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Integrated Floodplain Management (IFM):
How can we better utilize scarce dry season water for balanced production of fish and crops in Bangladesh floodplains?

Increased *boro* rice cultivation in low-lying floodplains (beel basins) reduces natural fisheries production as crops compete with fish for water in the dry season. The dry season is crucial for fish survival as water shortages make them vulnerable to high natural, and fishing, mortality.

Is there an alternative balanced use of water for both fish and crops?

Putting research knowledge into practice

Dry season water: a scarce resource with competing uses

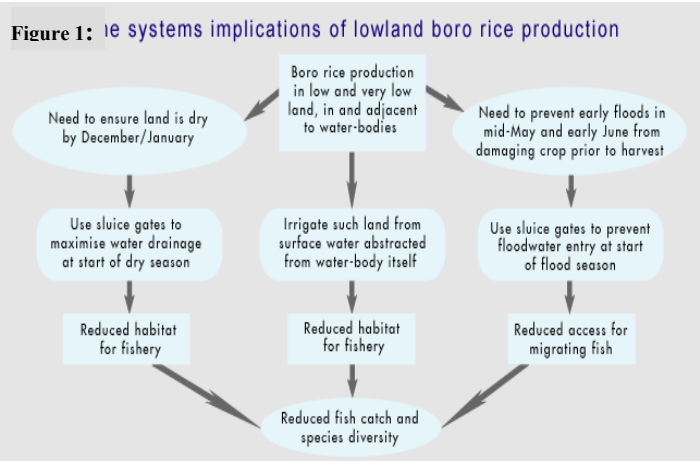
Although much of Bangladesh remains flooded in the monsoon, acute water shortages in the dry season affect the floodplain production systems. The farmer's first choice, and national policy, has been to grow irrigated *boro* rice in the dry season using surface water, ignoring other requirements for water, especially for fisheries. Availability of water in the dry season is crucial for sustenance of the vast floodplain fisheries that support the livelihoods of millions of poor and marginalized households in Bangladesh. Therefore, water becomes a precious resource in the dry season for both fish production and rice cultivation. Thus, balanced use of water becomes a key question for all concerned.

Boro rice is a water hungry crop – it requires 10,000 cubic meters of water to irrigate a one-hectare _boro_ field per season

Boro Rice and Fish: the most preferred but least friendly crop

Boro rice is a dry season crop that requires intensive irrigation, which is met through both surface and groundwater sources, but the two are interconnected and reduce the amount of remaining surface water. The entire floodplain fish stocks become vulnerable to their highest natural and fishing mortality in the dry season, due to a combination of shortage of surface water, harsh environmental conditions, and easier conditions for fishing. *Boro* rice cultivation in the floodplains (beel basins) has a three-pronged effect on fisheries and aquatic biodiversity (Figure 1):

Figure 1: ıe systems implications of lowland boro rice production

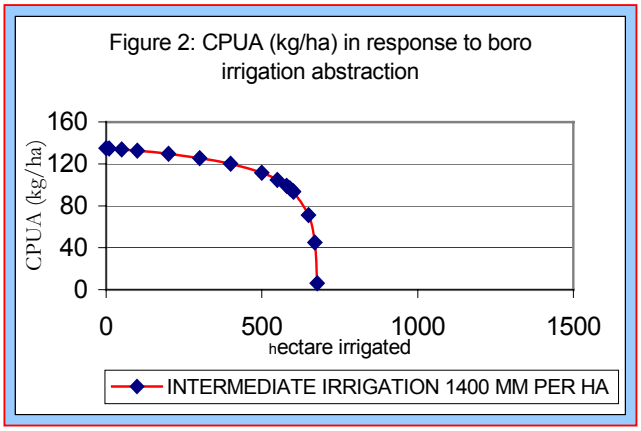


- **Firstly,** a tendency to quickly drain water post-monsoon (November-December) to plant *boro* rice, shortening the duration of water for fish growth;
- **Secondly,** the remaining surface water is used for irrigation in the dry season (January-March) when fish suffer from acute shortage of water;
- **Finally,** farmers delay the entry of river water in beels to protect rice before harvest in the pre- and early monsoon (mid-April to mid-June), which coincides with peak fish migration from rivers to beels.

