

The TAWA Reservoir Fisheries Management: Experiences and Options

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Abstract: *In developing economies, open water inland fisheries not only plays an important role in the nutrition for the poor, but also provide livelihood for many people engaged in fisheries. Reservoir fisheries assume importance to understand the CPR nature of the resources and requires analytical framework to describe the management of them toward an equitable, efficient and sustainable end. A system, which delivers or ensures these, becomes a reliable response to the institutional requirements in CPR type of resources in general and reservoir fisheries in particular. In the case of reservoir fisheries we identify various types of institutional regimes. Each regime has its advantages and disadvantages in terms of allocation of rights, appropriation of the fish resource and distribution of income. In India, these institutions can be broadly framed into three categories, namely, state, private and cooperative managed regimes. Each regime has diversified activities relating to stocking, production, collection, transportation, marketing and distribution of products, income and profit. These factors are driven by opportunities and uncertainties, though.*

Madhya Pradesh state has thirty-two medium and five large dams has experienced various management regimes in the last three decades. We could identify and attempt to understand in this paper four different regimes; these include the fisheries department of the state, MPFDC (Madhya Pradesh Fisheries Development Corporation), Co-operative federations and private contractors. The attempt here is to understand functionalities and regimes change in the case of Tawa reservoir in Madhya Pradesh. The analysis contrasts productivity (efficiency criterion), wages and employment (equity criteria) and stocking production and technology use (resource sustainability criteria) across different regimes. Further, the paper details the management practices under the Tawa Matsya Sangh (TMS) and emphasises that management practices should be integrated with the understanding of resource base.

Introduction

In a developing economy context, open water inland fisheries not only plays an important role for the diet and health of the population, but also the livelihood of many people engaged in this activity. Broadly, the open water inland fisheries can be divided into five categories, namely, riverine fisheries, reservoirs, aquaculture water bodies, estuaries, and flood plain lakes. The fishing practices also vary in these ecosystems. Usually, riverine fisheries are based on capture activities where regeneration of fish is left to the nature. The large and medium reservoirs are generally managed as stocking-cum-capture fisheries resources, whereas, small reservoirs and aquaculture water bodies are usually managed through culture practices. Estuaries are based on capture fisheries and flood plain lakes have both the components of culture as well as stocking-cum-capture fisheries.

India is one of the countries in the South Asia that has a large share of open water with rich and complex fisheries. She has around 340 million hectares of riverine catchments for fisheries; another six million hectares area is under open water fisheries in different reservoir, aquaculture in small ponds, estuaries and flood plain system. Over the last fifty years, the extent and share of inland fisheries in total fish production has increased by many folds. Despite the significant increase in inland fish production, it seems impossible to meet the projected demand of 14 million tonnes by the year 2005, more than twice the amount of current production (*Bhattacharya, 2002*). Inland fisheries need specific attention in the

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context of India due to the following reasons. First, fish production through inland fisheries largely caters the needs of the domestic consumption as against marine fisheries, which is primarily produced for export. An estimate of resource potential by the fisheries division of Ministry of Agriculture, Government of India, suggests that inland sector has a potential of 4.5 million tonnes as against 3.9 million tonnes of marine sector (fisheries Statistics, 1993). Therefore, an increase in the production of inland fisheries would bridge the gap between domestic supply and demand while catering to the nutritional requirements of the populace. Second, inland fisheries are an important source of employment. There are about 2 million people in India engaged full time in fishing and another 4 million people as part-time or occasional fisherwomen or men (Fisheries Statistics, 1993). A third dimension relating to open water inland fisheries is that the relative importance of inland capture fisheries is declining with a corresponding increase in the culture fisheries. Government policies are partly responsible for such trend. Fourth, India has a vast potential of open water fisheries, which with proper institutional, technical and financial support could contribute to the fulfilment of multiple developmental goals³. The learning process of institutional arrangements and requirements for open water fisheries would provide substantive understanding on the management of this sector, which is for a long time has been neglected.

Indian Scenario

The last fifty years the extent and share of inland fisheries in total fish production has increased many folds. Table 1 gives the quantity of fish production in last five decades.

Table 1: Trend in Inland fish production and its share in total fish production

Year	Inland production (in '000 tonnes)	Total production (in '000 tonnes)	Percentage Share
1950-51	218	753	28.95
1960-61	280	1160	24.14
1970-71	670	1756	38.15
1980-81	887	2442	36.32
1990-91	1536	3836	40.04
1996-97	2400	5300	45.28

Source: Handbook of Fisheries Statistics (1994)

Despite the significant increases in inland fish production it seems impossible to meet the projected demand of 14 million tonnes by the year 2005. If only the domestic consumption is taken into account, the deficit ~~between-in~~ production ~~and consumption~~ is ~~felt evident~~ from 2003 onwards. In this context, inland fisheries play an important role due to its rising share in the composition of total fish production. ~~In order-T~~to bridge the gap between the supply and demand ~~situations~~ it is essential to evolve effective policy instruments to boost production.

Inland fisheries need specific attention in Indian context due to two ~~important~~ reasons. First, its share in total fish production is increasing over the years and, second, the potential ~~is high of production is high in the case of inland fisheries~~ compared to ~~that of~~ marine fisheries. Within inland fisheries, reservoirs ~~specifically~~ have ~~very~~ high potential of productivity ~~in-comparison-compared~~ to their present productivity levels. Therefore, this resource system needs a closer observation, ~~in order to understand the gaps between potential and actual level~~

³ These goals include reducing poverty by generating employment and income, promoting sustainable development by sustaining the resource base, enhancing welfare of the society by equitable share of income, and creating efficiency in production through proper technical and institutional services which can ensure output to cater to the increasing demand.

