Ensuring that Climate-Smart Rice Cultivation is also Biodiversity-Smart

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Irrigated Rice Fields Produce More than Rice!

- **Often remarkably valuable for biodiversity.**
  - **Can host many birds (migratory and resident), fish, frogs, crayfish, snails, other aquatic life.**
  - **Biodiversity-rich rice fields in every region—tropical and temperate, developed and developing: North and South America, Europe, Africa, East and South Asia, Australia.**

- **Sometimes even a Critical Habitat:**
  - **Rice fields of NSW, Australia host 40% of global breeding population of Australasian Bittern (EN); also endemic Southern Bell Frog.**
  - **90% of Hooded Cranes (VU) and 50% of White-naped Cranes (VU) winter in rice fields of Izumi, Japan.**
  - **Rice fields of Louisiana and east Texas (USA) are critical spring migration stopover site for millions of shorebirds including Buff-breasted Sandpiper (NT).**

Why is Irrigated Rice So Important to Wildlife?

- Unlike most field crops, **irrigated rice fields are WETLANDS** (included in Ramsar definition).
- **Surrogate wetland habitats** (where natural wetlands have been lost).
- At different stages of cultivation, **ideal conditions for many (not all) wetland-based species** (open shallow water, mudflats, marsh, wet prairie).
- In drier regions, standing water creates **oasis effect**, attracting birds and other wildlife.

Human Benefits of Rice Field Biodiversity

- **Subsistence and commercial harvests of rice field biodiversity:**
  - Local people capture wild fish, frogs, crayfish, snails, birds, small mammals, etc.
  - Important contribution to livelihoods and food security.

- **Nature-based tourism:**
  - Birders travel far to observe hard-to-see species in rice fields.
    - In Madagascar, some endemic wetland birds seen most easily in rice fields.
    - Annual Yellow Rail and Rice Festival in Louisiana (USA) enables birders to watch post-breeding Yellow Rails flying from rice-harvesting machinery (otherwise very hard to see).
  - Sustainable sport hunting of wild ducks and geese in flooded post-harvest rice fields in USA (California, east Texas, Louisiana, Arkansas).

Rice Fields May Abound in Biodiversity, Even When Not Managed for It!

Unfavorable practices affecting biodiversity include:

- Spraying with toxic pesticides or herbicides.
- Unregulated hunting or shooting.
- Unsustainable harvest of fish, other aquatic life.
- Bird-scaring devices and activities.
- Urban expansion into rice-growing areas.

Nonetheless, biodiversity persists--even thrives--to a remarkable degree in rice fields with some unfavorable practices.

Of course, the best rice fields for wildlife are those managed with biodiversity in mind!

Besides Rice and Wildlife, Irrigated Rice Fields Produce Methane

- Methane (CH_4), a greenhouse gas (GHG), results from decay of submerged organic matter in wet rice fields.
- Methane from paddy rice accounts for ~1.5% of global GHG emissions (measured in CO_2 equivalents).
  - Tiny fraction of all GHG emissions, but each sector--including rice cultivation--expected to do its part to mitigate climate change.

Climate-Smart Rice: A Tool to Help Mitigate Climate Change

- **Climate-smart rice (CSR) methods aim to reduce methane emissions by reducing the time that fields are flooded, mainly through:**
  - Dry direct seeding
  - Mid-season drainage
  - Alternate wetting and drying (AWD)

- **AWD has been found to reduce methane emissions, while maintaining rice yields.**
  - AWD leaves a growing rice field wet, then dry, then wet, then dry, etc. for intervals ~1 week each.
- **CSR now heavily promoted by governments and development agencies:**
  - Perceived as "win-win" with reduced GHG emissions and water use, without sacrificing yields or farmer incomes.
  - Part of broader Climate-Smart Agriculture agenda.

Climate-smart Rice Can Succeed with Shortened Ponding Periods BUT Many Wetland-based Species Cannot!

- **Length of ponding period--when fields are wet before draining for harvest--determines habitat suitability for wetland-based species.**
- **CSR-driven ponding period reductions (including AWD) are incompatible with the life cycles of many wetland species.**
- **In monitored rice fields, biodiversity has notably declined with shorter ponding periods.**
  - **In Italy, dry seeding of rice (with shorter ponding period) has diminished bat feeding activity, amphibian densities, and heron and egret breeding colonies.**
  - **In NSW, Australia, shorter ponding periods now threaten the breeding of Australasian Bitterns.**
  - **In California, winter flooding of harvested rice fields provides essential habitat for millions of migratory waterfowl and shorebirds—but is being challenged by CSR efforts to reduce the amount of time the fields are flooded.**

Rice Growing Methods that Reduce Ponding Periods Will Usually Reduce Overall Biodiversity

- **Water abstraction for irrigated rice can shrink natural wetlands.**
  - Example: Kilombero Wetlands in s. Tanzania harbor 3 bird species found nowhere else, but at risk from irrigation water abstraction for rice-growing.
  - BUT reduced water use in rice cultivation will benefit the natural wetlands only if less water is abstracted—not if that water is sent elsewhere!
  - More typically, the irrigation water source (such as a large river or reservoir) is not markedly diminished by water use for rice cultivation alone.
- Thus, **CSR cultivation that reduces ponding periods will directly diminish rice field biodiversity--it is less likely to indirectly benefit natural wetlands** that depend on the same water source.