All these activities make the wetlands more vulnerable, and reduce their products and benefits, ultimately leading to encroachment and loss of wetlands and floodplains. ***The policy question is whether to use water for only rice, only fish, or for both?***

Higher surface water irrigation: Lower fish availability

Dry season water maintenance is critical for floodplain fisheries. Modeling results for PIRDP (Pabna Irrigation and Rural Development Project), an area of 6,773 hectares, showed that using **surface water** to irrigate more than 500 ha of *boro* results in rapid fishery decline and complete collapse of fish recruitment occurs after irrigating about 700 ha (Figure 2).



In a 6,773-hectare area, <u>every additional</u> hectare of *boro* irrigated by surface water, after 500 ha, reduces fish catch by 242 kg

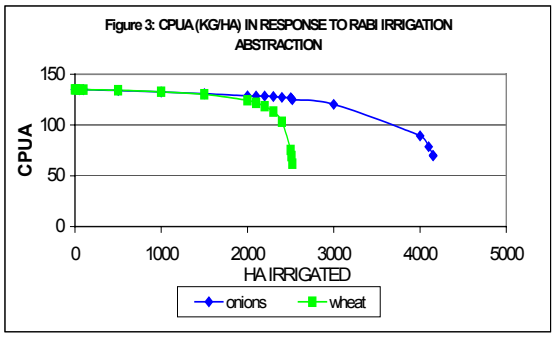
Rabi crop diversification: the most suitable and best alternative

Crop diversification away from *boro* rice is beneficial for many reasons, amongst which water conservation to protect fisheries in the dry season is key. In many places potato, garlic, maize, wheat, onion, and other *rabi* crops with lower irrigation requirements are attractive alternatives to *boro* rice for low, medium and medium-high lands (Table 1).

Table 1: Possible Alternative Crops

	835
Wheat	200
Maize	240
Brinjal	320
Onion	175
Potato	190
Garlic	150

Source: Biswas and Mandal (1993)



In the PIRDP area, onion is an attractive crop for medium and high land elevations, in place of *boro*. The adverse effects on fisheries of irrigating alternative *rabi* crop are seen to be ten times less that of *boro* rice. Modeling results in the 6,773 hectare PIRDP area show that if wheat is cultivated in place of *boro* rice, even after irrigating 2,500 ha of land, we could still catch more than 50kg/ha of fish, whilst for onion, we could catch over 50kg/ha of fish after irrigating more than 4,000 ha (Figure 3). **Results show that every hectare of onion crop irrigated, results in only a 20 kg of fish loss in the modeled area, which is about <u>one-tenth</u> the loss that *boro* cultivation causes.**

Systems Benefits of *Rabi* Crop Diversification

- Alternative *rabi* crops require less water than *boro* rice, leaving more surface water, and thus a better dry season habitat, for fish;
- Alternative *rabi* crops are harvested several weeks prior to *boro* rice, this reduces the risk of crop damage due to early flood/rains;
- Early harvest of crops reduces the pressure to keep sluice gates closed during the early flood season, facilitating natural recruitment of fish;
- *Rabi* diversification followed by deepwater aman in the *kharif* season would improve wet season fish habitat conditions, as the greater vegetation cover makes it harder to catch fish, thus permitting fish growth;
- The fisheries gain, from increasing dry season water extent in low-lying basins, is substantial.

Table 2: Growth duration and yield of some important *boro* rice varieties

Variety	Growth duration (days)	Grain yield (t/ha)
BR 28	140	5.8
BR 36	140	5.5
BR 26	145	5.8
BR 14	160	6
BR 29	160	6.5
BR 11	165	6
BR16	165	6
IR8	170	5.5

Sources: Jashim and Chowdhury (2001); Salam (1992), FAP20 (2000), BRRI (1997)

Policy Recommendations

- Promote cultivation of alternative *rabi* crops that require less water in place of water hungry *boro* rice in low, medium high, and high lands, to save water for fish and other environmental requirements.
- Support and facilitate cultivation of potato, garlic, maize, wheat, onion, and other *rabi* crops with lower water requirements, as alternatives to *boro* rice, wherever suitable.
- Promote cultivation of short-duration *boro* rice varieties, BR26 and BR28 (140-145 days) to save crops from early flash floods or drainage congestions, instead of BR 29 that requires 165 days.
- Promote deep water aman after alternative rabi- that will increase farmers benefit as well as benefit to aquatic environment.
- Encourage retiring very low lands in beel basins from *boro* rice cultivation (land where crops are at high risk of flood damage) to preserve these lands for natural fish production and maintain minimum water coverage in the dry season.

References and further reading

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This policy brief is prepared based on research findings of various projects aiming at improved floodplain resources management.

Further Information

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