from the COP VIII to Ramsar's STRP, originally for the 2003-2005 triennium, to develop a framework for the dissemination of good agriculture-related practice, site-specific and crop-specific information and policies that demonstrate sustainable use of wetlands for agriculture.

To date a framework document has been developed which has the following specific scope and purpose:

- To apply the Drivers, Pressures, State change, Impacts and Responses (DPSIR) model to analyses cases of agriculture-wetland interaction,
- To identify the most pertinent issues affecting agriculture-wetlands interactions around the world,
- To identify the most appropriate responses to these issues/challenges (i.e. to encourage 'good practice'),
- To illustrate through presentation/application of a set of cases that the issues are 'real' – i.e. that they are valid to a wide set of bio-physical and socio-economic settings.

This framework document is divided into three sections the main findings of which are summarised below.

Agricultural Wetland Interactions

There is a great diversity of wetlands and of agriculture-wetland interactions (AWIs), but two major groups exists: direct, in-situ interactions and indirect, basin wide ones. These relationships are shown in Figure 1. They can be environmental, socio-economic and political.

The AWI experience is best understood with reference to the Millennium Ecosystems Assessment (MA) and the Comprehensive Assessment on Water Use in Agriculture (CA). These reports show that AWI pressures will grow with increasing economic and demographic growth, which have been the major driving forces in the predominantly human-induced transformation of wetlands. The drive to increase economic output, and food production in particular, has led to production systems in

wetlands that depend on excessive emphasis of the provisioning services at the expense of the regulating services, in the MA view, and excessive water use from the CA perspective. This has led to wetland degradation and to situations where water resources in a river basin are over-allocated (closed basins – CA terminology) and where environment flows are inadequate for wetlands. These pressures will increase and continue for at least the next three decades.

The MA stresses that a rebalancing of the ecosystem services is needed in order to sustain the productivity of these areas but that the perfect balance will not always occur due to priorities such as the Millenium Development Goals (MDGs). The CA focuses on the provisioning services and the need to make these more ecologically sensitive, with attention to agro-ecological opportunities, multiple cropping systems, and achieving diversity within agricultural landscapes.

Together the MA and CA provide vital guidance for the GAWI work drawing attention to different concepts and scales of analysis, including the ecosystem services, the functioning of linkages within river basins, multiple use in agro-ecosystems and the landscape scale of management.

The conclusions that can be drawn are that wetlands need to be seen as potential contributors to development in many ways and hence there is a need to enhance their functioning as multiple-use resources, providing a range of ecosystem services. To achieve this, there is a need to understand the actors involved, the forces which are driving wetland use and the different socio-economic contexts and impacts. It is in this context that the GAWI study has been designed.

Methods, Data Analysis and Findings

Ninety cases of AWI were analysed from all Ramsar regions. Half the cases came from Africa and Asia, but at least ten cases were drawn from each of the other regions. These were analysed using a checklist system whereby the various experiences in each part of the Drivers, Pressures, State Changes Impacts and Responses (DPSIR) model were identified and coded. A database was established for the analysis of these cases. (The subsequent figures are taken from a preliminary analysis. The final analysis and database will be published in a joint Ramsar / FAO volume which should be distributed at COP 10).

The major trends and occurrences in DPSIR elements provide empirical confirmation of the major findings and conclusions of the MA and CA, showing that the ecosystem services tend to be skewed towards an over-exploitation of provisioning services at the expense of regulating and supporting services. The drivers operating towards the exploitation of ecosystem services in wetlands are: population, food and land dynamics (36%) and market demands (28%) – both global markets and local markets. The latter for instance being a major driver for increased agricultural production in Africa. Another substantive driver at play is government policies (16%) that try to encourage food production or regulate the use of wetland and natural resources. Not surprisingly it has been found that the latter is of much more importance in Europe (30%) due to the EU focus on regulations. On the other hand, drivers with regard to climate change and climatic variability are conspicuously low or absent, expect for Africa where it is mentioned in 32% of the cases.

These drivers are transformed into common pressures on wetlands caused by increased agricultural activities such as: agricultural expansion (32%), increased water use/depletion (31%) and agricultural intensification (30%). The analysis shows that agricultural expansion is predominantly occurring in Africa and the Neotropics (South America), and intensification in Neotropics and Asia. The pressure of increased water depletion is highly divergent over the regions, depending mainly on the overall water resources availability. Pressures stemming from nature conservation are limited to Europe (10%).

