Knowledge Paper Series
UDAIPUR DIVISION, RAJASTHAN
FISHERIES DEVELOPMENT
Knowledge Paper Series
UDAIPUR DIVISION, RAJASTHAN
FISHERIES DEVELOPMENT
Present Status And Future Strategies

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Background

Rajasthan is a landlocked border state of India, sharing the country's frontier with Pakistan in the west and northwest. The State encompassing an area of 3,42,239 km² shows great physiographic variations. Six distinct geographical divisions are clearly discernible. The sprawling western region is arid and virtually a desert land, where no reservoirs are located. The semi-arid region between the Aravalli ranges and the western deserts runs across the state. Southern part of this region is drained by the Luni river, while the northern part remains dry. The Indira Gandhi Canal, carrying water from Bhakra dam passes through this region in the SriGanganagar district. The Aravalli region is undulating hill country dominated by mountains. Taking advantage of the uneven terrain, a large number of small impoundments have been created in the region, especially in the districts of Pali, Udaipur and Sirohi. The eastern region is extensively drained by the Banas River and its many tributaries. This region is rich in industries with a large number of reservoirs, especially in Sawai Madhopur, Bundi, Alwar and Bharatpur districts. The southern region of the State, embracing the districts of Banswara, Chittorgarh, Rajasmand, Jhalawar and Kota consists of stony uplands setting ideal sites for water resources development. The maximum number of manmade lakes are situated in this region. The Chambal ravine region lies along the river Chambal, forming the boundary between Rajasthan and Madhya Pradesh.

Rajasthan is a state of adverse and diverse climatic conditions that call for varying strategies for agricultural and livestock activities. Fishery is not an exception to this as surface water bodies extending from a few hectares to several square kilometers are directly exposed to the challenges of varied environmental conditions. The peculiar agro climatic conditions of Rajasthan and particularly of southern Rajasthan, are diverse and offer opportunity for the gainful exploitation of these aquatic resources. The present fish production from these waters ranges between 40,000 and 50,000 MT per year as against their production potential of over 90,000 MT per year. This low production is mainly due to the unavailability of quality seed, lack of technical inputs, poor awareness programmes and insufficient research efforts. If fish culture is propagated in micro-water sheds, it will optimize the use of these water bodies, improve income of tribal and rural folk, enhance fish production, provide social, economic and food security to the people, generate employment and alleviate poverty, provide self-sufficiency and also the social and financial security to women folk by providing them less labour oriented additional source of income through ancillary fisheries activities such as net making, mending, fish pickling, drying, ornamental fish rearing, etc.
Available Resources and Status of their Utilization

The Udaipur division of Rajasthan, is blessed with vast and varied, natural and created, open and closed inland aquatic resources that harbor a wide range of fisheries and fish diversity. This zone of the state is known for extensive inland water resources that offer suitable environment for the development of fisheries and aquaculture. Existing inland fisheries resources are in the form of rivers, reservoirs, lakes and micro watersheds. The region is also known for its rich fish biodiversity (Fig. 1). Its aquatic system is the natural abode of Indian major carps and most of the economically important freshwater fish species. Fishing in rivers, lakes and micro water sheds for food and income has been a traditional activity in tribal populated Udaipur division. As a result, there is a good population of fishing communities in the state. These communities are highly skilled as they are traditionally engaged in fishing in lakes for their livelihood.

One of the biggest limitations in undertaking planning for development of fisheries sector is the availability of authentic data on various resources and the status of their utilization. In view of this serious limitation an extensive data collection exercise was also conducted by the Central Institute of Fisheries Education, Mumbai (CIFE). These data have been compiled and processed and are now available for use by the Department of Fisheries, Government of Rajasthan. A summarized account of available inland fisheries resources is presented in Tables 1 & 2.