Table 2: Projected Demand Supply situation of fisheries in India

Year	Fish production (1)	Inland contribution (2)	Total Demand (3)	Domestic consumption (4)	Export (5)	Difference (3-1) (6)
2001	5909	2648 (44.81)	11030	5745	5285	5121
2002	6094	2739 (44.95)	11732	6065	5667	5638
2003	6279	2829 (45.05)	12548	6500	6048	6269
2004	6463	2920 (45.18)	13386	6955	6431	6923
2005	6648	3010 (45.28)	14127	7315	6812	7479

Note: Figures in the brackets are percentage share of inland fisheries to total fish production.

Source: Compiled from Bhattacharya (2002)

Issues in Reservoir Fisheries

Riverine, reservoirs and aquaculture are the main sources of inland fisheries. Riverine fisheries being capture based, productivity ~~is~~ largely depends on natural regeneration of fish resources. Often, open access system describes its institutional form. On the other extreme, aquaculture bodies are often privately owned and productivity depends on private initiatives on investment and economic efficiency factors. Reservoir fisheries, or ~~in better words~~ stocking-cum-capture fisheries, having all attributes of common pool resources are placed between these two extremes⁴. Reservoir fisheries ~~though~~ are analytically a complex issue; ~~but, yet,~~ physically they are manageable unlike riverine fisheries. In the case of riverine fisheries, ~~the~~ spread of river and flow nature of the fish resource makes it difficult to manage the resource base directly, which is not the case with reservoir fisheries. ~~On the other side,~~ Reservoirs (specifically medium and large ones) are too huge to manage at individual capacity as in the case of aquaculture water bodies. Therefore, reservoir fisheries are classic examples of common pool resources, which has the characteristic of rivalry in consumption on the one hand, and non-excludability of resource extraction on the other. In this context, reservoir fisheries assume importance to understand the CPR nature of the resources and requires analytical framework to describe the management of the resource towards an equitable, efficient and sustainable end.

Physical characteristics, socio-cultural environment and the institutional arrangements for managing fish production and associated activities are the most important factors in determining the productivity of the reservoirs. On an average, small reservoirs have better average yield compared to medium and large ones. In some small reservoirs culture fisheries is followed against usual stocking-cum-capture fisheries in medium and large reservoir. Therefore, small reservoirs in general are not strictly comparable with other two types due to differences in the nature of fishing.

Fishery scientists also believe that the present low level of fish production in Indian reservoirs can be attributed to ~~inadequate~~ ~~poor~~ management in ~~as~~ ~~much~~ as many of them have high propensities of production (Sugunan, 1995). Proper management system can enhance the productivity of the Indian reservoirs from an average 20kg/ha/year to 100, 75 and 50 kg ha⁻¹ per year in small, medium and large reservoirs respectively (Sugunan, 1995). Table 3 shows the yield variation in different sizes of reservoirs in India. The average level of production in small medium and large reservoir is far below the expected productivity level. Only in small reservoir case, some ~~reservoirs~~ have achieved the average expected productivity level. This, however, has not happened in medium and large reservoirs.

⁴ Technically, aquaculture bodies and reservoir are not comparable. Aquaculture bodies are those water sources where fish culture is practiced. Even in the case of small reservoirs aquaculture could be practiced. On the other hand, in medium and large reservoirs stocking -cum-capture fisheries is practised. This also can be practiced in large water bodies like tanks that are not necessarily reservoirs. Therefore, we assume aquaculture bodies are usually small which may include small reservoirs also. Similarly, medium and large reservoirs are comparable with large water bodies like tanks as far as stocking-cum-capture fisheries is concerned.

Table 3: Yield variation in Reservoir Fisheries in India according to their size

Yield*	Small	Medium	Large	Total
Average	49.90	12.30	11.44	18.12
Standard Deviation	54.62	7.38	10.69	12.45
Coefficient of Variation	109.46	59.99	93.47	68.68
Maximum	188.00	24.47	35.55	36.48
Minimum	3.91	1.90	0.11	0.05

Note: * yield in kilogram per hectare per year

Source: Computed from Sinha and Katiha (2002)

Given the biophysical constraints, socio-cultural environment like consumption behaviour, traditional knowledge of fishing techniques, historical presence of fishing communities also add to productivity of the reservoir. Therefore it is ~~impedingly~~ important to understand the institutional characteristics of reservoir fisheries to evaluate factors responsible for productivity of the reservoirs and consequent formation of collectives to manage the fish resource.

Since reservoir fisheries are based on capture-cum-culture practice ~~and the fact that, fish stocking becomes an important factor to determine fish production. As~~ reservoir fisheries show the CPR characteristics, institutional initiative is prerequisite, ~~for adequate fingerling stocks in order to enhance productivity of the resource base. The institutional initiative can be understood in terms of creating conditions for collective action in the community level and other institutional facilities from government and other non governmental agencies.~~ Following aspects play important role in the evolution of collective action in the case of reservoir fisheries:-

- > Technological extension services and innovation in technology to enhance production
- > ~~Preventing catch of Barring~~ certain kinds and sizes of fish ~~from production~~ to sustain the reproductive capacity of the resource.
- > Adequate storage, transportation, and marketing facilities for efficient disposition of fish and enhancing revenue.
- > Mechanisms to ~~redistribute~~ the ~~income-revenues~~ equitably.

