

Baseline Study for Fisheries Development in Telangana State

FINAL REPORT



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Executive summary

Fisheries and aquaculture is one of the promising primary sectors with an estimated share of 0.6% of GSDP and 3.47% of agriculture GSDP (2014-15). The sector generates substantial income and employment to rural population and provides for welfare of fishers. The state is ranked 4th with 6.14 lakh ha of water spread area accounting over 11.6% of total inland water resources of the country and is next to Odisha (9.89 lakh ha), Karnataka (7.4 lakh ha) and Tamil Nadu (6.93 lakh ha). In terms of fish production, at 2.37 lakh tons (2015-16), the state ranks 9th position in the country and contributed to about 2.2% of country's total fish production (10.76 million tons). The state is also known for its rich fish biodiversity harboring over one hundred and sixty five species of fishes in its diversified inland waters.

The state is endowed with a rich and wide variety of water bodies both seasonal and perennial. The resources are vast and diverse, and are in the form of tanks/ponds, reservoirs, rivers and canals, water harvesting structures, non-conventional water bodies viz., coal & quarry tanks/pits, irrigation wells and small water bodies constructed under MGNREGA, Mission Kakatiya, NMPS, NHM, NFDB and such other programs of Government of India and the state. The state's fish production of 2.28 lakh tons and freshwater prawn of 0.09 lakh ton contributes about 2.2% of country's total fish production (10.76 million tons) during 2015-16. With respect to inland fish production, the state's contribution during the year was about 3.3% of country's inland fish production of 7.16 million tons.

With the changing consumption pattern, emerging market forces and recent technological developments, the sector has assumed increased importance with farmers and others. Fish culture in tanks and own ponds, reservoir fisheries, fish harvesting, net fabrication, transportation and distribution, marketing and supply chain management are also emerging as important commercial activities. Hence, the major focus of Govt. is on facilitating development in line with the technological advancement to achieve inclusive socio- economic growth, meet community aspirations for their livelihood and economic progress, entrepreneur's expectations on the sector.

Study context: *The key predicaments are mainly resource related viz., predominance of seasonal resources, common property resource supporting multiple activities; low adoption of improved technologies, process, management and governance; inadequacy in institutional support for HR development; limited supportive initiatives, schemes / programs; lack of reliable database and sustainability of related initiatives. The DOF has used a combination of policy levers, with several pro -fisher policies and guidelines for boosting the overall sector growth. Providing better resource access to fishers associations on priority, free seed supply, positioning of infrastructure and support system to address backward and forward linkages including knowledge awareness, skill strengthening, training and capacity building are being taken up. However In spite of these, per hectare productivity remains at sub-optimal levels and is a matter of concern for development. The state is witnessing continued supply-demand gap of 20-30% and the present shortfall in fish supply is being met mainly from neighboring Andhra Pradesh and other states. Thus, meeting the growing demand for fish always holds the key and is regarded as one of the important constraints and a major challenge in the development of the sector.*

In this backdrop, the Government of Telangana intends to address identified Key Resulting Areas (KRA's) viz., Integrated Resource Development (IRD), better resource expansion & utilization, vertical resource productivity enhancement improved fish culture and management practices, growth of the sector with improved resource productivity, enhanced fish production, profitability and community socio- economic benefits in a holistic way.

With a view to Profiling of sector through a well structured professional baseline / benchmark study to understand status of resources, stock enhancement and farming practices, support systems, institutional arrangements and networks, schemes/programs and policies to promote fisheries and aquaculture; identifying gaps; explore new opportunities; develop road map and strategies to build a new landscape for sector growth in the state, the Government of Telangana vide letter no. No. 954/B1/2016 dated 29th April, 2017 has requested Agricultural Finance Corporation of India (AFCI), Mumbai for consultancy services to assist Government in

conducting baseline study of fisheries in the state defining the **Broad Terms of Reference** for the assignment viz., carryout

(i) baseline assessment of water body resources, (ii) aquaculture production systems and practices, (iii) status of fish seed production in the State, (iv) functioning of Fishermen/ Fisherwomen /cooperative societies and Federation, (v) status of available infrastructure in the entire supply and value chain (vi) assessment of domestic fish consumption, demand & supply, (vii) fish marketing trends, market potential, scope and opportunities for exports and imports, (viii) Institutional arrangement/support services in support of backward and forward linkages, (ix) HR development, (x) Finance and credit support of banks, (xi) Policies in practice, (xii) Documentation of socio-economic issues of fishers and others involved in fisheries and aquaculture activities, (xiii) Issues to ensure accelerated growth in sector and (xiv) Suggestions & Recommendations for the overall sector growth. The study was taken up from June 2017 and field survey in the nine selected districts was completed between July-October 2017.

Study methodology: The existing 31 districts of the state were divided into three nearly homogeneous strata (each stratum with a given a number of districts-10-11) based on climate, rainfall, soil quality, resource spread, intensity and diversity of fisheries and aquaculture activities. For sampling, three districts from each stratum were selected in consultation with the Department of Fisheries, GOT based on critical aspects of resource spread, diversity, sector related activities and performance, contribution and untapped potential etc. Within each selected districts, nine village clusters (each cluster with 5 contiguous villages and each village having at least one resource type) spread across different Mandals were selected randomly for the detailed study. Thus altogether 45 villages / district formed the study units. Study covers 405 villages across 81 clusters. For operational convenience the field study was organized at three different levels i.e., level I at villages, level II at clusters (mandals) and districts and level III at state level. For the purpose of the study, Agriculture Finance Corporation of India (AFCI) positioned a Study Team comprising 'Core Team of Multi-disciplinary Experts', field enumerators (one per district), team leaders (one for three districts).