Fig. 1 Important fishes of Udaipur Division

Table 1: Fisheries Resources (Reservoirs) in Udaipur division

<table>
<thead>
<tr>
<th>District</th>
<th>Small Reservoirs (101-1000 ha)</th>
<th>Medium Reservoirs (1001-5000 ha)</th>
<th>Large reservoirs (&gt;5000ha)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rajsamand</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Udaipur</td>
<td>15</td>
<td>3972</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Dungarpur</td>
<td>7</td>
<td>1609</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Banswara</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chittorgarh</td>
<td>25</td>
<td>6159</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>12270</td>
<td>6</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 2: Fisheries Resources (Tanks: micro water-sheds) in Udaipur division

<table>
<thead>
<tr>
<th>District</th>
<th>Small (&lt;1ha)</th>
<th>Medium (1.1-10 ha)</th>
<th>Large (10.1-100ha)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rajsamand</td>
<td>517</td>
<td>441</td>
<td>1776</td>
<td>1093</td>
</tr>
<tr>
<td>Udaipur</td>
<td>370</td>
<td>338</td>
<td>2588</td>
<td>1210</td>
</tr>
<tr>
<td>Dungarpur</td>
<td>317</td>
<td>292</td>
<td>2732</td>
<td>1122</td>
</tr>
<tr>
<td>Banswara</td>
<td>346</td>
<td>142</td>
<td>73</td>
<td>439</td>
</tr>
<tr>
<td>Chittorgarh</td>
<td>627</td>
<td>469</td>
<td>1330</td>
<td>1050</td>
</tr>
<tr>
<td>Total</td>
<td>2177</td>
<td>1682</td>
<td>2268</td>
<td>4914</td>
</tr>
</tbody>
</table>

Fisheries Reservoirs

There are 60 reservoirs in Udaipur division covering a total water spread area of 93,410 ha at FSL. The Fisheries Department, Government of Rajasthan classified reservoirs as small (<1000 ha), medium (1,000 to 5,000 ha) and large (>5000 ha) for the purpose of fishery management. Out of the total, 11 reservoirs with water spread area of 81,140 ha are under the management of Department of Fisheries, and the remaining 49 reservoirs (12,270 ha) are managed by the Panchayat Raj Department. The average fish yield of the reservoirs of Udaipur division is relatively poor to the tune of about 56,176 and 286 kg/ha/yr from large, medium and small reservoirs respectively. Though the mean production from reservoirs of Udaipur division is above national average, it is still below the production potential (Table 3).
Fisheries in Tanks
In Udaipur division, a large number of natural and created water tanks (micro water sheds (> 4500 numbers over >25000 ha area)) are available which were basically created for water harvesting. Beside this, incidental to providing jobs to rural poor communities and with the objective of creating productive assets of water harvesting and holding structures including ponds have been renovated or constructed under MGNREGP support. Such ponds and other water bodies developed under MGNREGP are additional resources which are used for rearing of fish seed as well as for food fish culture depending upon the size of ponds and period of water availability. However, large number of these water resources (~50%) are still unused for fisheries. Not only this, the tanks used for fish production are harvested below the production potential (Table 3).

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Category of Water Body</th>
<th>Fish Production (kg/ha/year)</th>
<th>Production</th>
<th>Potential</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoir</td>
<td>Small</td>
<td>286</td>
<td>500</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>176</td>
<td>250</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>56</td>
<td>100</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Tank (Micro Water shed)</td>
<td>Small</td>
<td>1600</td>
<td>3000</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>1000</td>
<td>3000</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>250</td>
<td>1500</td>
<td>1250</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Potential Fish Yield Gap

Fish Culture Practices
At present, scientific fish culture is yet to take full leap in Udaipur division. Stocking mainly of fry or spawn size seed in different densities is the most common practice. The seed is mainly procured from MPUAT, Udaipur, RTADCT Ltd Jaisamand, DoF Farm, Gujarat and U.P. Further, neither fertilization / manuring nor feeding is practiced by lease holders. The same is the case with availing benefits from one or the other government schemes aimed at increasing fish production.

