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A Perspective on Fisheries Sector Interventions for Livelihood Promotion

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Abstract

The distinctive features of fisheries resources, fishers and their geographic contexts, on the one hand, and broad stylized features of the existing lacklustre performance of this sector, on the other, call for specialized and sustained efforts to promote livelihood of usually poor, backward and unorganized fisher communities, which are nevertheless and often the most intimate stakeholder of this sector and its underlying resources. To develop a perspective on intervention strategies for livelihood promotion of most intimate stakeholders – that is, the fisher folk, in a sustainable manner, this paper uses clues from recent economic theories and management tools on property rights, Coase Theorem, stakeholder cooperation and public-private-community partnership in an effort towards resolving the multi-dimensional problems of this sector. It stratifies and brings out the pros and cons of the existing fishing efforts into four categories of models – the traditional marketing model, state-led models of livelihood promotion and fisheries development (including cases of para-statal cooperatives), entrepreneur or leader-driven models, and technology-driven models, through selected illustrations from different parts of the country and covering both marine and inland (including brackish water) segments of fisheries. The paper, after identifying the major ingredients for sustainable livelihood development around fisheries, finally articulates Dr. APJ Kalam's concept of PURA to recommend a rural entrepreneur-led hybrid model of fisheries development to solicit sustainable and growth oriented cooperation among the suppliers of land (i.e., stakeholders to fishery resources, which are available through Nature), labor (including fishers) and capital (including professionals). The ultimate goal of this paper is to derive inspiration from Coase Theorem and the Japanese model of Keiretsu to empower the producers and suppliers of fish – namely, the fisher folk and to place them at the centre stage of control of rural entrepreneur-led private organizations, wherein the fisher community will not be deemed as mere consumers or vendors of fish, but will enter as dignified co-producer partners with significant shares in residual claim and residual control in those organizations.

¹ The first three co-authors are respectively Professor at IIM, Ahmedabad, Post-graduate from IIM, Ahmedabad currently working on Dr. APJ Abdul Kalam's PURA Mission and Senior faculty at St. Joseph's College, Darjeeling, whereas the last two co-authors are Research Assistants at IIM, Ahmedabad.

A Perspective on Fisheries Sector Interventions for Livelihood Promotion

SECTION I: INTRODUCTION

1.1 As a natural bio-mass producer, the fisheries sector shares many of the common features of agricultural bio-mass, though high incidence or intensity of such features makes the task of fisheries development in general and of fisheries marketing in particular a very difficult proposition. The constraining factors are as follows:

1. Enforcement of unambiguous private property rights, which is looked upon as the most important precondition for application of Coase Theorem to achieve value maximization from use of any asset, is especially difficult, if not next to impossible, on large water bodies like lakes, rivers, ocean etc, where the stakes of a large number of diverse parties spread over time and space are involved.
2. The above-stated problem is more serious in capture than in culture fisheries, though traditionally across the world more emphasis has been laid on capture fisheries so much so that the 'open access' nature of such resources has often resulted in too many fishermen chasing too few fish, and consequent wild fluctuations in supply.
3. Being very intimately related to natural resource conservation, fisheries has on the one hand the added responsibility of practicing 'Responsible Fisheries' in the interest of natural resource and bio-diversity conservation; on the other hand, it is very often the center of attack, sometimes unjustifiably, by environmentalists, thus halting its natural progress.
4. Large overlap between fisher folk and backward, poor and rural communities all over the world very often makes this largest and the most intimate stakeholder group a weak link in the value chain, who are always on the receiving end with respect to acquisition of knowledge, capability building and interfacing with professional stakeholders.
5. Heterogeneous nature of the output with lack of steadiness in supply (e.g., in the marine segment) and high degree of perish ability makes development of standards and perfect markets a far cry.
6. Prevailing cultural/ethical objections to eating of fish by a large section of the population are further constraining factors.

7. Failure to evolve easily detectable parameters to judge quality of fish and presence of tiny bones in large varieties of fish are further factors deterring market development.

1.2 Preponderance of the above-stated features, which only a suitable alliance of leadership and technical-cum-management professionals can overcome, has led to not only high cost of coordination and negotiation (popularly referred to as ‘transaction cost’) for undertaking the necessary reforms, but also perpetuation of powerful non-competitive players wielding ‘wealth effects’ and capturing rents, in the value chain between the fish producer and fish consumer – all boiling down to failure of the Coase conditions for value maximization² on fisheries resources/assets. Not only thus the size of the ‘cake’ (i.e., value from fisheries) remained small, but also, in the process, both fish producers and consumers stand ‘exploited’ by powerful intermediaries in the value chain.

1.3 The present paper is divided into five sections. Section II provides a brief overview of the Indian fisheries sector. With several anecdotal but representative cases from both marine and inland segments based on the authors’ field experience in the background, section III classifies Indian experience in fisheries into several stylized categories to analyze performance of each in terms of sustainability of fish, fisher and the relevant business propositions. The next section through a comparative analysis of Indian experiences across several sectors (especially, fisheries vis-à-vis poultry and milk) attempts to identify the major ingredients for sustainable livelihood development around fisheries. The concluding section finally articulates Dr. APJ Kalam’s concept of PURA to recommend a rural entrepreneur-led hybrid model of fisheries development to solicit sustainable cooperation among the suppliers of land (i.e., stakeholders to fishery resources, which are available through Nature), labor (including fishers) and capital (including professionals) if the goal of is to empower the fisher community and place them at the centre stage of control alongside other important stakeholders of such rural entrepreneur-led private organizations.

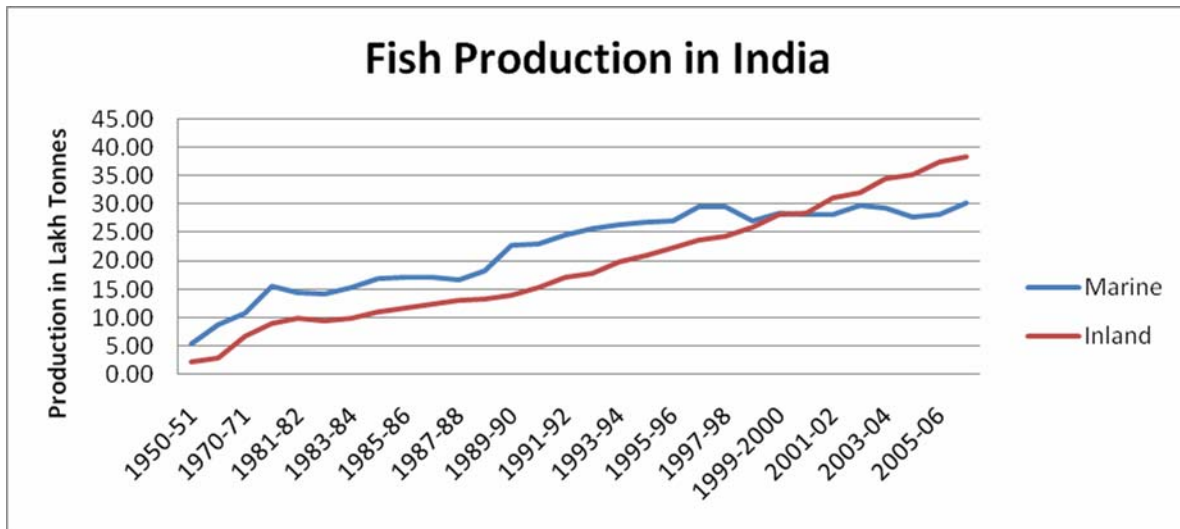
² Coase Theorem argues that irrespective of initial distribution of property rights across stakeholders on a resource, the latter will arrive at a value-maximizing configuration of property rights, provided the following three conditions are fulfilled: first, the initial distribution of property rights is unambiguously defined to set the negotiation process going; second, transaction costs involved in the negotiation process are negligible so that such costs don’t exceed the benefits of negotiation; and third, the negotiation process is a competitive one free from ‘wealth effect’, so that any party to the negotiation, because of its superior power, can’t dominate the negotiation process.