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A system, which delivers or ensures the above-mentioned services, becomes a reliable response to the institutional requirements in CPR types of resources in general and reservoir fisheries in specific. In the case of reservoir fisheries we identify various types of institutional regimes. Each regime has its advantages and disadvantages in terms of allocation of rights, appropriation of the fish resource and distribution of income. In India, these institutions can be broadly framed into three categories: ~~namely,~~ state, private and cooperative managed regimes. Each regime has diversified activities relating to stocking, production, collection, transportation, marketing and distribution of income and profit. These factors are again driven by opportunities and uncertainties. For example, if there is a private regime for an uncertain period, the party may intend to maximise its profit in the short-run. Therefore, it may continue with high fish catch irrespective of ~~kind-type~~ and size. Similarly, the private party may not have incentive to drop required numbers of fingerlings in the reservoir. On the other hand, state regime ~~may~~ turns out to be inefficient due to ~~high possibility of systemic indifference, corruption~~ and absence of ~~of any~~ incentives to perform ~~well~~. Cooperative regime may also fall into the similar prey of the state regime. Therefore, these systems may not be ~~full-fool~~proof in terms of efficiency, equity and sustainability of the resource base. In a private regime, the contractor or private party develops its own device to monitor the reservoir from others to catch fish. It employs the fisher folks from the region or from outside on wage basis.

In ~~the~~ state managed systems, ~~traditionally~~ fish catching ~~activities- was on the basis of~~ ~~can be on the basis of~~

rights to communities of fishermen settled near the water body and in some cases rights were conferred even to individual fisher folk. Of late, however, formation of cooperatives is being emphasised in the state managed systems. These cooperatives could either be or through formation of primary cooperative society on wage or (catch) share basis. Many of the state governments also involve themselves. Similarly, state can directly involve itself in transportation and marketing (under the wage based system). There are instances now of or can privatising e-some or all these aspects/stages. Some of these are. This can be true for cooperative regimes too. However, cooperatives function strictly through the formation of primary society whose representatives and others form the federation of the primary societies. Both the state and cooperative regimes have the possibility of higher overhead costs leading to inefficiency. On the other hand, cooperatives if and when are-managed managed-well can-provide better income returns to for the fisher folks. The CPR nature of the resource therefore requires a model, which can optimise in terms efficiency in production, equitability in e-distribution of income and sustainability of the resource. We attempted to understand a few of these factors in our-taking the case study of Madhya Pradesh. A case-in-point to be emphasised is here-is that resource base and institutions governing it are intertwined and inseparable and found to jointly affect the outcomes. However, Bbefore getting into the specifics of the case it would be worthwhile to discuss the institutional arrangements in reservoir fisheries in various states in India is discussed.

Institutional Arrangements of Reservoir Fisheries in India

Institutions in reservoir fisheries are of varying in nature in different states of India. The system of leasing rights and fishing rights also vary from state to state. Even within same-a state leasing and fishing rights vary from between reservoirs to reservoir. Usually, in most of the states, the Department of Fisheries or State Fisheries Development Corporations obtain the fishery management rights from the reservoir authorities by paying a nominal amount or royalty (and in cases -or without any payment at all). Fishery Departments or Corporations in-turn either manage the the fisheries system themselves or lease out the reservoir for a definite a-particular period ranging from a few months to a few years and receive ing a royalty. The Leasing arrangements of the fishing rights is-are different in different states, though. These include departmental fishing, fee based or free license fishing, free license fishing, share system, open auction to cooperatives or private parties with or without rendering any fisheries development services (Sinha and Katiha, 2002, for details see, Appendix Table 2). Sinha and Katiha (2002) list the leasing systems and fishing rights in different states, which is shown in the appendix table 1.

From the appendix table 1 we find that In fact, many states follow multiple systems of leasing and fishing rights (Appendix Table 2). To understand appreciate the implications of different management regimes a few factors should be understood clearly. First, stocking is an integral part of reservoir fisheries, which follows a stocking-cum-capture pattern, evidently i- If stocking is neglected it will have adverse effect on the output is adversely affected. On an average, two years time lag is followed for fingerlings to mature into a well-grown fish. Second important factor is the output and productivity of the reservoir. Third factor is associated with the marketing and income from the fisheries and the fourth factor is distribution of income distribution; i.e. the number of human days of employment the fishing activity could generate and the share of income of the fisher folk. Where-While the first factor is associated with sustainable resource use, the other three denoterepresent efficiency in production and equity in distribution of income. All these factors have to be understood under different institutional domains in order to develop a meaningful understandingperceptive of the institutions involved in fisheries management of the reservoirs. We attempt to understand recognize these factors in the case of Madhya Pradesh reservoir fisheries.

Reservoir Fisheries Management in Madhya Pradesh

Madhya Pradesh⁵ having thirty-two medium and five large dams has more than 32 and 10 percent area of the total medium and large dams in India respectively. Fisheries activity in the state is largely based in the reservoirs.

⁵ Chhatisgarh, which was earlier part of Madhya Pradesh, became a separate state in the year 2000. Here we have considered both Madhya Pradesh and Chhatisgarh together.

Madhya Pradesh has undergone various management regimes in the last three decades.

There were four different regimes, which encompassed the Madhya Pradesh fisheries management at different points of time. ~~In the pre-Before 1979- stage~~ it was the state fisheries department ~~of the state which that~~ used to manage fisheries, ~~specifically in terms of stocking, and giving~~ leasing and fishing rights to ~~different~~ fisher folk or primary co-operatives. In 1979 MPFDC was formed which became the nodal agency for fisheries management in reservoirs. It also extended its services in providing extension services and marketing. In initial years MPFDC itself used to procure the fishes and transport it to distant ~~ee~~ markets. However, due to recurring losses in transportation, MPFDC started calling for tenders from private parties to lift the fish from different sites of the reservoirs. In early part of 1990, MPFDC went a step ahead and leased out the fishing rights too. During this period, it called for tenders and contracted out the ~~fish~~ catching to the private parties on royalty basis ~~on from yearly basis to year~~. Madhya Pradesh *Matsya Mahasangh* (Fish Federation) replaced MPFDC in the year 1999; ~~and~~ this fish federation is now responsible for management of fisheries activities in all the reservoirs except ~~for~~ Tawa. ~~This way-Thus~~, fisheries department, MPFDC, Co-operative federations and private contractors formed the four major regimes in different reservoirs. For ~~one a year, in~~ 1995-96, there was no institutional regime in Tawa reservoir. This can be treated as a period of open access, which formed another dimension of the property regime in the fisheries history in the reservoirs of Madhya Pradesh.