Causes of Low Fish Production in Udaipur
The low production fish production in Udaipur division is mainly due to
- Unavailability of quality seed
- Poor extension network
- Lack of technical inputs
- Poor awareness programmes

Some Basic Issues of Rajasthan Fisheries
- Recurrent drought and drying up of water bodies
- Absence of perennial rivers
- Slow pace of scientific and research support

On an average about 40,000-60000 spawn or 10,000-15,000 fry or 2,000-2,500 per ha fingerlings are usually produced.
There is enormous scope for the development of aquaculture in Udaipur division. The data collected from the division indicate that only 48% of the community ponds owned by Panchayats are currently utilized for aquaculture. About 13 thousand ha of ponds are still lying unutilized as they are not leased out. The data also show that the number of private ponds are scanty. It shows that very little efforts have been made to promote aquaculture as a promising farming option for farming households. In the neighbouring states of Gujarat & MP, the number of private ponds are much higher than the ponds owned by Government or Local Government bodies and the number is steadily increasing. A large number of farmers and entrepreneurs of Rajasthan have been inspired by neighboring state farmers’ achievement in terms of fish production, productivity and profitability. There is now tremendous response and interest among the farming communities, educated youth and entrepreneurs in aquaculture. To explore the aquaculture expansion potential in Udaipur division, the SWOT analysis (extremely useful tool for understanding and decision-making for various situations) was performed by the MPUAT and the outcomes are described here.

**Strengths**
- Vast and varied unutilized and underutilized natural resources
- Human asset: Presence of large population of traditional fishing communities with rich indigenous traditional knowledge
- Local availability of critical inputs required for aquaculture: Large population of buffaloes, cows and other livestock animals offer easy availability of organic manure – a basic input for aquaculture. Major ingredients of fish feed such as oil cakes, maize, soya bean, etc. are extensively produced in the state.
- Presence of state level institutions (College of Fisheries, MPUAT-Udaipur and Fisheries Training School at the state government’s, Udaipur) dedicated to the development of fisheries.
- Assured market for fish: Fish is one of the choicest food items for tribal and the non-vegetarian population of the state.

**Weaknesses**
- Both aquaculture and identified fisheries resources are largely utilized and following traditional practices resulting in low fish productivity. On the other hand, sustainability has also become a major concern in case of reservoirs due to overfishing, destructive fishing, habitat loss and environmental degradation.
- Shortage of staff: Shortage of professional and field staff is seen as a significant bottleneck.
- Technical and traditional knowledge related to ecology and fisheries of natural resources, especially the reservoirs system, are on back foot resulting in destruction of habitat, degradation of ecosystem and loss of fish diversity at rapid rate resulting in loss of livelihood among traditional fishing communities.
- Paucity of quality seed: Against the total projected demand of 1100 million fry, the current production is
Opportunities

- Lack of crop insurance: Aqua farming insurance on the line of agriculture crop insurance is yet to be introduced in aquaculture, though this has been introduced in some states.
- Social taboo: There is a social taboo against the sector as well as those associated with it, whether fishers, farmers or field officers.
- Low and erratic rainfall: and increasing water use from rivers, reservoirs, lakes and community tanks for irrigation result in drying up of aquatic ecosystems leading to near collapse of fisheries.

Ornamental fish is becoming increasingly popular and there is also increasing demand for aquaria, accessories and aquarium fishes in the division.