SECTION II: AN OVERVIEW OF INDIAN FISHERIES SECTOR

2.1 Fisheries activities in India can be classified in a number of ways. First, we can differentiate across sources of fish harvested – whether harvested from sea under marine fisheries or from sweet water / brackish water bodies under inland fisheries. Confluence of sweet and saline water provides habitat to certain specific aquatic species that have considerable market demand. Such fishing activities are identified as brackish water fisheries. Disaggregated data using this distinction suggests that Indian fisheries were earlier dominated by marine fisheries. Inland fisheries production outpaced marine fisheries since the beginning of the present millennium and the gap has been rising since then (Chart 1). No separate data are available for brackish water fisheries and for all practical purposes brackish water productions are clubbed with inland fisheries. In terms of concentration of fishermen across these sectors, about 74% Indian fisher population are engaged in inland fisheries, with the rest 26% involved in marine fishing.

2.2 The second differentiation in fishing activities runs in terms of the nature of harvesting. Fish can be either captured or cultured. Culture involves a business process that takes care of growing fish involving investments in production and subsequent harvesting. Obviously, investments in production – both in terms of physical resources and time – are proportionately higher than that in harvesting. Capture involves no investment in production with almost the entire investment concentrated in harvesting efforts. The production efforts are solely carried out by nature. Chart 2 captures the distribution of fishermen in terms of their engagements in capture or culture fisheries. It clearly suggests that Indian fishermen are predominantly engaged in capture fisheries (more than 60%).

CHART 1



2.3 Predominant dependence of Indian fisheries sector on capture fisheries is fraught with possible threat to its sustainability in the coming days. Specie-wise landing of marine fisheries – mostly capture in nature – reveals reduced availability of a good number of species between 1994 and 2005, while landing of some other species increased appreciably. Table 1 below captures percentage decline (-) and increase (+) in species-specific catches. While the pattern of changes vary between the coasts, some species like Natanian Decapods, Rastreliger kanagurta- Indian Mackerel, Struooed Seerfish (Thazard Cirrus), Marine Crust Crab, Trachinotus spp., Lizard fish recorded appreciable (more than 60%) decline, considering landings from both the coasts together. Some other species – Thunnus tonggol (Long Tail Tuna), Istiophoridae (Marlin Sailfish), Euthynnus affinis (Kawa kawa), Bregmaceros, Sardinella - Indian Oil Sardine, Auxis thazard - Firgate & Bullet Tuna, Carangidae (Bangada), Hemirhamphus spp.. (Half Beaks), Lates sp. Lutjanus (Perches) have shown remarkable increase (more than 100%) in landing, throwing up possible cases of overharvesting to meet increased demand from the market, disregarding the capacity of Nature to replenish them. It is, however, not very clear if the reduction in landing of some of the species is due to decreased demand or reduced availability, for want of information on changes in specie-wise price realization.

2.4 Variations in species-wise landing in inland fisheries between 1994 and 2005 are simultaneously encouraging and alarming. There is a steady growth in the landings of minor carps

that are popularly grown in culture fisheries (Table 2). Catfish landings have grown encouragingly in Tamil Nadu, perhaps due to the introduction of hybrid varieties from Thailand. Exotic carps – totally produced under culture fisheries – have also registered an encouraging growth. Murrels and other fresh water fishes – not amenable to culture yet and not much demanded beyond local domains – have seen a drastic decline in landing. Loss of fish biodiversity – both marine and inland – is an important concern rightly raised by the Working Group on Fisheries constituted for the 11th Five Year Plan.

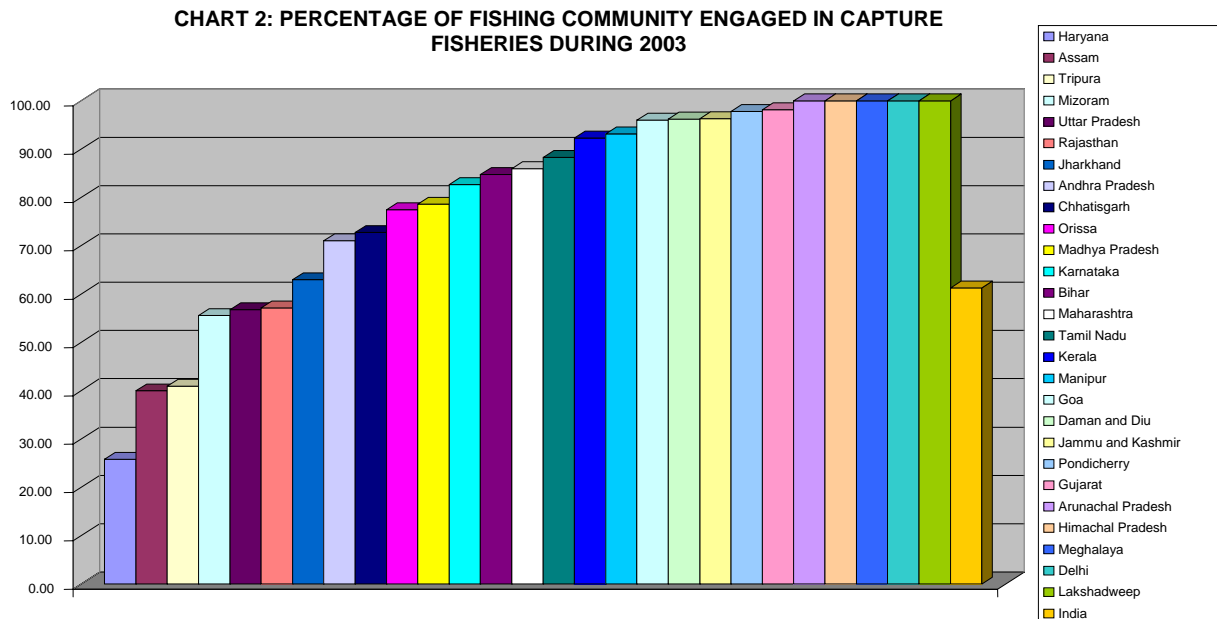
2.5 Another fundamental feature characterizing Indian fisheries sector is the nature of disposal of fish in the market. Available figures suggest that most of the fish harvested by fisher folks are marketed fresh, without going through any further value addition. It is also observed that percentage of harvested fish disposed fresh has been increasing steadily over the years, while traditional method of curing fish has been facing a rapid decline. The extent of wastage as a percentage of gross fish production, on the other hand, is displaying an alarmingly rising trend over the years. It is quite disturbing to note that perhaps the traditional methods of curing fish has lost favor with the modern consumers but no simple technology affordable to both the rural producers and consumers could be developed.

2.6 However, Indian fisheries sector has generated substantial employment for rural population. Table 3 reveals that between 1992 and 2003, there has been a perceptible increase in employment generation through other activities related to fisheries, even though the growth in employment for those engaged in fishing remained insignificant. This finding perhaps suggests saturation of opportunities to be involved in fishing activities and calls for efforts to create economic opportunities in activities centred around further value addition to fish harvested (i.e., vertically integrated activities) as well as in fisheries related activities (i.e., horizontally integrated activities).

