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Water management to address salinity in agriculture in Bangladesh

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Background and problem description

Global food security faces significant challenges due to limited freshwater availability and increasing salinity intrusion. The increasing of water and soil salinity is a complex issue, with expectations that it further increases in the future, negatively impacting food security. The factors that influence these challenges include climate change, population growth, and human activities.

Bangladesh is among the most vulnerable countries due to climate change and development challenges (geographic position, poverty levels and high population density). Effective water management and agricultural practices are important in increasing food security in this context. However climate change together with salinization of the coastal region add to the complexity of ensuring food security. The complexity also lies in that existing salinity is not constant throughout the year. Salinity levels in Bangladesh are dynamic; the levels peak in May/June, just before monsoon rains and increased river discharges and heavy rainfall mitigate them significantly. However, practices such as groundwater over-extraction during the dry season, saline aquaculture, and the reduced inflow of fresh water, increase soil and water salinity in coastal areas.

Local farmers are applying strategies to deal with these saline conditions, using methods such as the raised beds (sarjan system), using salt-tolerant seed varieties, and mulching to limit evapotranspiration and the salinity increase in the root zone. Nevertheless, high salinity levels decrease agricultural yields and reduce arable land availability, particularly in coastal Bangladesh where water scarcity is a primary constraint on farming.

In this region, home to over 139 polders, managing saline water intrusion into these polders is critical. This is achieved through the careful operation of control structures within the polder embankments, a key measure in maintaining agricultural productivity in the face of salinity challenges.

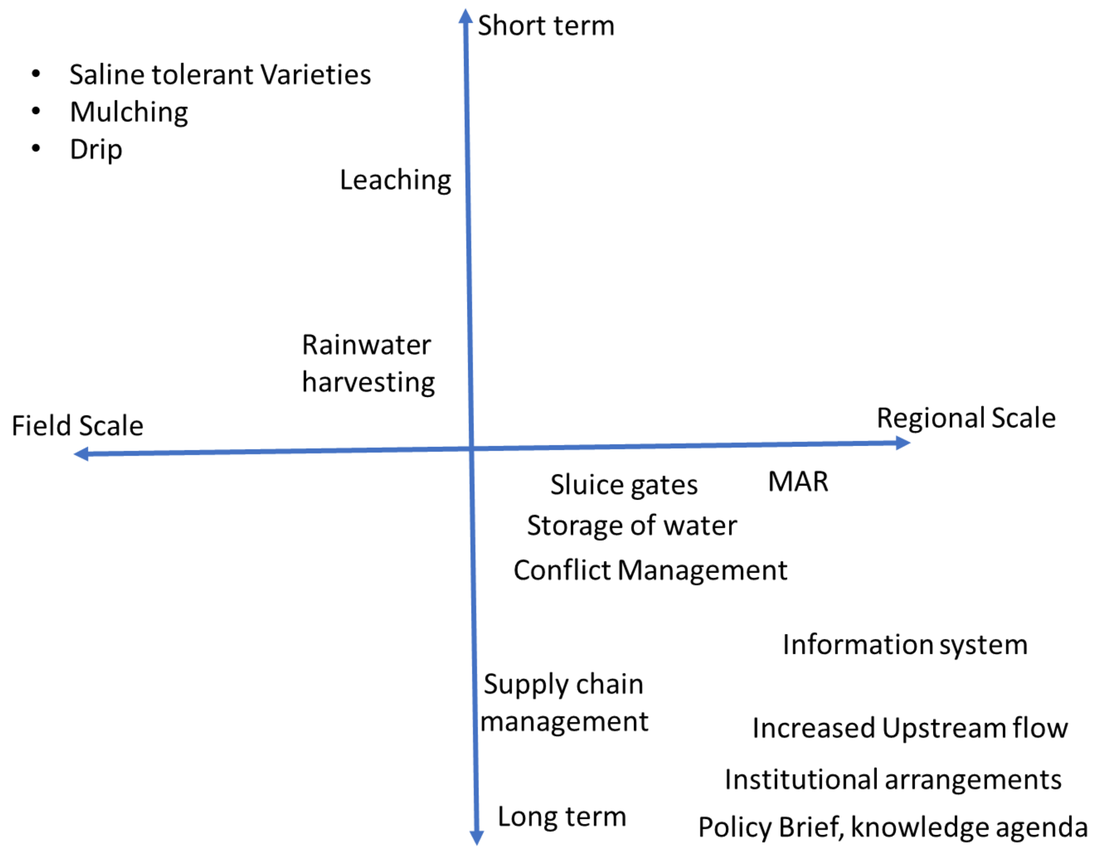

Figure 1: Overview of potential solutions in agriculture practices and water management addressing salinity at different spatial-temporal scale

Approach of the study

This study elaborates on the Coastal Opportunities and Agriculture Solutions to Tackle Salinity in Bangladesh (COASTS) approach, and provides a reflection on how water management aspects could be addressed when tackling salinity in agriculture, using spatial scale (field to regional) and temporal scale (now to future) to map innovations. The analytical framework used is represented in figure 1.

Water management and agriculture in Bangladesh

COASTS is an innovative project, working through a consortium of an NGO (Cordaid), Private sector company (Lal Teer Seeds), a knowledge institute (Bangladesh Agricultural University, BAU) and government agency (Soil Resource Development Institute, SRDI), with farmers addressing salinity at field scale level, and training Farmer Business Advisers (FBAs) as local advisors on salinity tolerant seeds and for measurement of salinity in the soil. Under COASTS project, field scale interventions such as saline tolerant vegetables, mulching, raised beds, rainwater harvesting, and drip irrigation are employed to increase productivity in a water scarce saline region.