The resulting environmental state changes are predominantly changes in the water resources (ranging from diminishing resources to altered flood regimes) (33%), and a general reported loss in biodiversity (27%). Changes in soil characteristics (loss of fertility and erosion) score on average high (23%) due to its severity in Africa (40%) and large size of the African sample in the data-base. Deteriorating water quality is less of a reported state change (14%), except for Europe where it is the second most severe state change (27%).

The consequent socio-economic impacts are quite diverse and multiple indicating a general shift in agricultural production. On average the most frequent reported impact is the loss in subsistence agriculture (24%), which is off-set by substantial gains in market oriented agriculture (23%). This indicates a transformation of agriculture, with increased market-oriented agriculture which is generally associated with mono-culture of intensive water and resource use. It is therefore not surprising that the third most frequently occurring impact is that of increased socio-economic differentiation and association conflicts over resources use (16%). As in many instances the transformation in agriculture in effect represents a differentiation of access to natural resources and thereby of derived benefits – for instance the high reported loss in inland and coastal fisheries occurs at the expense of increased aquaculture and crop intensification in Asia. Gains in subsistence agriculture are limited to 13% of reported impacts. The European region forms a clear exception with regard to impacts, as flood control and water purification are reported as the dominant impacts for the region (together 29% of regional impacts, against 8% of all reported impacts). This is primarily due to the fact that agriculture is in decline, rather than increasing, and to an explicit valuation of these services within EU policies and regulations.

Response scenarios for all cases were studied separately. This showed that 63% of the cases had responses of some sort attempting to address the AWI situation. A further 7% showed some evidence of an established sustainable use regime, usually because of a low intensity and subsistence forms of agricultural use. In contrast, there was evidence of increasing agricultural exploitation in a different 7% of the cases.

The regional nature of this data shows that the highest level of response was in the cases from Europe, North America and to a slightly lesser degree Oceania, with the lowest rates of response in the Neotropics and to a lesser degree Africa and Asia.

The Response Scenarios were grouped into four categories based on the database and checklist information:

i. The ***Conservation*** group (33%) includes various cases where protecting or enhancing the natural state of the wetlands, or the human created biodiversity or landscape in a wetland is sought.
ii. The ***Livelihood Development and Conservation*** group (33%) includes cases where there are combinations of conservation / rehabilitation of wetlands - or parts of them, with measures to improve the livelihoods of communities using wetlands.
iii. ***Water Resource and River Basin Planning*** (26%) involves a focus on the hydrological systems, usually a river basin, and so addresses larger spatial units, rather than individual wetland sites (and catchments) which is often the focus in the above two response groups.
iv. ***Payment for Environmental Services / Financial / Market Mechanisms*** (5%) includes three cases where there are a range of financial mechanisms – charges, markets and subsidies related to environmental services, which act as new drivers to influence land use and water management in wetlands and their catchments.

Analysis of the responses suggested that in order to achieve sustainable wetland use response scenarios need to have five characteristics:

- they must address several or all elements of the DPSI analysis in an AWI situation, including feedback mechanisms;
- they must seek to redirect drivers to reduce the negative results which occur, especially through reducing the prominence of use of one ecosystem service or activity,
- they should involve all stakeholders in an open and inclusive process, so that the skills and contributions of the different groups, organisations and individuals can be utilised,
- they should address both in situ issues and basin level issues, and
- they must be suited to the situation – responding to facilitating factors or overcoming bottlenecks.

Overall they must achieve a more sustainable balance between socio-economic / poverty reduction goals and ecological needs in wetlands to ensure the sustainable use of wetlands for multiple ecosystem services for the benefit of society.

Discussion of the Ways Ahead

To restore the balance between the different ecosystem services, and progress towards the objective of sustainability in agriculture-wetland interactions, it is necessary to undertake activities at different scales, *in situ* - within a wetland site, and basin wide - including catchments and wetlands.

In situ activities may include:

- Reducing provisioning demands on wetlands so that the alterations / damage to regulatory and support services are reduced;
- Diversify into other provisioning services and develop new patterns of livelihood uses, which are more ecologically suitable for wetlands and can help maintain regulatory and support services;
- Exploit the economic value of regulatory, support or cultural services from wetlands, such as water purification, biodiversity protection and carbon sequestration, thereby compensating for reductions in provisioning activities.

At the catchment and basin scale, specific trade-offs between provisioning and regulatory services will also be needed, along with overall water resource and land management and planning to minimise negative impacts and act as mitigating strategies. This can involve a number of measures:

- Strategic land use allocation of parts of a basin for provisioning services and other parts for regulatory, or other non-provisioning, services thereby providing a basis for sustainable use;
- Better management of all production systems to reduce pressures on wetlands with the use of good agricultural practices (GAP).
- Revitalisation of the regulatory capacity of agricultural and natural ecosystems to improve water storage in catchment, water infiltration and improved hydrological functioning in the catchment, which can in turn benefit wetlands;
- Exploit non-provisioning ecosystem services, such as flood control and water purification, nature conservation and ecotourism;
- Supplement wetland incomes with off-wetland activities rather than seeking increased or alternative incomes from the wetland.