2.7 The potentials for growth of fisheries activities in India are however noted to be very high, as elaborated below:

1. India is endowed with 8118 kilometers of coastline and access to 5.3 lakh square kilometers of continental shelf to facilitate marine fishing. 195210 kilometers long river and canal system, more than 6 million hectares of water bodies under reservoirs, ponds,

tanks, *beels*, oxbow lakes and derelict water bodies provide scope for enlarged activities for sweet water inland fisheries. 1.24 million hectares of brackish water bodies can also be suitably utilized for fisheries purposes. In addition, between 0.19 million (Kharif) and 0.175 million (rabi) hectares of farm land were used exclusively for fish cultivation during 2003 [NSSO Report 496, p. A-73].



- The projected demand for fish in the country by 2012 is 9.609 million ton, with the present production level hovering around 6.74 million ton, thus ruling out any possibility of oversupply in the near future.
- Considerable prospects exist for not only increasing the productivity of inland fisheries but also expanding its scale of operation. Only about 16% of fresh water and 10% of brackish water are presently used for fish culture. With an estimated potential of 10 tonnes per hectare, freshwater aquaculture (present yield 2.2 tonnes per hectare) and brackish water aquaculture (472 kgs per hectare) have the potential to increase non-marine annual fish production to about 6 million tonnes. The prospective yield from EEZ has been estimated at 3.9 million tonnes, with the highest harvestable potential from water up to 50 metres depth (2.3 million tonnes) already being achieved. Around 1.3

million of potential harvest in water between 50-200 metres depth is still to be fully tapped. The prospect of deep sea fishing – given the global experience—is not so encouraging FAO(2008). Higher prospects for inland fisheries are also corroborated by the fact that the share of inland fisheries in total fish production of the country has been steadily increasing and in fact overtook that of marine fisheries since 1999-2000 [Chart 1].

2.8 Against this background, the Working Group on Fisheries for 11th Five Year Plan rightly argues that *“Indian fisheries is a sunrise sector. With third position in fisheries and second in aquaculture, the country has high potentials in the sector for rural development, domestic nutritional security, employment generation, gender mainstreaming as well as export earnings, that only few other activities can provide”*. [Report of the Working Group on Fisheries, XIth Plan, p.10].

2.9 However, fisheries sector in India is plagued by a number of threats as well. They are:

1. Indian fishing activities are still dominated by “capture fisheries” – creating a “property rights” problem and a subsequent threat to sustainability of not only aquatic species harvested but also fishers engaged for their livelihoods. In marine fisheries, catch rates are declining along with a rapid increase in fishing mortality rates. As a result, slow growing and slow-fecund species like lobsters, sharks and catfishes have started showing signs of vulnerability. Number of marine species that recorded reduced landing between 1994 and 2005 are significantly high and landings of some traditional indigenous inland species have also gone down considerably during the same period [Tables 1 & 2]
2. Given highly perishable nature of the commodity in consideration, an effective and efficient cold supply chain management of fisheries product with a proper inter-linkage with value chain management to facilitate seamless movement of fisheries products – fresh fish from harvesters to ultimate consumers, is still to be put in place. One has to note that about 83% of Indian fish catch was marketed fresh in 2004, a significant and steady jump from 1977, when the proportion of fish sold fresh was a little less than 66% of the total catch.

3. No effective fishermen's association, like the ones established for milk producers (Amul, Verka, for example) or for egg producers (National Egg Coordination Committee) exists to empower the fishers in India.
4. The single most institutional roadblock hindering any sustainable growth of Indian fisheries sector is lack of property rights on water bodies where fish grows – be it marine or inland. As things stand today, almost the entire marine fisheries are under capture fisheries while culture fisheries are gradually inching their way into inland fisheries. Although no disaggregated data is available on production from capture and culture inland fisheries, NSSO figures suggest that between 0.20% (kharif) and 0.27% (Rabi) of the farmland possessed by individual farmers is utilized for fish farming and a larger share of this land was leased in rather than owned by the fish farmers. [NSSO Report 496, Round 59, 2003], highlighting the miniscule presence of unambiguously defined property rights regime in inland fisheries.

2.10 Several critical policy measures that can contribute meaningfully to sustainable growth of fisheries resources in India are identified as:

- Diversified production through integration with agriculture and other allied sectors.
- Focused attention on seed production – specially of carp (projected at 34400 annually), scampi (giant fresh water prawn, projected at 8000 million annually) and shrimp (for brackish water aquaculture, 10000 million annually); in the context of increasing diversification, additional requirement of seed of other species like catfishes, seabass and ornamental fishes is also foreseen.
- Conservation of fish diversity and fish habitat – Indian fish diversity is estimated to be composed of more than 2200 fish and shellfish species in the marine, brackish water, freshwater and coldwater environments. So, an important task ahead will be to protect them from anthropogenic pressure and hazards of climatic change. Further, in the context of inland fisheries it is imperative that habitat restoration, setting up protected habitats and sanctuaries, ranching of rivers with seed of river-based brood stock are taken up with immediate effect. Probably, remote sensing technology can be suitably used to achieve such ends.

- Cost efficient mechanization of fishing gears to make off shore fishing beyond 50 metres of depth not only commercially viable, but also accessible to artisanal farmers³.
- Reduction in by-catch or incidental catch through development of equipment like turtle excluding devices, etc.
- Development of fish aggregating devices, which are not available to the fishers today.
- Cost effective technologies to reduce wastage of harvested fish.
- Inexpensive solutions to storage facilities for both marine and inland fisheries – both on-shore and off-shore.
- Technological inputs at affordable prices - necessary to provide effective safety network while fishing at high seas.
- Effective technology to introduce mariculture in marine water and cage and pen culture in inland water bodies.
- Fish seed production at costs that can render collection of fish seed from the wild relatively expensive.

2.11 Thus to summarize, in spite of vast and versatile fishery resources, which can virtually produce any fish in large quantities, any sustainable development of fish and fishers in India calls for removing the following basic hurdles of this segment:

- some in-built threats to operationalize not only the standard marketing models available for non-agricultural products, but also those innovative models developed for other agricultural and allied products, like ambiguities in property rights and consequent preponderance of capture fisheries;
- lack of necessary technological and infrastructural support to increase its productivity and facilitate further value addition through processing, and
- absence of a proper regulatory mechanism to protect the enormous species diversity still observed in the country⁴.

Obviously, sustainable development of fish and fishers in India calls for an appropriate business format which is automatic, replicable and responsive to the needs of the multiple stakeholders.

³ With the entry of motorized and mechanized fishing boats, average annual catch by an artisanal active fisherman reduced from 2950kgs to 328 kgs between 1980 and 1998.

⁴ It should be mentioned in this context that absence of such mechanisms also contributed significantly to loss in species diversity in our agricultural and animal husbandry stocks, even though such losses did not attract much attention from those who raised hue and cry about the same phenomenon in relation to fisheries.

The issue is whether existing models of fisheries development are good enough for the purpose in hand or whether and how a fresh approach needs to be developed in this context. The rest of the paper will be devoted to answering this question.