Among the different regimes, Fisheries Department and MPFDC regimes broadly represent the role of public ~~sector, sector~~; co-operative regime reflects the people's management and contractor regime ~~reflects~~ the role of private sector in fishing management. Understanding of these three domains i.e. public, private and cooperatives ~~can would~~ give a comparative perspective of functioning of the regimes in terms of productivity, financial management, wages and employment and sustainability of the management system. This ~~may further may~~ enable one to identify the institutional strengths and shortcomings of different regimes, which can be ~~born-borne~~ in mind while designing institutional needs for management of reservoir fisheries.

The Case of Tawa

The Tawa reservoir ~~was is~~ constructed on the river Tawa, a tributary of ~~The R~~iver Narmada. The construction of Tawa Dam was started in 1956 and ~~was~~ completed in 1974 and fish production started in the reservoir in the year 1975 by the state government. It was transferred to Madhya Pradesh State Fisheries Development Corporation, which was continued till 1994.

Table 4: Basic Features of Tawa Reservoirs

Reservoir	Tawa
River	Tawa <u>on The Narmada</u>
District(s)	Hoshangabad
Number of Displaced Villages	44
Reservoir Area in ha (At full tank level)	20 050
Reservoir Area in ha (At minimum level)	4 240
Average Reservoir Area in ha	12 145
First year of Fishing	1979
Management regimes of Fishing	Fisheries Department (1975-79) MPFDC (1979-94) Contractor (1994-95) Free Fishing (1995-96) Cooperative Federation (1996 onwards)
Average Productivity* (1990 to 1995)	10.60

Note: * productivity in (kg/ha/year)

Source: Sunil and Smita (1996)

The local community was not involved in fishing activities during these periods and fishing was carried out mostly by employing fishermen hired from outside. In 1994, the reservoir was auctioned to a private contractor from Bhopal ~~(-the state capital)~~, who brought his ~~force~~ muselmen of people from the city to ~~prohibit~~ exclude the local

villagers from fishing in the reservoir. The local communities were not even allowed to catch fish from the reservoir for their self-consumption. Such denial of access to ~~their own~~ resource and other displacement related problems due to declaration of the ~~surrounding~~ forest ~~areas surrounding~~ as Wildlife Sanctuaries, ordnance factory, and army firing test range created unrest among local communities, who organised protest under the leadership of a non-government organisation called *Kisan Adivasi Sangathan* (Tribal and Peasant's Association). Being displaced from their homeland and in search of their livelihood the tribals who were settled in upper lands gradually learned the art of fishing.

Under the leadership of *Kisan Adivasi Sangathan* the local communities demanded exclusive fishing rights over the Tawa Reservoir. As a result of prolonged struggle, the government agreed to their demands and an agreement was signed on October 1996 between Madhya Pradesh State Fisheries Development Corporation and *Tawa Visthapit Adivasi Matsya Utpadan Evam Vipanan Sahakari Sangh Maryadit* (Tawa Displaced Tribal Fish Production and Marketing Cooperative Federation Limited). This gave birth to *Tawa Matsya Sangh* (TMS) or Tawa Fisheries Cooperative. Initially the TMS got exclusive fishing rights for five years in 1996, which was further extended recently ([for a highlight of different management regimes, see Table 5](#)).

Table 5: Management Regime in Tawa over a period of time

Year	Tawa
1975-79	Fisheries Department
1979-94	MPFDC
1994-95	Contractors
1995-96	Open Access
1996-onwards	Cooperatives

As the map of Tawa shows, there are a few major locations where fishing activities are prominent. The main reservoir area is the major fish hunting ground for all the fisher folks ~~almost~~ round the year. However, the patches with backwater flows contribute to fishing activities when the reservoir level is high. Therefore, in ~~the~~ years of ~~low~~ when rainfall is low, or, in ~~the~~ relatively dry seasons, fisher folks abandon these areas and move towards the main reservoir area. The right bank of Tawa reservoir falls amidst two Protected Areas. Therefore, the interference of Forest department is high in restricting fishing activities in this region. This again compels the fisher folk to move towards the main reservoir for fishing.

Map 1: Location of fishing settlements around Tawa Reservoir



Management Regimes in Tawa Fisheries

Since the fishing activities were started in Tawa reservoir in mid-1970s, it had experienced several management patterns. The property rights over the reservoir and the fishing rights have undergone different management regimes starting from state control to community control. We are discussing below a brief account of different management practices in Tawa Reservoir.

MPFDC Regime (1979—94): The fishing activities were started in Tawa in by the Fisheries Department of state government and in 1979 the Madhya Pradesh Fisheries Development Corporation (MPFDC) took control over it. Fishing was carried out on a regular basis by the MPFDC by hiring traditional fisher folks belonging to *Kahara* and *Dhimara* communities. The local tribal communities (*Gond* and *Korkus*) were not integrated into the fishing activities, since traditionally they did not belong to fisher communities. They were engaged mostly in agriculture and forestry related occupations. The State Control of fishery resources in the Tawa Dam continued for a period of fifteen years till 1994.