Other projects, addressing water management, like Sustainable Agriculture, Food Security, and Linkages (SAFAL)- Integrated Water Resource Management (IWRM) and Blue Gold project, re-excavated drainage canals to reduce flooding and to increase storage of fresh water at sub-polder scale. These improve the field conditions and agricultural production.

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COASTS trained field advisors, mainly women, who can advise farmers when selecting a salt tolerant crop. Picture: COASTS project

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Communities are engaged in COASTS, SAFAL-IWRM and Blue Gold project to sustain the proposed solution even after completion of the project, but often this is not automatically happening. In the case of COASTS, the link with FBA is expected to be continued after the project, in the case of SAFAL-IWRM the value chain activities and in the case of Blue Gold the water management organizations are expected to be continued. Along with these polder/sub-polder scale activities, institutional arrangements are required at regional scale level (government involvement).

Recommendations

For upscaling in COASTS, the promising results at field scale need to be operational at regional scale level to have meaningful impact on agricultural production and food security. The field level water management of COASTS needs to be connected with water management at the landscape/regional level. Farmers of Cordaid need to connect with the water management group (WMG)/water management organization (WMO), farmer field school (FFS) and farmer groups. The government institutes such as Bangladesh Water Development Board (BWDB), Bangladesh Agricultural Development Corporation (BADC), Local Government Engineering Department (LGED) need to be engaged as well.

It will support progress if policy makers and donors like Embassy of the Kingdom of the Netherlands (EKN)/ The Netherlands Enterprise Agency (RVO)/ Ministry of Foreign Affairs the Netherlands (BuZa) can assist in connecting the spatial and temporal scales when addressing salinity impacts and by connecting policy interventions with generated knowledge and experience. For instance, linking the interest and vision of financing organizations such as World Bank, Asian Development Bank (ADB), Japan International Cooperation Agency (JICA) and government of Bangladesh with field level experiences of consortia like in COASTS. Private sector parties both from the Netherlands and Bangladesh can assist with their interest in finding operational business models addressing complex issues, co-creating and co-funding knowledge to find solutions and the implementation of the solutions. Netherlands Food Partnership (NFP)/ Netherlands Water Partnership (NWP) could assist facilitating parties focusing on new innovations and their applications related to water management, salinity and food production where storage and supply chain will be carefully considered. Locally lead, locally produced, involvement of local communities and local knowledge need to play a role when considering to inspire the adoption of application of the technologies.

Figure 2: Steps for transition in water and food systems in deltas (Source: Verhagen et al, 2022)

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And suggested way forward

The steps are summarized below, including concrete examples for the way forward:

Step 1: Create a vision together with stakeholders for common goals using structured approach such as Food System Approach (Verhagen et al., 2021);

Example: Organizing a brainstorming event/workshop with stakeholders like the Ministry of Water Resources and the Ministry of Agriculture, but possibly also the Ministry of Planning, representatives from Local Government Institutions (LGI), private sectors and NGOs to develop vision for the future regarding water management and agricultural practices to address impact of salinity.

Step 2: Formulate transition pathway and policies for the perceived future, involving relevant stakeholders;

Example: Facilitate interaction between the Ministry of Water Resources and Ministry of Agriculture to formulate transition pathway and required policies to achieve the envisioned future.

Step 3: Define responsibilities for stakeholders and government agencies;

Example: BWDB to maintain water infrastructure, DAE to promote climate smart agricultural practices, Ministry of Planning to ensure adequate interaction between the government agencies, LGIs to facilitate conflict resolution at field/local scale, CBOs to operate the gates and canals of polders to drain the polders when needed and store access water for further usage, private sectors to provide the seeds and equipment to achieve food production goals, NGOs such as Cordaid to provide information to the farmers and to connect WMOs and FFS.

Step 4: Create a platform to work together;

Example: Explore setting up a platform where Ministry of Water Resources, Ministry of Agriculture, representatives of LGI, private sector and NGOs interact with each other. EKN could possibly facilitate, Cordaid can also potentially provide such a platform, where they can also interact with regional and national scale stakeholders who might wish to avail their services to reach field level stakeholders.

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Step 5: Explore source of funds to implement the project, including mechanisms such public-private-partnership (PPP);

Example: Cordaid can potentially interact with Ministry of Agriculture to showcase their success and ability to effectively work with field scale stakeholders, so this model can be replicated in future projects, e.g. as under World Bank funded 'Partner' project. Possibly Cordaid could play a role in this, providing services.

Step 6: Present and carry out pilot cases showcasing the successful implementations and their impact with a plan to upscale on spatial and temporal scale;

Example: Similar to COASTS project, pilot field applications to address the impact of salinity in water management and agriculture can be carried out. To ensure upscaling, private sectors and local stakeholders involved in water management and agriculture could be involved from the beginning. The upscaling potential and a pathway should be prepared at the initiation stage.

Step 7: Monitor, adapt, learn and share the experience gathered from the project;

Example: Learning in the COASTS project can be documented and shared, and thus may lead to engagement in follow up activities of the partners.

Step 8: Think and explore together on future challenges and activities.

Example: Similar as to step 1: Once a platform exists, different parties will have a role - Local/field scale stakeholders and regional/national scale stakeholders interact within such a platform to explore future challenges and activities. Stakeholders can formulate future plans can be formulated at local/regional scale. Interaction between local and national level will need facilitation. An NGO, like Cordaid, can act as a facilitator for such interactions having the unique experience doing so in their current programmes in which they interact with local and national level stakeholders and transfer knowledge across different scales.

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