Table 1: Percentage Change in marine species-wise landings between 1994 and 2005

Species	East Coast	West Coast	India
Hiisa liisha (Tenuaiosa)	-11.74	14.36	-9.71
Flat Fish	16.28	-49.93	-41.24
Bregmaceros	232.24	226.43	227.40
Harpadon neherus	149.17	25.62	36.24
Sea Catfishes	-8.29	23.63	3.90
Lizard Fishes	-3.24	-69.47	-61.51
Muraenesox spp.. (Eels)	21.45	33.53	28.77
Lactarius (Parava)	8.33	66.83	44.80
Leiognathus (Silver Bellies)	-8.04	52.15	1.19
Sciaenidae (Croakers)	8.08	-28.86	-25.19
Upeneus spp.. (Goat Fish)	-55.10	-17.93	-32.38
Lates sp. Lutjanus (Perches)	11.78	455.67	108.35
Hemirhamphus spp.. (Half Beaks)	70.28	279.25	113.44
Exocoetus (Flying Fish)	-20.24	23.44	-19.25
Sphyræna spp. (Barracudas)	2.14	-39.99	-13.79
Mugilidae (Mulletts)	78.43	14.83	54.83
Polynemidae (Indian Salmon)	87.79	-59.15	16.24
Caranx spp.. (Kata Bangada)	37.93	-39.54	-24.43
Trachinotus spp..	46.31	-99.21	-66.86
Carangidae (Bangada)	57.98	214.11	138.57
Stromatidae (Butter Fish)	-63.88	-21.98	-43.29
Sardinella - Indian Oil Sardine	-53.07	698.72	182.16
Engraulidae (Anchovies)	-13.89	44.00	31.12
Other Clupeids	113.09	1.34	31.05
Chirocentrus spp.	-26.43	-7.05	-18.54
Wahoo	0.00	0.00	0.00

Species	East Coast	West Coast	India
Spanish Mackerels	150.01	-96.82	65.53
King Mackerel (Indo-Pacific)	83.97	-1.90	1.95
Struooed Seerfish (Thazard Cirrus)	-60.91	-100.00	-70.57
Seer Fish Scomberomorus spp.	-16.30	22.80	5.68
Auxis thazard - Firgate & Bullet Tuna	0.00	131.99	168.81
Euthynnus affinis (Kawa kawa)	433.92	213.79	351.84
Katsuwonus pelamis (Skipjack Tuna)	-16.99	5.16	0.62
Thunnus tonggol (Long Tail Tuna)	0.00	4991.14	5267.51
Istiophoridae (Marlin Sailfish)	0.00	238.46	641.03
Scombridae (Tuna Like Fishes)	20.29	-94.12	-40.75
Trichiuridae (Hair Tails)	-8.45	108.52	71.21
Rastrelliiger kanagurta- Indian Mackerel	-19.59	-81.44	-73.76
Elasmobranches (Shark, Rays, Skates)	-34.44	-11.97	-25.71
Other Marine Fishes	-36.69	88.97	35.11
Decapods	0.00	0.00	0.00
(a) Penaeid Prawn	61.25	-34.42	-19.10
(b) Non-Penaeid Prawn	-15.23	78.90	54.12
(c) Other Crust Crab	42.84	-79.93	-41.21
Natanian Decapods	0.00	-99.96	-98.49
Marine Crust Crab	-84.82	-45.17	-66.89
Cephalopods	0.00	0.00	0.00
(a) Squid & Cuttle Fish	3.70	-18.17	-15.63
(b) Other Molluscs	972.24	0.00	225.45

Source: estimated with data available from www.indiastat.com

SECTION III: STYLIZED MODELS OF FISHERIES DEVELOPMENT FOLLOWED IN INDIA

3.1 Against this backdrop of the status of fisheries sector, we would like to elaborate some salient features of various development efforts made so far in the fisheries sector. To capture the reality we concentrate on some prominent interventions made in this sector so far. The interventions so far can be clubbed into the following five characteristically distinct models:

Table 2: Percentage Change in inland species-wise landings between 1994 and 2005

States/ UTs	Minor Carp (Catla, Rohu, Mrigal and Calbasu)	Minor Carp	Exotic Carps (Common, Silver and Grass Carp)	Murrels (Ophiocep halus Spp.)	Catfishes (Wallagoattu, Pangasius, bagarius)	Other Fresh Water Fishes	Others	Total
Andhra Pradesh	429.73	0.00	0.00	-61.10	0.00	-79.29	4469.59	301.87
Arunachal Pradesh	608.22	-27.27	-38.02	-100.00	0.00	-14.43	0.00	104.72
Assam	148.07	-6.10	598.97	-85.54	0.00	-65.76	41.30	15.93
Bihar	15.80	1450.50	-81.28	-12.68	77.67	-59.97	-98.51	7.93
Goa	-99.94	0.00	0.00	0.00	0.00	0.00	0.00	27.94
Gujarat	35.71	9.23	0.00	505.29	78.34	0.00	-35.76	5.67
Haryana	459.83	-96.39	0.00	0.00	0.00	0.00	0.00	181.82
Himachal Pradesh	3210.34	-100.00	-100.00	0.00	-100.00	-86.08	-100.00	38.03
Jammu & Kashmir	-81.25	0.00	0.00	0.00	0.00	0.00	0.00	18.94
Karnataka	-19.39	0.00	0.00	0.00	0.00	0.00	0.00	60.34
Kerala	1455.74	0.00	575.10	3.34	0.00	0.00	-57.95	27.24
Madhya Pradesh	171.35	-81.46	0.00	0.00	0.00	-96.54	0.00	149.09
Maha-rashtra	0.32	0.00	0.00	0.00	0.00	0.00	0.00	58.97
Manipur	258.68	26.85	-35.99	-100.00	-100.00	-99.09	0.00	96.35
Meghalaya	25.60	-46.12	43.68	-14.62	-100.00	32.16	0.00	33.75
Mizoram	147.33	0.00	-100.00	0.00	0.00	0.00	0.00	87.50
Nagaland	285.00	-100.00	-65.89	0.00	0.00	-100.00	0.00	90.92
Orissa	3451.76	-18.47	-40.60	-97.48	-89.12	-59.78	195.19	20.73
Punjab	1245.67	-100.00	267.55	-100.00	0.00	-100.00	0.00	404.67

States/ UTs	Minor Carps (Catla, Rohu, Mrigal and Calbasu)	Minor Carp	Exotic Carps (Common, Silver and Grass Carp)	Murrels (Ophiocep halus Spp.)	Catfishes (Wallagoattu, Pangasius, bagarius)	Other Fresh Water Fishes	Others	Total
Rajasthan	-1.25	-6.41	88.24	0.00	6.01	319.80	0.00	16.05
Sikkim	-69.07	0.00	0.00	0.00	0.00	0.00	0.00	75.26
Tamil Nadu	2.97	-85.43	-7.00	-76.56	3158.17	-70.95	0.00	97.35
Tripura	20.93	-93.02	-50.73	-100.00	0.00	-100.00	0.00	-0.94
Uttar Pradesh	107.98	0.00	0.00	0.00	0.00	0.00	0.00	111.32
West Bengal	111.10	0.00	40.88	-65.03	0.00	-89.18	645.32	68.04
Andaman & Nicobar Islands	163.16	0.00	0.00	0.00	0.00	0.00	0.00	163.16
Chandigarh	5.00	0.00	0.00	0.00	0.00	0.00	0.00	52.50
Dadra & Nagar Haveli	38.46	0.00	0.00	0.00	0.00	0.00	0.00	38.46
Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delhi	-69.62	0.00	0.00	0.00	0.00	0.00	0.00	-69.62
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pondicherry	-48.34	0.00	76.68	-47.98	0.00	-12.68	41.28	-11.89
India	110.46	98.90	103.27	-35.69	512.40	-67.46	366.54	85.10

Source: estimated with data available from www.indiastat.com

Table 3: Employment Generated in the Fisheries sector

Year	# of family members in fishing operations		Family members engaged fishing related activities other than actual fishing			
	Full time	Part time	Marketing of fish	Repair of fishing nets	Processing of fish	Other activities
1992	738400	713700	464700	225700	87500	256200
2003	809966	965791	494299	250065	95029	358716
% Change	9.69	35.32	6.37	10.80	8.60	40.01

Source: Handbook on Fisheries Statistics 2000, Ministry of Agriculture, Department (for 1992) & Livestock Census (for 2003)

1. Traditional market-led model;
2. Technology-led models sometimes promoted by R&D organizations;
3. State-led development models, often with help of para-statal cooperative bodies, wherein the fishermen are often considered as 'passive' beneficiaries;
4. Individual entrepreneur-led models;
5. Collective action based organizational models carefully crafted by leadership that is often from outside the community (including those sometimes confronting wrath of environmentalists).