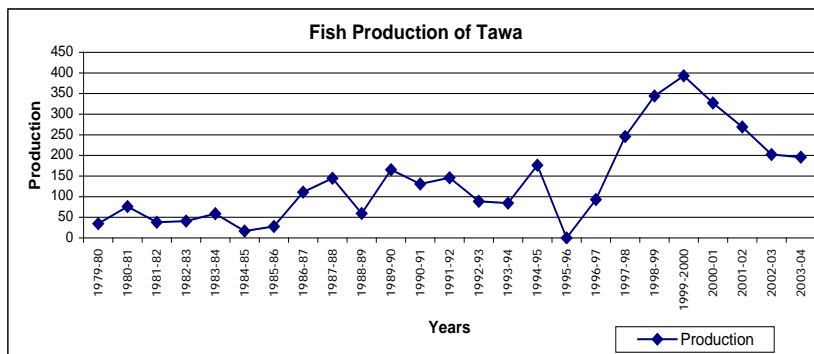
Private Control: In 1994 the fishing rights in the reservoir were leased out to a private contractor from Bhopal. The private contractor employed local fisher folks and also brought professional fisher folks from outside the state of Madhya Pradesh and prohibited the local tribals and non-fishing communities from accessing the resource. The private control of the resource continued for one year, i.e. from 1994 to 1995.

Open Access: For a period of one year i.e. from 1995 to 1996 there was no management regime in Tawa Reservoir. The government did not lease the reservoir for the second year and the resource was unmanaged during this year. The open access situation created thereof prompted the local population as well as fisher folks from neighbouring areas to access the resource. This led to overuse of the resource.

Production efficiency and sustainability issues

It is difficult to identify any specific trend associated with any specific regimes in Tawa reservoir since ~~In the absence of~~ adequate information on stocking, production and distribution of income over a longer timeframe corresponding in different regimes is not available. ~~it is difficult to infer and compare the results.~~ However, looking at the available data figures show we find a fluctuating trend of production under MPFDC regime. On the other hand the cooperative regime under TMS shows high level of production.

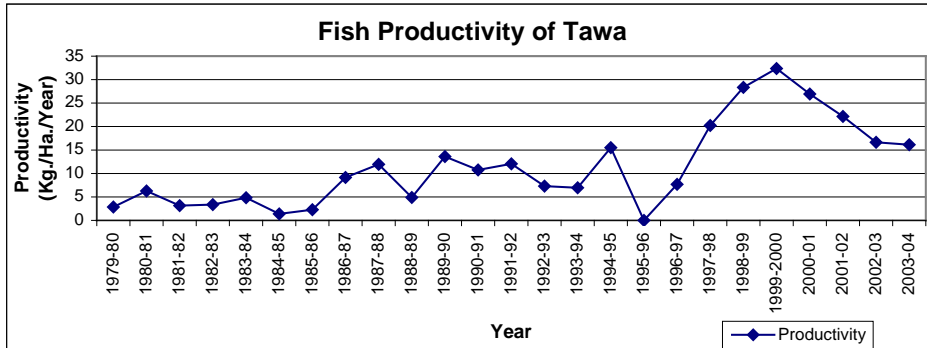
Figure 1: Fish Production in Tawa under different regimes



Note: Production in Metric Tonnes

Source: Sunil and Smita (1996) and Annual Reports of Tawa Matsya Sangh

Figure 2: Fish Productivity in Tawa under different regimes

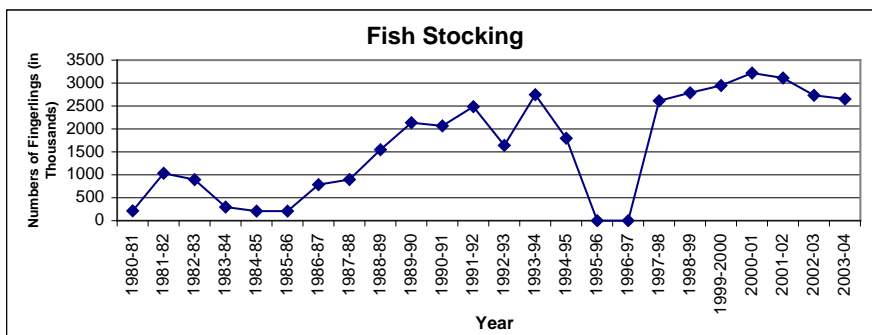


Source: Sunil and Smita (1996) and Annual Reports of *Tawa Matsya Sangh*

An overall understanding-analysis of different regimes during 1989 to 2004 shows that private or cooperative regimes performed better than the MPFDC regime. It is therefore essential to understand what-the factors that would might have led these. to such scenario. Though the existing micro level scenario would be different for the reservoir, grossly the poor performance during MPFDC can be attributed to three factors. First, there was no consistent level of stocking (see figure 3), which is essential for maintaining the production level. Second, due to irregularity in lifting-marketing and lower wage, the fisher folks were forced to pass on the catch to the illegal marketing networks (Sunil and Smita, 1996). Therefore, the reported level of production may be an underestimate statement of actual production. Thirdly, the average number of fishing days was were much lower than what otherwise would have been possible in a normal year. All these factors point toward the inefficient management system of the regime. Contrary to this, private regime and cooperative system under TMS show higher efficiency in management.

Illegal fishing in the reservoirs was ere stopped during both private and TMS regimes. -Hhowever, approaches to stop illegal fishing were different, in both the regimes. While the private contractor used musclemen to monitor the fishing activities in the reservoir, under cooperative system of TMS the primary cooperative societies undertook the responsibility. Therefore, a part of increase in production can be attributed to accuracy in reported production. During both these regimes arrangements were made for, collection, transportation and marketing along with the increasing days of fishing added to the efficiency level in production.