These basin level measures should be seen as trying to improve the functionality of the river basin as a whole in terms of total productivity and income generation, whilst maintaining regulatory and support ecosystem services.

In exploring how to implement these options it is necessary to look at the DPSI elements, and the facilitating factors which need to be altered if successful change is to be achieved. These may involve:

- Investment at the policy level to agree necessary payments and the development of technical support to make changes in provisioning services attractive – with incentives for applying good agricultural practices and ecological capacity practices.
- Better management practice guidance from GAWI cases to help achieve multiple uses in wetlands and enhance benefits, while ensuring wetland use stays within the resilience level of the ecosystem and ensures that ecosystem services are maintained.
- Policy responses are also needed in order to redress and re-allocate provisioning services - take away perverse incentives (subsidies) for overuse, provide new incentives for diversification, institute limits on wetland use and design and apply regulations.
- Develop payments for environmental services with compensation actually accrued at the local level, compensating users and managers for their sustainable use and management, as well as compensating losers.

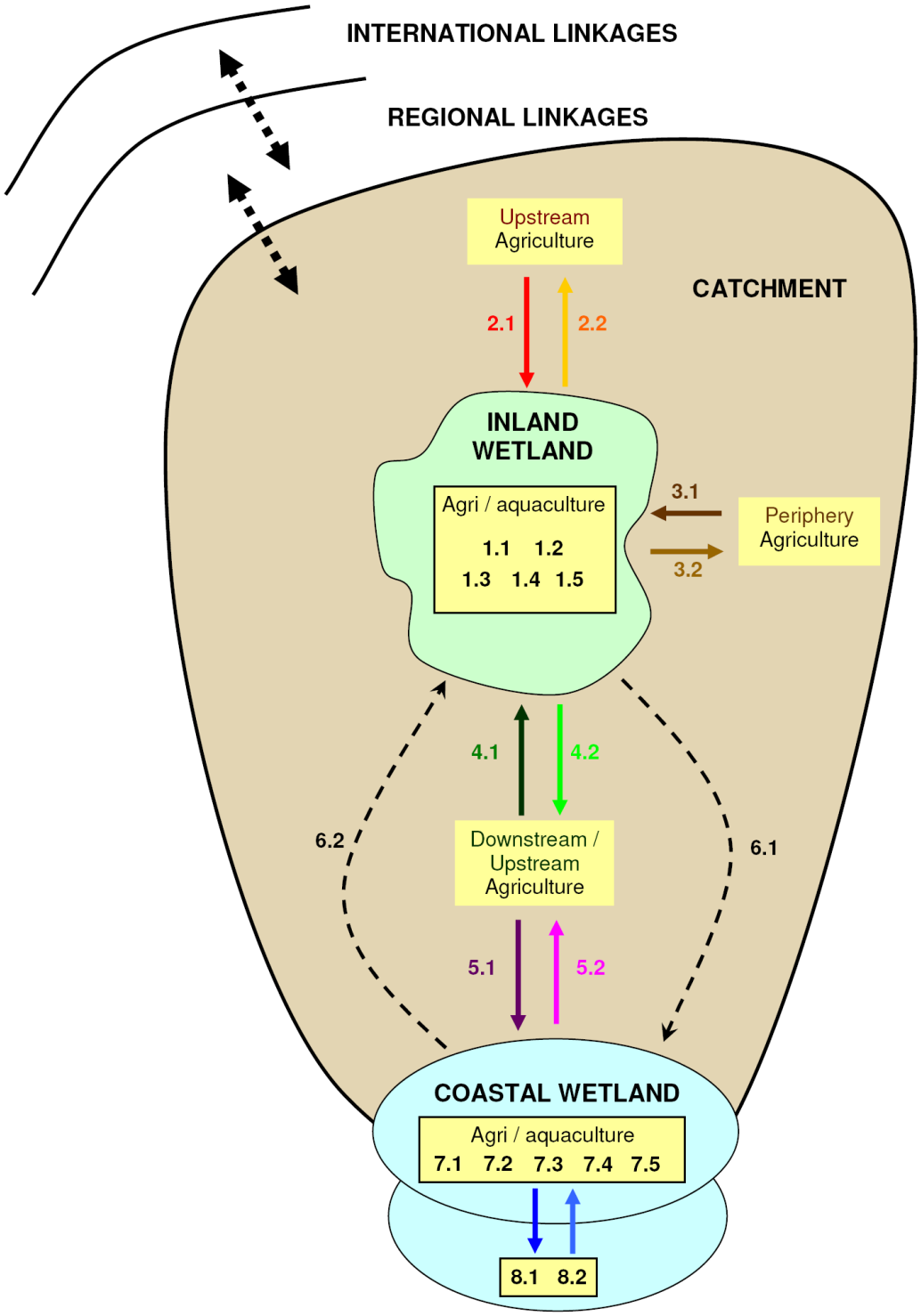
Conclusions

The GAWI Framework Document shows that the DPSIR tool is an informative conceptual approach to the analysis of agriculture-wetland interactions. Combined with the eco-systems services concept from the MA, this has helped interrogate a range of diverse cases and clarified where changes in the broad nature of the interactions are needed. However, the experience with responses, especially in terms of their effectiveness, remains weak and further exploration of this is needed, along with the discussions of *in situ* and basin level opportunities.

Overall it is appropriate to conclude by re-iterating the following key points:

- The diversity of wetland experience shown by the DPSIR analysis, means that guidance and responses must be based on case by case DPSIR analysis, rather than any prescriptive copying of lessons;
- There is a need to address the real driving forces in the AWIs, rather than the symptoms, and this action will be more effective if there are interventions at multiple levels based on the use of the DPSIR analysis to identify key elements at the different levels;
- It is important to recognise the socio-economic and socio-political elements in sustainability, both at the driver and the impact levels.
- There is a need to determine where guidance is already available, and where it is not for such multiple level and multi-actor response measures, so that GAWI can focus on developing only that guidance which needs to be developed.