In the paragraphs that follow we highlight some of the stylized features of these five types of efforts supported by short and even anecdotal evidences.

1. Traditional market-led model

3.2 Like any other agricultural and allied products, Indian fisheries sector is characterized by the existence of a large number of unorganized fishermen who sell their harvests in some well-known organized fish markets (e.g., the Howrah Fish Market) or lesser known small localized fish markets – almost all of them under control of a handful of traders. The salient features of such a market are

- prevalence of a large number intermediaries between the actual producer and final consumers, so that the market often assumes the characteristics of competitive suppliers confronting monopsonist buyers;
- even though there are several firms promoted by MPEDA to produce value-added items in fish mainly for exports (e.g., in Verabal in Gujarat), such intermediaries are often among many suppliers confronting monopsonistic buyers, who are in turn monopoly suppliers of value-added items in the global market;
- the results of the first two features are well-known: intermediate purchasers of fish, even if they have market power, have no interest in developing healthy and longer-term promotional backward linkages (e.g., through supply of credit and other inputs) with fish or fishers – consequently both fishers and fish resources get depleted at home;

3.3 Although some regulated free markets do exist, for example the Crawford Market in Mumbai, where arrangements for auction are there (this is also true of beach auction organized by Matsyafed and others, for example), economic theorists' so-called efficient 'separating equilibrium' solution provided through such auction can hardly be deemed as a competitive one in the absence of necessary regulations and their enforcement. In fact, regulated fish markets are rather few and far between across the country. In this market model, fish is often a free/cheap resource merely to be tapped for profit, irrespective of longer-term environmental and bio-diversity implications⁵, and the fisher is nothing more than a vendor with imperfect market-determined fixed claims.

2. Technology-led models sometimes promoted by R&D organizations

3.4 Marketing of fish can also be effectively facilitated through infusion of technological innovations that introduce scopes for better utilization of water bodies (e.g., intensive fish culture in inland water bodies, cage and pen culture in large water bodies, and mariculture), besides processing and value addition on fish and fish by-products captured/produced. A good number of fisheries technology institutes are functioning under ICAR throughout the country, and though quite a few technological breakthrough have been achieved, claimed and demonstrated by the scientific

⁵ The market also doesn't care whether fish and fishers are victims of environmental pollution from other powerful segments of the economy, in spite of much-publicized 'polluter pays' principle. In other words, the economists' glorified market principle doesn't care whether fish and fishers have the right kind of property rights for sustained growth.

community, only a small fraction of these technologies are being applied in practice, especially by poor fisher community, to sustain their livelihood as well as to achieve sustainability of their fish resources. So, technologies claimed to have been generated seem to have been grossly underutilized, apparently for a number of reasons. First, technologies generated in laboratories with governmental support are often out of line in terms of costs and thus in terms of commercial viability in actual practice. Second, technologies are sometimes generated based on 'perceived' demand by the fishers and the industry, not on the basis of actual demand – thus sometimes making generated technologies of little relevance for the purpose in hand. Third and probably the most important, most technology institutes often look for mere technological solution, totally ignoring the management aspects of technology generation and its diffusion. In other words, general absence of a happy marriage between technology and management, further reinforced by absence of strong fishery-based industry making consistent demand for fishery professionals, is probably the important lacuna of almost all fishery institutes in this country. The lacklustre performance of a fishery cooperative called 'Matsyagandha' once conceived by CIFE, Mumbai, the moribund condition of once-famous Versova Cooperative Society nearby CIFE, and nearly total loss of faith in CIFE-promised assistance and assurance by a women entrepreneur named Sabitaben probably bear some testimony to the last-mentioned weakness of technology-driven interventions in this sector. Issues of organizational choice, leadership development, capital shortage, lobbying for policy change, developing new marketing channels seem to have remained unaddressed, although some efforts have definitely been made towards imparting training and skill development without making suitable arrangements for necessary complementary inputs.

3. State-driven models

3.5 Considering the potential of fishery resources, on the one hand, and the poor economic condition of the fisher folk, on the other, state intervention is omnipresent in almost all spheres of fishing activities. Besides regular line departmental efforts, specialized state agencies (like FFDA) have been created to promote fisheries in important pockets like Verabal for marine fisheries, Darjeeling for cold water fisheries, Lakshadweep Development Corporation Limited (LDCL) for tune fisheries, Sardar Sarovar for inter-state river fisheries, Kulleru Lake for lake fisheries etc. At the same time, state and central governments have been assisting in a big way all fishery cooperatives –

especially, their higher tiers - with numerous subsidized schemes, including pumping in of huge amounts of share capital at free of cost. Still problems are simply too many and hardly sustainability of fish and fishers is achieved. The prominent features of state-led models are the following:

1. Whether in the marine segment or in the inland segment, fishing community is almost always at the receiving end. In marine segment, thanks to subsidized supplies of boats, fuel etc., the current situation is simply one of too many boats chasing too little fish, left in marine water bodies after unhindered catches for decades and centuries, often with the help of modern large vessels. The fisher folk have simply no control over their fishing fields and pollution therein. State Federations have simply no lobbying power to protect the interests of fish and the fisher. State bodies have superficial presence in processing and marketing of fish and fish products. Fisher folk suffer from chronic shortage of institutional credit at reasonable rates.
2. Most of the organizations are there to provide welfare measures for the fisher folk out of the state exchequer, and not out of their profits (as most of them are not commercially viable). Some of the State Federations shamelessly claim positive profits, while conveniently forgetting the fact the profit figures are not net of the huge amount of share capital they have amassed from government which is never serviced or paid back, besides cornering crores of rupees in the form of subsidies under one scheme or the other.
3. MPEDA has certainly made some dent in exports, but backward linkages are simply missing. Nor is the vast domestic market explored and developed. Fisher folk are mere vendors without any claim on residual income (i.e., income left after meeting all fixed contractual payments).
4. Fisher folk have no control over decision making. Governance structure of state-led and para-statal organizations are highly tilted against the fisher community.

From the observed performance of the state-led structure, it appears both fish and fisher would be better off if government withdraws from direct management of fisheries organization.