- Preference for locally grown fish: There is high preference for locally grown fish which fetches at least 10-20% higher price than those coming from outside the state. Locally grown fish also offer opportunity to sell live fish in the market which fetches 50% more price than normally sold iced fish. With the growing concern for quality and food safety standards among urban consumers the live fish market is growing.
- Diversification of aquaculture: There is a growing interest among the local farmers to diversify aquaculture through culture of new candidate species like pangasius, giant freshwater prawns, monosex tilapia, etc. There is a great potential for culture of pangasius and tilapia in the state. Both pangasius and tilapia fillet have substantial domestic and export market potential.
- Growing demand of quality fish seed: There is a great opportunity in the area of fish seed production enterprise. Awareness is building up towards stocking of fingerlings instead of fry. There is huge opportunity for fish seed production enterprise to meet the growing demand. This area has the potential for establishing a number of new hatcheries.
- Increasing area of water bodies in the form of ponds, dams and small irrigation reservoirs: MGNREGP the flagship programme of the GOI, offers unprecedented and immense opportunities for the development of aquaculture and fisheries. By providing guaranteed rural employment of 100 days to the BPL family, this programme also aims at creating permanent and productive assets / infrastructure and while doing so a significant amount of efforts are also being directed towards harvesting and holding rainwater through desilting / renovation of existing water bodies, construction of new ponds / tanks and dams, etc. Proper convergence with MGNREGP with that of fisheries is bound to create a massive impact on water availability, recharging of ground water table as well as enhancement of water availability of genetically vigorous quality seed.

- Huge untapped and underutilized potential for aquaculture and culture based fisheries: All water bodies available in the form of ponds, tanks and reservoirs are yet to be brought under the development of aquaculture, and culture based fisheries A number of reasons are assigned for this delay and these include multi-ownership and lack of enabling and encouraging leasing policies. Through strengthened extension services system, creating mass awareness, transfer of appropriate technologies, enhancing the capacity of farmers and fishers and bringing out desired reforms in policy and leasing system, there is tremendous opportunity for increasing fish yield and overall fish production.

- Wide gap between fish yields: The current level of annual fish yield in tanks in Udaipur division is 250-1600 kg/ha/yr which is much less than the potential fish yield demonstrated by research institutes. By strengthening the extension services system there is a good possibility of improving the existing farming technology practices resulting in higher fish yield and production.

Threats

- There is a growing competition for use of water among various sectors such as irrigation, industry, and domestic uses. This may drastically reduce availability and allocation of water for fisheries and aquaculture.
- Impact of climate change appearing in the form of erratic and deficient rain, more frequent spells of severe drought and flood, widening gap between minimum and maximum temperatures, etc. affect severe damage to aquaculture and fisheries in several ways.
- Threat to fish biodiversity in reservoir ecosystems due to introduction of exotic fishes.
- Incidences of poisoning of ponds, poaching of stocked fish in ponds, lakes and reservoirs, etc. are frequently reported. If not checked firmly, it would hold back fisheries and aquaculture development activities.
- Gradual siltation of ponds and reservoirs would require sizable amount of money for renovation.
- Illegal and forceful extraction of water from seasonal ponds for irrigation of crops.
- Risk of entry of disease entities through live fish seed brought from outside the state.

Lack of crop insurance: Aqua farming insurance on the line of agriculture crop insurance is yet to be introduced in aquaculture, though this has been introduced in some states.

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Low and erratic rainfall and increasing water use from rivers, reservoirs, lakes and community tanks for irrigation result in drying up of aquatic ecosystems leading to near collapse of fisheries.

A Fish seed certification policy is also required to be enforced to ensure availability of genetically vigorous quality seed.

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- Low and erratic rainfall and increasing water use from rivers, reservoirs, lakes and community tanks for irrigation result in drying up of aquatic ecosystems leading to near collapse of fisheries.
Comprehensive State Action Plan has been prepared keeping in view the guidelines issued by the Government of India for ‘National Plan of Action, 2020’ under Integrated Development and Management of Fisheries under Blue Revolution. In addition to this, for the encouragement of private investment, three MoUs worth Rs. 210 Crore have also been signed. M/s West Coast, Mumbai and Niva Aero Solutions, Chennai are executing the first two MoUs for 4000 cages in Mahi Bajaj dam and 1000 cages in Jaisamand dam in Udaipur division respectively. The other MoU for farming of prawns in Churu district has also been conceptualized looking to the abundance of salty water in the region.