Figure 3: Stocking Scenario in Tawa from 1980-81 to 2003-04



Note: Stocking in thousands of fingerlings

Source: Sunil and Smita (1996) and Annual Reports of *Tawa Matsya Sangh*

However, as ~~we have~~ discussed earlier there were inherent dangers in continuing private system for a longer period of time. In order to maximise profit, fisher folks were encouraged to fish ~~even~~ of smaller sizes; that are prohibited under the contract. Nets used for fishing were also replaced during this regime. Monofilament yarn (MFY) nets replaced the earlier nylon nets (~~Sunil and Smita, 1996~~). MFY nets are more expensive compared to nylon nets and lasts for a few months as compared two years for the nylon nets. This led to higher cost for the fisher folks. Therefore, high but unsustainable income accompanied by higher cost of production characterised the private regime.

Employment and Income Distribution Issues

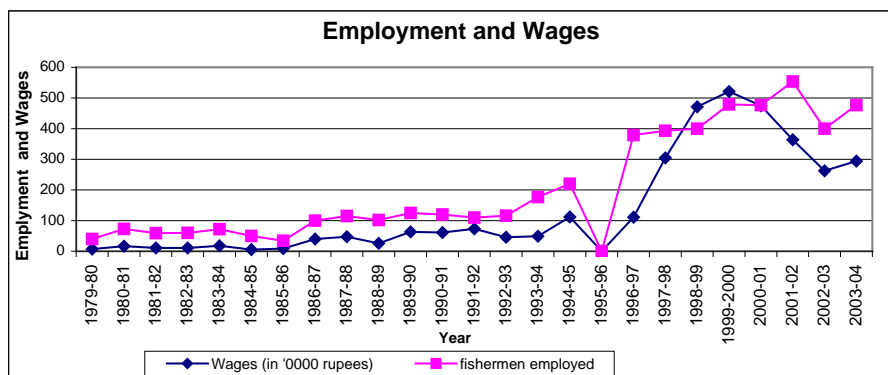
Efficient and sustainable production accompanied by more equitable distribution of income is what required for a desirable institutional arrangement. In income and employment generation front too, private and cooperative regimes performed better than MPFDC regime. Private regime though yielded a very high per capita income; it also enhanced the cost of production due to change in the quality of net. Secondly, contractors in the private regime employed outsider fishing-communities. Therefore, income was not accrued to the local folk. On these aspects ~~Thirdly, due to over fishing it may not be possible to sustain the level of income over a period of time. In this regard~~ cooperatives seem to be a better alternative. Wage level as well as employment both in terms of number of days and people was consistent and high in the cooperative regime.

Emergence of New Institution in Tawa

The structure of the Tawa federation is two tiers ~~in nature~~. At the local level there are primary cooperatives and at the apex level the federation manages various activities associated with fishing. The primary cooperatives work at the village level. Each primary cooperative is run by a 13-member committee including a president.

Each primary cooperative ~~has sends~~ one representative ~~in to~~ the Federation and the Federation chooses its ~~B~~board of ~~D~~irectors from ~~these~~ representatives. In addition to the elected/selected members the ~~B~~board of ~~D~~irectors of the Federation also include ~~other~~ ex-officio members such as the district collector, Assistant Director of Fisheries of Hosangabad district, Executive Engineer of Tawa Dam and representatives from MPFDC. Activists from *Kisan Adivasi Sangathan*, ~~are also office-bearers also hold positions of office~~ in the Federation.

Figure 4: Wages and Employment Scenario in Tawa from 1979-80 to 2003-04



Source: Sunil and Smita (1996) and Annual Reports of *Tawa Matsya Sangh*

The TMS, which started with 31 primary cooperatives and three affiliated cooperatives, is now increased to 34 primary cooperatives and 6 affiliated cooperatives spread across Kesla and Sohagpur Block of Hosangabad district. There are about 1300 primary members of the cooperative of which 477 members actively participate in the fishing activities. 29 out of 34 primary cooperative villages belong to *Gonds* and *Korkus* communities (both Scheduled tribes). Remaining five cooperative villages inhabit heterogeneous communities, including the Scheduled Castes, Other Backward Castes and Scheduled Tribes. The six affiliated societies largely constitute of traditional fishing communities of *Dhimar* and *Kahar*.

Table 6: Membership and Labour Days created during Cooperative regime of TMS

Year	No. of Primary Societies	Affiliated Societies	Functional Societies	Number of Members (aprox.)	Max. Nos. of Fisher folk	Average fisher folks in a day	Total Working days	Total labour days created
1997-98	33	03	33	1000	393	171	267	45750
1998-99	33	05	34	1042	400	205	257	52749
1999-00	33	05	36	1042	479	213	262	55880
2000-01	33	05	36	1242	477	209	250	52191
2001-02	34	04	37	1250	554	183	270	49394
2002-03	34	06	39	1250	400	156	272	42435
2003-04	34	06	38	1300	477	159	289	46039

Source: Various Annual Reports of *Tawa Matsya Sangha*

Total labour days created during TMS regime shows an increasing trend in initial three years after which it started declining. While comparing total production with the total labour days created, we find a positive correspondence between both (for production data see table 9). However, it is yet to be understood the causal link between the two. In contrast, in spite of reducing labour days in the later years, the total working days in the reservoir is increasing over the years.

