Modification in the management and system design of bundh breeding

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ABSTRACT
The indigenous, age old ‘bundh breeding’ technology for Indian Major Carps (IMC) is passing through modernization with changes in system design, adoption of scientific management protocols towards sustainability. An increase in the hatching (10 to 15%) and survival rate (40-45%) after adoption of advanced management systems has been quantified. The present paper addressed the state of the art of this indigenous technology in the light of changes in management approach and modification in the system designing by the bundh breeders themselves to come out from the difficulties.

Note

Bundhs are special type of perennial natural impoundments employed for breeding Indian major carps, where riverine condition is simulated by constructing embankments against a vast catchment area and subjected to rapid flooding during monsoon due to gravitation. (Alikunhi et al., 1964). The bundhs are mainly situated in Bankura and West Midnapore districts of West Bengal, Nowgong in Chhattarpur district in Chhattisgarh and Madhya Pradesh (Jhingran, 1991). Although a large amount of seeds are now available from Chinese hatcheries in different parts of West Bengal, bundh bred spawns are known to be qualitatively better as they are healthier and with better growth rate than the hatchery bred ones (Sarkar et al., 1998).

Though, bundh breeding technology developed in Bankura district has gradually been adopted by the farmers of different districts of West Bengal and India in general, this technique is gradually being logged out due to several environmental and biological problems. Uncertainty of rainfall, water pollution, introduction of predatory and weed fishes, mixing of seeds, poor recovery of seeds from earthen pits, strains and injuries of brooders during transport are the main drawbacks of bundh breeding. As a result, bundh bred seeds which used to contribute more than 60% of total seed production in West Bengal during the 1960s is now contributing only around 10% of the total seed production. This necessitated modification and modernization of this age-old indigenous technology of good quality carp seed production to become sustainable.

The whole study was conducted by in collecting primary data through direct
interview of the concerned farmers of Onda, Simlapal and Taldangra blocks of the district of Bankura following a structured questionnaire schedule. The points raised in the schedule encompasses detailed management informations of fish breeding to identify the level of incorporation of modern management practices which is in combination with the original one; thereby to overcome the difficulties facing with the original technology in its pristine form.

Altogether 20 farmers with ownership of varying numbers of bundhs, comprising a total of 60 numbers of dry bundhs situated in Onda, Taldangra and Simlapal blocks have been covered in the present study which is more than 20% of the functional bundhs of the said blocks (Table 1). Modifications for improving the performances was primarily through changes in the system design as well as additional incorporation of structural components like Chinese hatchery in the existing bundh itself. Soil and water quality parameters were not considered for analyses.

Though the bundh breeding technology is primarily based upon a rainfed concept, about 75% of the bundh breeders supply their bundhs with ground water as well as water from rivers, canals and streams in addition to the natural rain water. Availability of good quality brood fish is a problem faced by more than 50% of the farmers whereas, 35% farmers partially raise their brood fish in their own bundh and collect brood fish from outside sources also.

All the farmers primarily depend upon manuring with cow-dung for providing essential nutrients to water with the dose of application varying widely from 1500kg/ha to 7500kg/ha. About 45% farmers use mainly urea and single super phosphate (SSP) as inorganic fertilizers with no specific dose and frequency.

About 65% of the bundh breeders apply lime (75kg/ha to 375kg/ha) in the bundh for better survival of the fish seeds.

Breeding and hatchery management

For brood fish care, almost all the farmers provide supplementary feed in the form of rice bran and mustard oil cake (1:1 w/w) with no definite dosage. In addition a cake made of whole egg and molasses is also fed to brood fishes.

Some farmers (30%) installed Chinese hatchery adjacent to the bundh for hatching of eggs who undertake breeding operation in the original bundh itself and use only pituitary gland extract as inducer during the pre-monsoon period to increase the breeding response.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the block</th>
<th>Farmers (numbers)</th>
<th>Bundhs (numbers)</th>
<th>Total bundh area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Onda</td>
<td>10</td>
<td>30</td>
<td>1.42</td>
</tr>
<tr>
<td>2</td>
<td>Taldangra</td>
<td>5</td>
<td>18</td>
<td>0.81</td>
</tr>
<tr>
<td>3</td>
<td>Simlapal</td>
<td>5</td>
<td>12</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Table 1. Total survey area with number of farmers and bundhs distributed in the selected three blocks.
Breeding

In all the bundhs, breeding of fish occurs within the bundh itself. The breeding period normally starts with onset of pre-monsoon months (end of March till September) with peak season during June to August.