Figure 1: Conceptual model of agriculture-wetland interactions



KEY to Figure 1

1. Wetland Agriculture (DIRECT In situ) interactions
    - 1.1 Complete transformation of wetland ecosystem to agricultural use
    - 1.2 Partial transformation of wetland ecosystem to agricultural use
    - 1.3 Agricultural use of wetlands without transformation of ecosystem (e.g. limited / sustainable eco-agriculture).
    - 1.4 Enhancement of wetlands / creation of additional wetlands (often used for agric)
    - 1.5 Reversion to natural wetland

2. Upstream Agricultural activity (INDIRECT) interactions (from distant catchment)
    - 2.1 Upstream agricultural activity influencing wetland ecosystem & wetland agric downstream
    - 2.2 Wetland ecosystem influencing upstream agricultural activity

3. Periphery Agricultural activity (INDIRECT) interactions (from local catchment)
    - 3.1 Periphery agricultural activity influencing wetland ecosystem (e.g. irrigation water, fringe drainage)
    - 3.2 Wetland ecosystem influencing periphery agricultural activity (e.g. flooding)

4. Downstream Agricultural activity (INDIRECT) interactions
    - 4.1 Downstream agricultural activity (incl wetland agric) influencing wetland upstream (or wetland agric upstream)
    - 4.2 Wetland ecosystem influencing downstream agricultural activity (e.g. flooding, constant supply of water, water purification)

5. Coastal-Upstream Agricultural activity (INDIRECT) interactions
    - 5.1 Influence of immediately upstream (wetlands & non-wetland agric) on coastal wetland
    - 5.2 Influence of coastal wetland on upstream non wetland agricultural activity

6. Coastal wetland – inland wetland (INDIRECT) interactions
    - 6.1 Influence of inland wetland (natural or altered by agric) on coastal wetland
    - 6.2 Direct influence of coastal wetland (natural or altered by agric) on inland wetland

7. Coastal Wetland Agriculture (DIRECT / In situ) interactions
    - 7.1 Complete transformation of wetland ecosystem to agricultural use
    - 7.2 Partial transformation of wetland ecosystem to agricultural use
    - 7.3 Agricultural use of wetlands without transformation of ecosystem (e.g. limited / sustainable eco-agriculture).
    - 7.4 Enhancement of wetlands / creation of additional wetlands
    - 7.5 Reversion to natural wetland

8. Coastal Wetland Agri / aquaculture – other coastal wetlands (INDIRECT) interactions
    - 8.1 Influence of adjacent / upstream coastal wetlands
    - 8.2 Coastal wetland aqua / agriculture influencing adjacent coastal wetland functioning

Regional linkages = Groundwater resources, shared wildlife resources (inc. birds), population, ethnic groups, culture, agricultural and conservation policies etc.
International linkages = same, but next scale up.