Stocking Scenario during TMS management

Stocking of fingerlings is the most ~~instrumental-fundamental~~ factor in determining production, ~~of the reservoir.~~ In the absence of adequate availability of fingerlings in the region, future production remains ~~unknown, at the stake.~~ During the new institutional regime of TMS, dropping of fingerlings increased in the initial four years after which it declined marginally. Among ~~the~~ three types of fingerlings that are dropped in the reservoir, namely, *Katla*, *Rohu* and *Mrigal*, the first two are considered as major crops and the last one as local ~~(major) major~~ crop. Fingerlings of local minor crops are not dropped into the reservoir. Over the last eight years, the proportion of each variety of fingerling is changing with *Katla* having the largest share.

Table 7: Stocking Scenario in Tawa Reservoir during TMS Regime

Year	Proportion of Varieties of Fingerlings			Total Fingerlings (in thousands)	Fingerlings from TMS own Source (in thousands)	Per Ha. Fingerlings
	Katla	Rohu	Mrigal			
1997-98	52.75	18.40	28.85	2614	20	215
1998-99	42.90	28.86	28.24	2791	20	230
1999-00	45.73	33.04	21.23	2948	477	242
2000-01	41.01	35.23	23.76	3220	545	265
2001-02	54.12	26.73	19.15	3111	596	256
2002-03	39.25	33.13	27.61	2734	861	225
2003-04	42.98	26.40	30.62	2655	980	219

Source: Various Annual Reports of *Tawa Matsya Sangh*

~~One of the striking observations that come to the forefront is related to the sources of fingerlings.~~ In the initial two years ~~of the commencement~~ of TMS, fingerlings were largely purchased from Madhya Pradesh Fish Federation or other private firms. ~~However,~~ Over the years ~~however,~~ TMS has developed capacity among the local communities to harvest fingerlings that has significantly reduced the dependency on external sources. From a meagre percentage in the initial years to production of 37 percent of total fingerlings is a quantum jump, which shows the internal institutional capability to manage and sustain the fish production of the reservoir.

Table 8: Fingerlings Sources and Costs in the Year 2003-04

Source	Number of Fingerlings	Value (in INR)
Madhya Pradesh Fish Federation	37,4500	80,450.00
Prayash Fish Firm	60,0000	148,500.00
Ganesh Fish Firm	70,0000	185,500.00
Tawa Fish Federation	98,0200	262,100.00
Total	265,4700	676,550.00

Source: 8th Annual Report (2003-2004) of Tawa Matsya Sangha, 2004

The enhanced production of fingerling by TMS not only shows reduced dependency on external sources but also ~~reflect the means that~~ additional livelihood and employment opportunities ~~are~~ created in the periphery of Tawa reservoir. In the year 2003-04, nearly 37 percent of total fingerling stocks and 38.7 percent of the value of stocking was procured from TMS's own source (see table 8).

Production Scenario in New Regime

The overall production scenario shows that total production had an increasing trend in the initial four years of the regime and started declining afterwards. However, there were some significant changes in the fish composition. Major crops (e.g. Rohu and Mrigal) constitute ~~a the~~ substantial portion of total fish catch. With ~~a~~ fluctuating trend for the first six years, production of the major crops sharply declined in the year 2002-03 and 2003-04. On the other hand, production of local major crops showed a fluctuating trend throughout, though their share has increased in the last two years. ~~However,~~ ~~T~~ the share and production of local minor crops ~~have~~ shows ~~n~~ a consistent increase in last eight years.

Table 9: Production Scenario during TMS Regime

Year	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Major Crops (% to total)	74.719 (80.14)	202.809 (82.50)	288.170 (83.69)	312.193 (79.40)	243.547 (74.43)	206.638 (76.79)	119.931 (59.34)	107.325 (54.79)
Local Major Crops (%top total)	13.284 (14.24)	23.715 (9.64)	33.444 (9.71)	36.133 (9.20)	42.653 (13.04)	26.66 (9.91)	34.844 (17.23)	36.675 (19.23)
Local Minor Crops (% to total)	5.225 (5.60)	19.224 (7.84)	22.761 (6.60)	44.830 (11.40)	40.975 (12.53)	35.762 (13.29)	47.360 (23.43)	50.890 (25.98)
Total Production (in Tons)	93.229	245.811	344.375	393.163	327.125	269.054	202.136	195.891
Targeted Production (in Tons)	--	240.000	264.000	350.000	425.000	425.000	350.000	350.000
Per Ha. Productivity (in kgs.)	7.680	20.240	28.350	32.370	26.940	22.150	16.643	16.129

Source: Various Annual Reports of *Tawa Matsya Sangh*

The effect of Production can be easily seen in the total income from fish selling. Total income from fish selling as well as per capita per day income for the fisher folks (in current prices) show an increasing trend in the initial three years followed by decrease in income. However, in the last year there is a nominal increase in income in spite of decrease in production.

Table 10: Income Scenario during TMS Regime

Year	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Income from Fish sell (Thousand rupees)	7756	9986	12535	11671	9721	7127	7440
Total Income of the Fisher folk (Thousand rupees)	3045	4715	5212	4746	3637	2664	2943
Royalty (Paid to Fish Federation) (Thousand rupees)	1180	1653	1887	1570	1291	970	940
Per Capita Per Day earning in Current Price (in rupees)	65.56	89.39	93.27	90.93	73.64	62.79	63.92

Source: Various Annual Reports of *Tawa Matsya Sangh*

While comparing the simple growth rate of production and income from fish selling ~~there is we find an~~ interesting discrepancy in ~~the~~ growth rate of both. Except for the years 1997-98 to 1998-99 and 2001-02 to 2002-03, growth performance of income is better than the production. This also means that produced fish from Tawa got a better price ~~bargaining~~ in all these years.