4. Individual entrepreneur-driven model

3.6 In a vast continent size country like ours, there are numerous entrepreneurial talents to successfully tap the potentials of fisheries especially in the inland segment. Such talents include national award-winning entrepreneurs like Late Nilu Ghosh near Kolkatta, believed to be the pioneer in modern fish seed production in the country, Ashis Sarkar, Dipak Roy and Kirpan Sarkar of North Bengal, Hari Churan Das of Tripura, Darshan Singh Tabiba near Ludhiana in Punjab (all working on integrated fish farming in their own ways) – just to mention only a few names. Based on intensive field studies of these examples, one can arrive at the following stylized features of their models:

1. All of them developed mastery over the subject almost on their own, though in some cases they got useful extension support from the state Line Department. Eventually, they became masters in their subjects and became models for demonstration by Line Departments and Scientific Community. In other words, they had the capability of their own to draw attention of the Line Department and supplement their knowledge and skill. In no way, they were fully dependent on government support. They had a strong urge and stake of their own – they were not simply attracted by a subsidized scheme! The difference between them and others was that while they thrived, in spite of their capital limitation, others simply got lost – nobody knows of them.
2. All of them were practising integrated fish farming – of course in their own ways, using purely local and apparently non-tradable resources including small water bodies, waste/nearly waste materials and unskilled labor, which are difficult to market at any reasonable price. Nevertheless, they transformed such low-valued resources into fairly high-valued marketable resource like fish and several by-products (thanks to integrated farming)⁶.
3. The most striking feature of all these experiments is profound understanding of these innovators of the intimate linkage between fish production and management of Nature, which they put to practice. Most of them were using the process of cycling to make use of the by-product of one system of production as input in another production system. This

⁶ We have used a methodology to estimate resource cost ratio of their fish production, which turned out to be significantly less than unity, meaning much less than one rupee of local and non-tradable resources are used to produce one rupee worth of fish and other tradable. The gap is their value addition out of locally unused and underutilized resources, which gave them the surplus not only to make profits, but also to undertake a host of further investments as well as some social activities for the welfare of their employees and villagers.

method together with use of natural feed not only allowed them to economize on costs, but also to avoid creating any environmental diseconomy to others.

4. True, these individual entrepreneurs are driven by profit motive, but they are all classical-type entrepreneurs serving the cause of the society in the process of generating profits. They are not opportunistic rent-seekers or fly-by-night operators to quickly make money at any cost. So, in the process they happened to share residual benefits with the community, though there were no formal mechanisms established or followed to empower the community with residual claim or control rights.
5. Since they are all operating with limited capital and resources of their own, their models are not easy to scale up unless resource constraints including constrained supply of entrepreneurial talents are overcome. It is most unfortunate that the scientific community often completed their job by heaping ex post facto praise and awards on them and even claiming a part of the glory, rather than performing a SWOT analysis of these outstanding performances and then strengthening and protecting them from outside turbulence through undertaking suitable lobbying activities for them. In other words, mass production such talents even in halves and quarters through entrepreneurship development program should have been an important agenda of our national and regional institutes.
6. We would like to add a sad note at the end by pointing out that several of these great entrepreneurs referred to above have given up and closed down their fish farms not because they were not interested, but because they couldn't handle the turbulent law and order condition and unfriendly economic policy environment.

5. Leader-driven, collective action based models

3.7 Experiment by South Indian Federation of Fish Farmers' Societies (SIFFS) can be referred to as a sincere attempt to develop easy production and marketing avenues for small and marginal marine fishermen. It grew spontaneously out of the failure of Matsyfed (i.e., State Federation of Fisheries Societies in Kerala) to take care of the needs of such small fishermen. It involved fishermen in an organization with three tier structure, as in the famous AMUL model, and with clear demarcation of functions based on economic logic across the three tiers. It has a governance structure, which is not chaired by a Minister elected unanimously in an open general body meeting

and packed with government nominees in its Board. SIFFS works with effective participation from the fish producers in all tiers. There is enough room for functioning of professionals as employees of fishermen. SIFFS is commercially viable, and in spite of opposition by governmental bodies, it is expanding its domain slowly but steadily.

3.8 In the arena of waste water fisheries, Mudialy and Bon Hooghly Fishermen's Cooperative Societies (both from Kolkata) are outstanding examples of leader-driven collective action based models of fisheries. Both of them grew out of sheer livelihood needs of poor, backward and uneducated fishermen, thanks to certain favourable gestures by certain government quarters in the initial stages of their development. Both of them are actually environmental societies managing urban and polluted waste waters of the city of Kolkata, which are often contaminated by gracious release of heavy metals and chemicals by nearby industries. Thanks to the dedication, hard work and judicious management of these two societies under a government official, who acted as their visionary leader, and often blessed with timely advice from the scientific community, both societies have been able to convert polluted urban refuse water (a nuisance!) into beautiful Nature Parks with a diversified set of output – fish, horticulture, floriculture, farm forestry, animal husbandry, recreation and eco-tourism. In an interesting calculation of resource cost ratio, it is found that under appropriate assumptions about pricing of the ecological services being produced by the Mudialy Society, it has the capability to pay up to 53 paise per Rupee of value created for allowing the polluted water to flow into their system. In other words, under the 'polluter pays' principle, Mudialy ought to be paid at this rate for gratuitously accepting the polluted urban refuse water and converting it into a Nature Park! This experiment shows that given adequate training, education and empowerment, even the poorest community of fishermen can realize the full potentials of the sun, soil and water of Indo-Gangetic plains. Besides relieving Kolkata of polluted urban refuse water, Mudialy is able to sustain itself together with its members and employees, and even undertake a host of human capital investment activities for them out of its own funds⁷.

3.9 Using the same collective action process, more than 1200 SHG groups have been formed by a local NGO and under guidance of a leader in Sandeshkhali Block-II of the Sundarbans in West Bengal to initiate a diversified set of activities - aquaculture, agriculture, handicrafts etc., rather than

⁷ As per usual accounting practice, these human capital investments in health and education are looked upon as costs, rather than outputs of the system.

depending exclusively on wild catch of juvenile fish and fish seed from the river banks – an activity which was seriously damaging the embankments and the environment. They have been doing it for the last several years, though banks are reluctant to provide the promised credit linkage to sustain their approved plan of activities under governmental schemes.

3.10 Just like the opposition faced by Sandeshkhali-II SHGs from governmental banks, there are also several well-known instances of spontaneous and legitimate collective-action based fishery and allied activities, which are being thwarted, damaged and even banned by powerful elements and institutions in the society. One such powerful element in recent times is the Ministry of Environment and Forests, which became too aggressive after being equipped with several Acts on Conservation, once the term ‘environment’ got unjustifiably tagged to ‘forest’ and ‘forest’ only⁸! The unhappy events in Jambudwip in West Bengal, Tawa Reservoir in MP and Kulleru Lake in Andhra Pradesh where the environmental card is overplayed to the disregard of the livelihood issues of the relatively unorganized fishing community are pointers to a serious bottleneck in fisheries development, where Nature is omnipresent, and trade-offs are always involved in most human acts. Without a broad-based coalition of stakeholders involving professionals from the scientific community, poor and unorganized fisher folk, we believe, can never cross the environmental hurdle in fishing. Only an objective and scientific approach can bring out the net environmental benefits of fishery activities.

3.11 Several strengths and weaknesses of the collective action based leadership-driven community approach to fisheries can be listed at this stage:

1. Although most of these livelihood activities cited here are commercially viable, their long-term ecological sustainability needs to be established beyond doubt, especially in the minds of environmental activists, judiciary and even a section of bureaucracy and lawmakers.
2. Community empowerment, if it is not to be a mere lip service, can't be an overnight achievement, but has to be a long-drawn process, where gradually the decision-making right as well as benefit-sharing right of the community has to be established. Unless the

⁸ Contrary to environment being a neutral Ministry with representations from several other Ministries on equal footing to facilitate a healthy negotiation process, what has happened seems to suggest that other Ministries have nothing to contribute towards environmental protection! Thus, other Ministries and Departments, instead of being treated as joint stakeholders, are being made subordinate to the Ministry of Environment & Forests, thus allowing huge ‘wealth effect’ to creep in to jeopardize the entire Coasian negotiation process.

community is organized within a suitable organizational format, empowerment would have no meaning. Moreover, even an organized community can't establish its residual control and claim right in isolation; it has to be evolved through interaction with other co-producer partners and even stakeholders – otherwise appropriate checks and balances can't be evolved. Though community is often the most intimate stakeholder to a fishery resource (in the sense that it has the largest stake), even then, its rights can't be exclusive and absolute. Partnership is a must, and whom to involve in partnership and how to tinker with the rights and responsibilities across partners through tinkering and fine-tuning of an organizational format is the perpetual job of a leader.