Recommendation (I): Prioritize Biodiversity-Friendly Practices in Rice-Growing Areas of High Biodiversity Value

- **Avoid those CSR (including AWD) methods that would shorten ponding periods in or near protected areas, Ramsar Sites, IBAs, KBAs, other areas of high biodiversity value.**
- **Other biodiversity-friendly practices to promote in areas of high biodiversity value:**
  - **Avoid using toxic pesticides or herbicides.**
  - **Effectively control any hunting, fishing, other harvests of wild species to sustainable, species-specific levels (except non-native, invasive species).**
  - **Avoid deliberate scaring, other disturbance to birds or other wildlife (except where needed to maintain viable rice harvests).**
  - **Keep vegetated banks around rice fields.**
  - **Flood post-harvest and fallow fields, especially during seasons of high waterbird use**
  - **Provide water-retention ditches or pools as a refuge for water-dependent organisms when rice fields go dry**
  - **Maintain patches of natural wetlands (marshes, ponds, etc.) within or adjacent to rice-growing areas.**

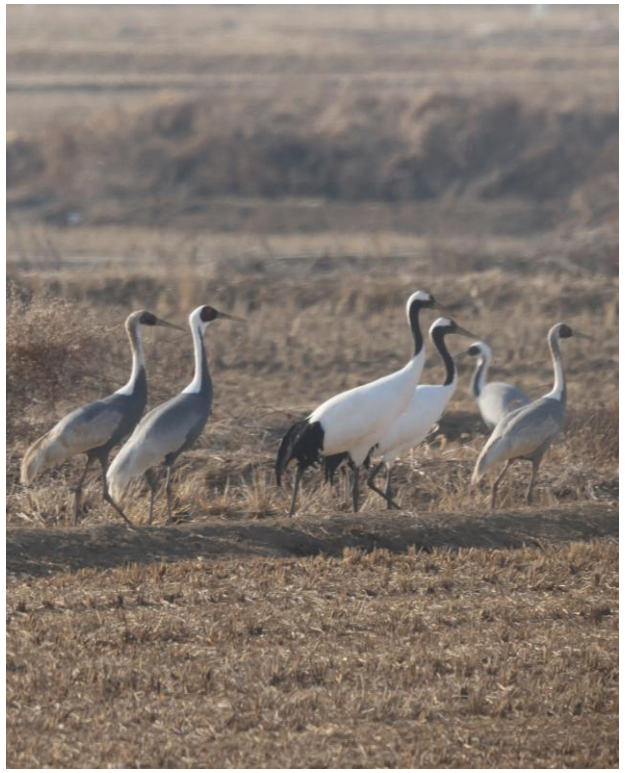
Recommendation (II): Biodiversity Monitoring and Adaptive Management

- **Where CSR (including AWD) methods are being promoted or tested, important to monitor biodiversity for changes in species presence or abundance.**
  - Analogous to monitoring for GHG emissions, rice yields, or farmer incomes.
  - Special focus on species of conservation concern or special management interest.

- **More systematic biodiversity monitoring in CSR cultivation areas would:**
  - Advance scientific knowledge around CSR, which still faces significant learning curve.
  - Facilitate impact assessment of scaling-up CSR methods to a larger rice growing area.
  - Enable adaptive management.
- **Adaptive management--based on monitoring--could optimize multiple objectives (biodiversity, climate change mitigation, yields, and incomes) within a rice-growing area.**
  - Could help design or refine farmer incentive schemes.

The World Faces a Biodiversity Loss Crisis AND a Climate Change Crisis

- **Efforts to reduce GHG emissions or water use should not come at the expense of migratory birds and other wetland species that now depend upon rice fields for survival.**
- **Key challenge is for CSR cultivation to reduce GHG emissions in ways that avoid seriously harming biodiversity.**
  - **Similar to other sectors, e.g. wind power needs to minimize bird and bat fatalities.**
- **CSR (including AWD) promotion and further innovation should continue—but in ways that recognize biodiversity importance of rice-growing areas.**
- **Environmental assessment professionals can help ensure that biodiversity impacts are considered in projects and programs that affect rice cultivation.**



Let’s continue the conversation!

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