Table 11: Comparison of Growth rate of Production and Income

Between the Years	Growth rate of Production	Growth rate of Income
1997-98 to 1998-99	40.10	28.75
1998-99 to 1999-00	14.17	25.53
1999-00 to 2000-01	-16.80	-6.89
2000-01 to 2001-02	-17.75	-16.71
2001-02 to 2002-03	-24.87	-26.68
2002-03 to 2003-04	-3.09	4.39

Source: Computed from various Annual Reports of *Tawa Matsya Sangh*

Overall understanding of Institutional regimes in Tawa fisheries

~~As mentioned, different institutional and property regimes were followed for fishing in the Tawa reservoir in Madhya Pradesh. Each regime needs a proper evaluation in terms of physical, socio economic and cultural parameters. In Tawa, MPFDC managed the resource for a longer period, whereas other management regimes were for a brief period. As a result, Therefore, strict comparison of management regimes is a difficult task. TMS regime appears to be better among the existed institutional forms in terms of fish production, income distribution and sustainability of resource. The cooperative structure in Tawa has to be understood differently. In Tawa, the dam-displaced people, who traditionally did not belong to the fishing communities, got the fishing right through a sustained struggle. Therefore, the implications of such cooperatives in terms of fishing rights are different from the usual cooperative regime. Here-The local people who did not belong to traditional fishing communities, get a larger stake over the resource and hence a share on the revenue generated. Besides, by taking initiative in rearing fingerlings, large number of people from Tawa region got additional employment and income. Fingerlings being one of the major inputs in reservoir fisheries, production of it within the system also has implication for sustainability of~~

the institution and resource base. However, declining production in last few years is a matter of concern.

The Tawa case points out that natural resources in effect offer a vector of management options. In the macro environment context where the state is increasingly withdrawing from both day-to-day management and maintenance of local infrastructure the contextual importance of this historical analysis is obvious. What makes TAWA a case by itself is the experience of the reservoir of different management regimes in a relatively short time. As expected, the government system appears weak while the private option manifests the much-debated issues of sustainability and equity. Cooperatives seem to be the best bet, as it appears. It should be noted that the strength of the cooperative is not only from within the reservoir activities, but largely owing to establishments or claims of aboriginal rights. Therefore, to claim the success of cooperative purely on merits of use and management of the resource alone would be an overstatement. This is also evidenced by some of the concerns of sustainability over future resource (fingerlings production). What the study does signal is the need for an arbitrator who could take in to account not only production-trade-marketing related functions but also scientific analysis of resource base planning.

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Appendix Table 1: Nominal Catches by Countries in Asia – Inland Waters

(in '000 tonnes)

Countries	1988	1989	1990	1991
China	4551.9 (49.42)	4857.2 (50.44)	5237.6 (50.56)	5528.1 (50.49)
India	1319.0 (14.32)	1381.1 (14.34)	1573.9 (15.19)	1700.8 (15.53)
Indonesia	711.6 (7.73)	763.1 (7.92)	792.4 (7.65)	806.0 (7.36)
Bangladesh	585.1 (6.35)	592.0 (6.15)	594.4 (5.74)	633.8 (5.79)
Philippines	547.0 (5.94)	553.7 (5.75)	585.5 (5.65)	612.4 (5.59)
Total	7714.6 (83.76)	8147.1 (84.60)	8783.8 (84.78)	9281.1 (84.77)
Total of South & South-east Asia	9210.9 (100.00)	9630.2 (100.00)	10360.2 (100.00)	10948.7 (100.00)

Note: Figures in the Brackets are percentage of total

Source: Computed from FAO Year Book on Fisheries Statistics, 1991 as cited in Hand Book on Fisheries Statistics (1993)

Appendix Table 2: Reservoirs Leasing System and Fishing rights in Different States of India

State	Leasing System and Fishing Rights
Andhra Pradesh	Department fishing, licensed fishing, free licensing system, share system
Bihar	Department fishing with 50% share of fishers, open auction with 10% concessions for cooperatives society and first year stocking by fisheries department
Gujarat	Leased to Gujarat Fisheries Development Corporation or Gujarat Fisheries Central Co-operative Association Ltd. with varying rate of royalty and target quota. These bodies either conduct yearly auction to contractors or give their own fixed rates to fishermen. The fisheries department monitors the fish harvesting to control overexploitation.
Haryana	Open auction for fishing only in the month of May
Himachal Pradesh	Annual lease to local cooperatives on the basis of 15% royalty to department.
Karnataka	Licensing with fee based on types and quantity of nets used.
Madhya Pradesh	Leased to Madhya Pradesh State Fisheries Development Corporation on some fixed royalty per ton. Corporation collects royalty from fishermen at a fixed rate for their catch. Annual contract for fishing based on tenders with highest royalty.
Maharashtra	For leasing, priority is for cooperatives @ maximum water spread x fixed rate per ha for three years; otherwise the department stocks the reservoir and issues monthly license to fishermen of different cooperatives; department issues free permit to members of cooperatives and charges royalty on some fixed rate.
Orissa	Leased to cooperative at some fixed rate per sq mile; in absence of cooperatives open auction.
Punjab	Departmental fishing
Rajasthan	Open auction for one year with 12.5% concession to cooperatives, long-term lease with 5% annual increase in lease amount.
Tamil Nadu	Departmental fishing, lease to state fisheries corporation based on royalty or share basis, licensing to fishermen on monthly/yearly basis.
Uttar Pradesh	Open auction for (i) one year with size <100 ha, (ii) three years for 100-150 ha, (iii) five year for 500-1000 ha and (iv) ten years for > 1000 ha.
West Bengal	On lease to West Bengal State Fisheries Development Corporation (WBSFDC) on nominal rent. WBSFDC engages fishermen of cooperatives on 50% share basis.

Source: Sinha and Katiha (2002)