3. Shortage of financial and human capital is obviously the most apparent hurdles in scaling up any successful experiment. But lobbying and networking with friendly organizations to handle turbulent outside environment and achieve suitable economic and legal policy changes for sustainable livelihood promotion must go hand in hand.
4. Continuity in leadership which most successful community-based organizations can't manage must be ensured. Since the corporate sector has so far managed the continuity issue more successfully than any other form of organization, there is no alternative to roping in appropriate corporate bodies, which are development-oriented and keen on empowering the community by roping them in as co-shareholders, rather than treating the community merely as vendors or consumers. Obviously, government or even pure forms of cooperatives can't do this job. Moreover, large-scale efforts are needed to promote leadership from grassroots level, who would have a natural stake in the job in hand, rather than always praying for elite-type leaders – which is the usual mindset in our country and happily approved by our systems. Elite leaders can at most act as good proxies to begin with. If such leadership is not interested in promoting grassroots leaders in the relay race, the message should be loud and clear that such leadership isn't simply interested in community empowerment, in spite of all rhetoric and assertions.

SECTION IV: INGREDIENTS FOR SUCCESS

4.1 While reviewing important and interesting cases across fisheries, dairy and poultry sectors, in particular, certain stylized features in terms of ingredients for success surface again and again. These

ingredients and conditions are listed and briefly described below to provide possible action points and a perspective for developing sustainable fisheries in the country:

1. **Market–orientation & leadership from below:** Not only in successful dairy enterprises, but also in successful poultry enterprises (e.g., NECC, Venky's, Suguna, Arambagh Hatcheries), entrepreneurs evolved from within the relevant sectors. Stories and life histories of Tribhubandas Patel (AMUL), Galbabbhai (BANAS), Tatyasaheb Kore (WARANA), B K Roy (Arambagh Hatcheries), Dr. B V Rao (NECC, Venky's) and Sundararajan brothers (SUGUNA) bear testimony to this point. Moreover, unlike brilliant leadership in the sugar sector, these inside leaders preferred to confront the market from the beginning, instead of depending on political favour and public exchequer to operate in a captive market. So, the issue is how to produce for fisheries sector a large number of such pragmatic internal stakeholders with strong leadership qualities.
2. **Designing a collective action process to promote a community-based organization together with backward & forward linkages as per market logic:** While most fisheries coops seem to have copied the AMUL model and instituted 3-4 tier organizations, the former seem to have failed to assign distinct economic functions for value-added activities to the higher-tier bodies, which ultimately turned out to be para-statal bodies not only draining scarce public resources on at best certain welfare activities, but also acting as burden on lower-tier primary societies. In milk coops, it didn't happen as internal leadership with distinct accountability to the farmers and constantly having a close look at the market and its dynamics could never afford to construct non-performing organizations and assets. In the poultry sector, private forces being very strong from the very beginning and in the absence of government support and subsidies, the leaders developed an altogether different private institutional setup to respond to the market demand.
3. **Marriage between leadership and professionals:** All successful leaders have built up bridges with professional technical and management personnel to have continuous dialogue with them and have even gone to the extent of internalizing them. 'Like King, like Queen' relationship between Tribhubandas Patel and Dr. Veghese Kurien in case of AMUL and that between Tatyasaheb Kore and Nandkumar Naik in case of Warana Sugar Complex near Kolhapur are best examples of such effective interface. All these organizations are eventually

run by professionals as the largest group of stakeholders, as in case of the corporate sector in general and especially in Japanese Keiretsu⁹, but they are accountable to leaders, on the one hand, and members, on the other. As a result, there is a constant relay race going on among leaders and professionals in successful enterprises to ensure their sustenance over the long run. While this relay race seems to be happening in successful cooperative dairy and poultry sectors, this is far from the case in fisheries.

4. **Clearly defined property rights over all basic resources, products and value-added items to achieve both vertical & horizontal integration:** In cases of both dairy and poultry, all necessary ingredients and resources in production, process and marketing have clearly defined property rights, which is hardly true for fishery resources. In milk sector, for example, there are private property rights over cattle, while the responsibilities for supply of feed, fodder and medicine are well-defined. The farmers get paid as per the easily observable parameters of milk. The milk farmers don't lose their property rights on milk at the moment they hand over milk to higher-tier bodies. As a result, they continue to remain effective partners in value-adding activities by higher-tier bodies. A similar innovative contract system has been devised by the poultry sector (especially by VH Group and Suguna), where farmers are involved in a suitable risk-cum-cost-sharing contractual system to grow day-old chicks under professional supervision, without taking the hassles of marketing. Moreover, successful leadership have always created network (best examples being NEEC and Milk Unions in Gujarat which sell their products together under a broad brand name of AMUL), that is a Brotherhood or Handshake form of organization to achieve friendly (rather than cut-throat) competition without harming cooperation. Networking and strategic alliances have enabled them to grow further and tap not only economies of scale, but also huge economies of scope by launching a diversified but related set of products. Even small players like Mudialy and Bon Hooghly in Kolkata have done the same to maintain an appropriate risk-hedging portfolio and flourish. VH Group and Suguna too have started selling value-added fish products, using the same cold chain system. So is also Reliance Retail Stores in selected urban pockets, though they are facing severe shortages of fish materials.

⁹ See, for example, Datta, Samar K. (2008): "A Technical Note on Property Rights": Course Material prepared for IIMA

With appropriate facilitating role of NFDB, the retail outlets can play a very useful role in promotion of fisheries marketing in future.

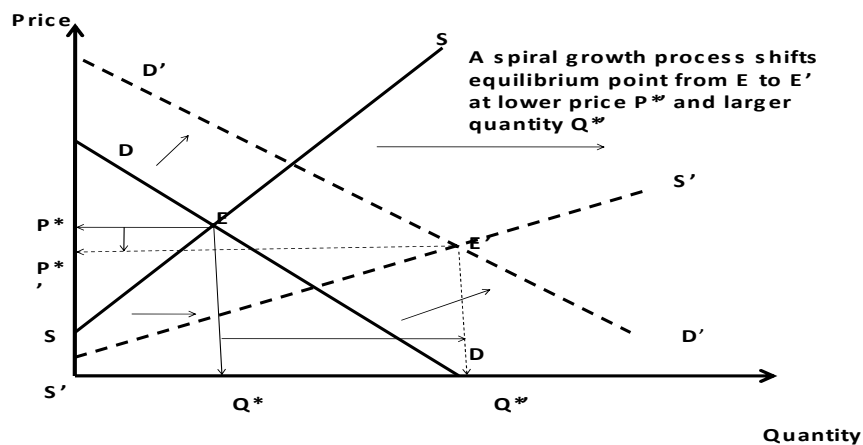
5. **Expanding market through investment in logistical development:** Under able guidance and leadership of NDDB, the dairy sector has created a vast national cold chain together with a vast network of wholesale and retail delivery system to launch practically any milk or related product (e.g., Assam tea by BANAS dairy) at relatively negligible cost. Though on a smaller scale, poultry players like VH Group, Suguna, Arambagh Hatcheries etc. have undertaken similar infrastructure investment. Fish farmers in Kulleru did a nearly similar job, purely on private basis, though it seems they are deprived of a fair opportunity under a suitable regulatory system – mostly due to pressure from environmental groups!
6. **Judicious efforts to become market leader and set up norms of market behavior, which other players have to follow:** AMUL started marketing its products initially with the help of a private marketing organization called Voltas, but was quick to learn the tricks of marketing, so that it started doing marketing on its own. After establishing itself in the market place, AMUL became a market leader not only with a significant share to influence market outcome, but also to set up the norms of behaviour in the market place (e.g., payment for milk on the basis of fat and SNF contents, specifying ingredients of milk on the top of each milk pouch and bringing out one new product after another), which forced any rival entrant to follow suit. NECC, V H Group, Suguna started following the same strategy, while the fisheries sector is yet to come up with a similar move, though there are enough beautiful fish products devised by the scientific community at CIFE, CIFT, IFP, LDCL etc. So far these organizations have failed to manage the distribution channel.
7. **Control over cost and quality of inputs:** Not only dairy coops, but also poultry leaders have undertaken R&D in inputs to ensure quality and cost control. Fisheries have largely failed in this context, although SIFFS seems to have made serious attempts, and also achieved a fair amount of success, without any government support.
8. **Cementing relations with farmers through welfare activities:** Undertaking corporate social responsibility alongside value-creation activities is an important feature of successful dairy/poultry units. Many of them have gone to the extent of organizing consumer coops for their members/employees. Such success stories are few and far between in case of fisheries.