Besides this, for the upliftment of tribal fishermen, an ambitious livelihood model scheme has also been started in three reservoirs of Jaisamand (Udaipur), Mahi Bajaj Sagar (Banswara) and Kadiana Back Water (Dungarpur) in the tribal area. In this model, the lift contract is given to the highest bidder under which the whole amount is transferred to the bank accounts of the fishermen as per the rate of more fish catch. This rate is highest in the country.

The department is also implementing the fish developmental work such as fish seed, storage, fish net subsidy and strengthening of societies of the above selected reservoirs. The department has opened three new offices at Jaisamand (Udaipur), Mahi Bajaj Sagar (Banswara) and Kadiana Back Water, Sagwara (Dungarpur). Under this model, approximately 6282 fishermen of more than 49 tribal fishermen cooperative societies have been benefitted and the income of the fishermen have increased many fold.

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Future Strategies for Fisheries Development

With due regard to potential for growth, aquaculture deserves prioritized attention. The core strategy should be to expand and intensify fisheries by utilizing unutilized and underutilized natural and human resources available in the Udaipur division. To achieve these, we need to ensure effective and efficient extension services system in place; easy availability of critical inputs such as seed and feed; incentives in the form of subsidy for pond construction/renovation, policy to encourage entry of entrepreneurs, fisheries professionals, investors and educated youth; mainstreaming fisheries in the existing farming practices for optimizing water and other inputs use, as and where appropriate; training to develop technical and managerial skills in operating fisheries business.

Looking at the available resources and their present utilization status, there would be two separate approaches for the overall development of fisheries sector in Udaipur division. The first is to develop fisheries for livelihood of local tribes by the state government and, the second, to invite investors to take more advanced farming systems such as cage fish farming in large reservoirs, recirculating aquaculture system and fish processing & value addition.

(A) First Approach: Fisheries Development for Livelihood Security

For the sustainable use and gainful harvesting of available aquatic resources, the following strategy needs to be implemented:

**Development of quality seed production infrastructure:** In order to bring all the available effective water spread area under scientific fish culture with optimum stocking density, 1200 million fry are needed every year. The total average seed supply is only 30% of estimated seed requirement. Further, only 25% of the present seed supply is met within Rajasthan, while the remaining is brought from other states mainly from Bareilly and Ramgarh region of U.P., Kokata region of West Bengal and Bharaurch and Surat regions of Gujarat. Within Rajasthan, the public sector hatcheries and seed farms supply only 13% of the total, while another 12% comes from private hatchery as well as the rearing in private sector.

There are 28 government hatcheries/seed farms in the state. In addition, there are 5 more hatcheries in Rajasthan: one at college of Fisheries, Udaipur; one with RTADC, Jaisamand and three private hatcheries viz. Chaudhary Fish Hatchery, Hanumangarh, Lupin Fish Hatchery, Bharatpur and Thar Fish Hatchery, Chittorgarh, Bikaner.

To meet the state fish demand, the following action plan is proposed:

**Establishment of hatchery farms:** Minimum six hatchery units (one in each district of Udaipur division) need to be established in areas where good quality water is available.

**Development of decentralized seed rearing units:** Looking to the agro-climatic and soil conditions of Rajasthan, it would not be possible to take both seed production and rearing activities at the same farm. Therefore, the cluster based approach (Fig.4) for seed rearing should be adopted by developing decentralized seed rearing units.
Reservoir Fisheries Management

In Rajasthan about 60% of the total fish production comes from reservoirs and the rest from tanks and ponds. Resource wise average productivity is 56 kg per hectare. Productivity from reservoir is above the national average. However, there is great potential to harvest above 100 kg/ha by adopting scientific reservoir management tools. Suitable techniques for enhancing reservoir productions are as below:

- **Adoption of ecological based fisheries management technology:** The stocking numbers and species to be stocked should be decided on the basis of water quality and productivity status.
- **Cage and pen culture in lakes and reservoirs:** By adopting cage and pen fish farming system in large reservoirs a production of 10 to 15 kg/m³ can be achieved, which is ten times higher than pond fish farming.
- **Seed rearing near the reservoir for stocking quality seed:** Availability of stocking material (advanced fingerlings of >60 mm) is always a problem. In case, the seed is transported from long distances, its survival after stocking is always doubtful due to environmental stress. Therefore, to enhance the reservoir production, the quality seed should be reared closer to the reservoir periphery.

Promotion of culture based fishery in micro-water sheds

In Rajasthan large number of micro water sheds (>1 lac ha) have been constructed for water harvesting, irrigation, etc. These resources are ideal for the development of culture based fisheries. The mean production from these resources is less than 1000 kg which can be increased upto 2500-3000 kg/ha/yr by managing proper stocking material and partially feeding and manuring technique.

Fish Culture in Seasonal Ponds

In seasonal waters, the culture of native carps is not possible because the culture period for these species is about one year. For the same reason, these waters are not used for aquacultural purpose. However, these waters resources can be used for Tilapia and common carp culture. These two species have a high demand and attain marketable size in 4-6 months. Therefore, the culture of Tilapia and common carp would be gainfully adopted in seasonal ponds.

By adopting cage and pen fish farming system in large reservoirs a production of 10 to 15 kg/ m³ can be achieved.

Development of Backyard Ornamental Units

Development of backyard ornamental would be a profitable venture to provide employment and livelihood to house wives. For this, both exotic (Goldfish, koi, platy, mollies, etc) and native fishes of Udaipur division (Gouram, loaches, Rasbora, glassfish, etc. should be considered.

**B) Second Approach: Involvement of Investors in Fisheries Development**

Private investment can be sought for development of following three sectors of fisheries, the involvement of investors is most for gainful exploitation of aquatic resources:

- Cage Fish Farming
- Recirculating Aquaculture System
- Fish Processing and value-addition
Cage Fish Farming: Though attempts have been made by the state fisheries department and MPUAT-Udaipur, cage culture is yet to become popular in Udaipur division. Economic factor is the main constraint in popularization of cage culture. Beside the initial high cost of cage installation, the recurring cost on seed and feed is also very high. Because of this, the poor farming community is unable to adopt this profitable fish farming system. In view of this, the five major reservoir of Udaipur division may be allotted to investors for cage farming. This approach will not only enhance the state fish production but also provide employment to large number of local tribal families.

Recirculating Aquaculture System: The recirculating aquaculture system has been found most profitable fish farming system for the areas where water scarcity is high and water retention capacity of the soil is very low. For this system, land and water requirement are very low. Approximately, for 300 m³ land, 10-12 lakh liter water is sufficient for producing 15-16 metric tonnes of fish in a production cycle of 6-7 months. Not only this, it is a very profitable farming system because recurring expenditure and profit ratio is almost 1:2. However, due to highly technical farming system high initial establishment cost (>25 lakh), the poor farming community of this region is unable to take up this venture. Therefore, the investors should be motivated to initiate this activity in Udaipur division.

Fish Processing and value-addition: In Rajasthan, on an average 40-50 thousand metric tonnes of fish is produced every year. Out of the total catch, major carp, catfish, minor carps and others share are 55, 27, 12 and 6 per cent respectively (Fig.8). The two groups “major carp and catfish” fetch a good market price in fresh conditions. However, 18% catch of minor carps and others (5 to 6 thousand tonnes) hardly get Rs. 35-40 /kg. In view of this, there is an urgent need to establish a processing unit in Rajasthan and particularly in Udaipur division so that the low priced fish would be processed for higher returns.

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