This study indicated two types of water supply arrangements in the earthen hatchery pits used for hatching of eggs based on their system design. Some farmers provide water to the pits by following the traditional design in which a central supply canal provide water to the small pits (3ft x 2ft x 1ft) arranged on both sides. In this type of arrangement, on each side, the outlet of one hatchery pit is connected to the adjacent pit. So, there is a continuity in the moderate water current produced by the outlet waters.

In a comparatively modern approach, most of the farmers supply water directly to each pit by pumped water without any central canal arrangement. It is to be noted here that the pits are much larger in this case and comparatively deeper but in the same site of the soil as earlier.

The number of earthen hatchery pits in each farm varies from 20-50 whereas, the number of Chinese hatchery in each farm varies from 2 – 7. In a modern approach, several farmers adopted a combined system of both earthen hatchery pits as well as Chinese hatchery for egg incubation.

The stocking density of eggs in each large size (5ft x 4 ft x 2.5ft) earthen hatchery pit varies from 3-5 bati (75,000-1,00,000), where there is a provision of direct water supply from outside sources like rivers, streams and canals. Whereas, in the old types where the pits are supplied with the bundh water, the earthen pits are small (3ft x 2ft x 1ft) and stocking density continued to be very less (1-2 bati, i.e. 25,000 to 50,000 nos.) In the Chinese hatchery such density range varies between 12-16 bati (3-4 lakhs). Some farmers add ‘red soils’ (red laterite soil) to the pits to make it turbid. The hatching percentage in the former ranged from 60-65% whereas, it was much better (76-81%) in Chinese hatchery. Many farmers add ‘red soils’ to the water of the hatchery pits as per their conventional knowledge which is being practiced over the eggs but the rate of survival of spawn is much higher in case of Chinese hatchery (85-90%) compared to that of earthen hatchery pits (40-50%). During high water temperature, the farmers shift the eggs to the deeper part of the bundh (heer) and during overcast condition almost all the farmers agitate the water with bamboo poles, sometimes all through the nights.

Before selling, the spawns are temporarily stocked in comparatively larger size deep earthen pits, partially covered with dried palm leaves to avoid overheating of water. However, in a better approach they are stocked in cemented cisterns with provision for temporary roofing.

Incorporation of hypophysation technique and eco-hatchery (Fig.1) device for incubating the eggs significantly increased the hatching rate (76 to 81%) as well as survival rate of spawn (85 to 90%) compared to the bundhs managing with original traditional technique.

Production of fish seed increased by 37.67% to 72.86% in 75% cases (Fig. 2). When comparing the total seed production by all the respondents, it was revealed that production in the year 2001-2002 was significantly higher ($t = $
It is evident from the present study that bundh breeders of Bankura district are already in the process of modernizing the traditional practice with state-of-the-art technologies like incorporation of eco-hatchery, application of hypophysation technology, modification of the system design of earthen hatchery pits and its water supply arrangement, etc.

To sustain the practice, the bundh breeders of Bankura have integrated their original bundh breeding practice with hypophysation and adopted sympathetic breeding as reported by Sharma (1986) earlier. The combined use of water current and partial hypophysation have bypassed the double injection of female brooders as usually adopted in other breeding practices. The farmers are also deviating from the original system of water inputs from the catchment areas, by making provision for continuous water supply from outside sources. The use of boiled eggs and molasses mixture to feed the brood fish has not been addressed in any of the published literature so far. This is because intake of egg helps in the gonadal development by providing valuable protein like albumin as well as cholesterol which is primarily responsible for the steroidogenesis during the breeding season.

Inspite of many difficulties the seed production has increased by changing the system design and by adopting modern management practices. Therefore, it is clear from the present study that though the bundh breeding technology is very old, it has the potential to substantially supply valuable good quality fish seed as the dry bundhs are inexpensive to build and easy to operate (Rao and Khan, 1978).

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**References**


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