9. **Differential sensitivity to environmental concerns across the sectors:** While fisheries activities in a number of court cases have been decried as contributing to ecological degradation leading to vigorous protestations and subsequent closure of such activities, a peculiar insensitivity is observed towards the ecological impact created by significant decline of bovine and poultry resources of domestic breed in India. Such an anomalous treatment by “environment crusaders” seems to have overstated the success of dairy and poultry, while simultaneously undermining the success of the fisheries sector. Failure to acknowledge the contribution of fisheries sector toward the process of de-polluting water bodies and the impact of environmental pollutions created by other sectors – agriculture, dairy and poultry included – on the functioning of the fisheries sector further tilts the balance against crafting formal marketing institutions around fishery resources.
10. **Autonomy of decision making bodies preserved by necessary homework and advocacy activities to influence policy:** NDDDB seems to have been most successful in this regard – not only to safeguard the autonomy of its organizations, but also to do the necessary homework and advocacy activities to promote alternative institutional options for cooperative members to organize themselves under Mutually Aided Cooperative Societies Act, under Amended Multi-state Cooperative Societies Act and under Producer Companies Act. NEEC and organized poultry sector players too have started playing a similar role. Unfortunately, the rather sporadic efforts in the fisheries sector (e.g., by SIFFS, Kulleru fishermen, Tawa fishermen, and Environment-preserving fisher folk of Kolkata) don’t seem to have gone very far. It is now up to NFDB to make a sensible assessment of these sporadic efforts by drawing a line between legitimate and illegitimate environmental concerns and to convert such efforts into a constructive movement to build up fisheries. While the nature of resources under fisheries is such that it is difficult to define property rights on such resources, this has been a relatively easy task for dairy & poultry. This is where innovative thinking by NFDB is necessary – especially with respect to aquaculture, the sunrise segment in fisheries.

4.2 The above-stated features seem to have been working fairly successfully in the context of dairy and also to some extent in poultry, but not in the context of fisheries. As a result, a continuous spiral process of growth through right-ward shifts in demand for and supply of a diversified set of sector-specific products are seen in the two former categories of sectors (i.e., by augmenting

demand and cutting down costs, mainly through productivity augmenting interventions, as shown in the diagram below).

4.3 National Fisheries Development Board (NFDB), set up as the apex organization to steer Indian fisheries sector to sustainability and profitability has its responsibilities well cut out in the days to come. It has to not only effectively pick up ideas from the insightful experiments of NDDB and NECC, but also take care creatively of the peculiarities of fisheries sector that are absent in the other two sectors. A typical government bureaucratic approach with over-emphasis on roles of governmental and para-statal bodies, we fear, will only make matters worse for an already crippled sector!



SECTION V: CONCLUSIONS – SUGGESTIONS FOR A HYBRID MODEL FOR THE FISHERIES SECTOR

5.1 After having analyzed the different models currently being employed and their relative successes and failure in the context of sustainable livelihood promotion, we would suggest a new hybrid model for the fisheries sector which is based with the following considerations:

- Sustainable and growth oriented financials with minimum support requirements;
- Protecting the interests of the most fragile and needy members of the eco-chain – the fishermen;

- Protection of the environment and the ecosystem;
- Maximizing the opportunity for technological intervention.

5.2 To realize these visions, a hybrid model, based on enterprise creation, and with an inherent characteristics to convert stakeholders into shareholders, would be required. Three key stakeholders and contributors come in the form of labor, land and investment. For the fisheries enterprise to succeed, the new hybrid model should envisage a situation where all these three parties are equal shareholders as shown in the following table.

Stakeholder	Description	Focus
Labor	Skilled and semi-skilled fishermen and other members from the community who can be involved in the operations right from the point of catching the fish, to its processing and sales.	This shareholder would work primarily towards protection of the interest of the fishermen and would also benefit from additional jobs in the domain of processing and marketing.
Land	Since the property laws are not unambiguous, it is difficult to classify the factor “land”, unlike in traditional agriculture or animal husbandry. The most plausible explanation for land in the context of fishery would be the environment and its natural resources which provide fish. Hence, the stakeholders would be representatives from local community who are trained in the environment protection for sustainable economy	The role of this shareholder would be to ensure that the fragile ecosystem in which fish is grown is not destroyed and hence fishing remains a sustainable process in a given water body. It would check excessive fishing, poor practices and external agents which damage the ecosystem.
Investments	By investment what is implied is the role of the investor in the financial capital for better equipment and knowledge for better processes and market linkages for better sales. This may come in the form of private sector participants. Government can also be a significant enterprise based investor among others.	The third leg of the enterprise would bring in better technology to assist the interests of the other two stakeholders and also to maximize profits. It would also be like investor who brings about better equipment and opens up more markets all with the goal of improving the bottom lines.

5.3 The foremost need is therefore to bring about an ecosystem which supports the training and incubation of entrepreneurs, provide linkages and logistics to the market and offers knowledge and technological support to fishermen-entrepreneurs. The PURA model as envisaged by Dr. APJ Abdul Kalam has a vision to create such rural ecosystem on the basis of the four connectivities. These are shown below along with the respective implications for the fishery sector:

Physical Connectivity	Roads and railways to provide linkages to the external. Similarly, physical infrastructure like cold storage and processing facilities to be established to increase the value and shelf life of the final product moving out from the fishermen. Government may assist in setting up the necessary infrastructure.
Electronic Connectivity	Fishermen villages to be linked electronically via V-SAT, WiMax or Radio etc. to district headquarters, markets and also to technological centres. Also important is attaining connectivity via mobiles, GPS trackers etc.
Knowledge Connectivity	Upon establishment of electronic connectivity, remote learning and information dissemination would be possible. Then the fishermen community needs to be supplied with all modern technological facilities, environment-friendly activities and market intelligence. Knowledge connectivity would also imply setting up training programs to breed new entrepreneurs.
Economic Connectivity	The three above-stated connectivities would finally be leading to economic connectivity of the rural enterprises. This would imply establishment of technology driven and environment conscious enterprises which are vertically integrated to maximize the value of the final product and are well linked with markets. It would also imply creation of a public-private-community partnership (PPCP) based stakeholder to shareholder model to incentivize an inclusive growth process.

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