The data requirement in the study was structured into seven broad categories viz., resources, activities, markets, institutions, infrastructure, human resource development, policies and strategies. A concept of location/**geographic tagging** has been developed for proper data management where in a coding has been adapted right from district level to Mandals and villages. **FGDs and Case studies** were also held by the expert team for more detailed analysis and inference. Apart from personal spot visits to reservoirs and tank resources on a selective basis, Interface / interactions with FCS, GPs, KVKs, training institutions, NGOs, SHGs, and Federation both at district and state level have been carried out as set out in the methodology.

Resource productivity studies were conducted in diversified water bodies of varied bio-physical characteristics. The focus was mainly on development of data base on resource characteristic, studying abiotic factors in support of estimation of fishery resource productivity and fish assemblages. The biological studies have been carried out in 11 reservoirs spread out in 7 of the study districts covering 7 small, 2 medium and 2 large reservoirs. Eight reservoirs covered are in Godavari basin while three are in Krishna basin. Similarly productivity of 36 tanks covering 28 Departmental tanks 6 Gram panchayath tanks and 2 private tanks.

Sector review: The activities of fisheries are being pursued in diverse water bodies of different sizes and varied bio-physical characteristics. Considering the resource base, it is the tanks and reservoirs that form the major focus of fisheries and aquaculture development in the state. Hence, the present fish production, sector growth and development are driven by the ongoing activities mainly in these water bodies. The resources have an integral role in fisheries and livelihood security of the local community.

Reservoir Resources: The state has altogether 103 reservoirs with a TWSA of 210010 ha spread out in 26 districts. The share of reservoirs to total water spread area accounts for nearly 34%. Within reservoir resources, large reservoirs account for over 64% followed by medium 22% and small reservoirs 14%. The water sharing in reservoirs is for multiple purpose (mainly irrigation, drinking, power generation etc) and fisheries comes next and is being encouraged by the state with certain conditions. Excepting about 17 reservoirs that are licensed out to fishers all others are leased out to PFCS for fisheries development. Fishers of the catchment are dependent on reservoir fisheries to eke out their livelihood.

Tank resources: These resources are regarded as the lifeline of state fishers and core of the rural ecosystem with a significant contribution both to agricultural production and fish production; and account for 4.04 lakh ha (23642nos.) with a share of 66% to total water spread area of the state and are mainly functioning as rain water harvesting structures. In general, most of the tanks are seasonal in nature and are rain-fed. Short seasonal tanks account maximum both in numbers (19687) and water spread area(219997 ha) accounting for 83% in number and nearly 55% in area; Share of long seasonal tanks is 16% in number and 41% in area and perennial tanks, 1% and <5% respectively. The existence of more seasonal tanks, and rain dependence, has limited the anticipated fish production to meet domestic fish demand and hence the state has now no alternative other than promoting aquaculture. Further, this needs to be emphasized to offset lower acreages under perennial water bodies for fish farming in the state.

Principal **craft** used is thermocole raft (locally called TEPPAM) and in few water-bodies, coracle and Boats made of Wooden/ galvanized sheets are employed. Only the passive **gear** such as simple gill nets made of monofilament net material. Shore seines (pondy) of various dimensions and mesh sizes are employed for harvest of fish in long seasonal and perennial tanks. Use of cast nets is predominant in tanks and small reservoirs, occasionally in large and medium reservoirs also. **Fishing operations** in reservoirs are carried out by licensed fishers or managed and monitored by the Societies. While in tanks allotted to societies, fishing operations are carried out directly by members of society or through hired labour or FCS enter into an agreement with merchants for sale of fish.

Aquaculture: Development of this segment in the state is at low key. About 474 aquaculture ponds covering 784 ha is under this production system and the activities are more traditional, restricted to low level of input usage, and limited to only a few districts viz., Gadwal, Wanaparthi, Mahabubnagar, Khammam, Sangareddy, Warangal Urban, Yadadri and Mancherial. The contribution of freshwater aquaculture to total fish production is very insignificant. Normally grown species are Indian Major carps and in recent years farming of pangasius and Tilapia, native catfishes, murrel and freshwater prawn and vannamei are gradually gaining attention of fish farmers.

Cage culture of pangasius is being pursued in reservoirs (open waters) of some selected districts (LMD, Wyr, Paler etc.). Tilapia farming was experimented in selected reservoirs and the economic feasibility was not encouraging to promote / expand the activity on a commercial scale. The low market price and reduced market absorption worked against wider expansion of the farming activities of these fishes at present. **Pen culture** is yet to go for field level adoption and efforts are going on for promoting fish seed rearing and fish farming in pens and coves in selected reservoirs and perennial tanks on a trial basis. **Re-circulating Aquaculture System** is coming upon a limited way under closed system of farming exclusively on feed and under intensive system. IPAT farming system is also regarded as upcoming technology for enhancing fish production.

Fish seed production and Rearing: The state has six Government **hatcheries** (farm area of 45.5 ha) and 5 private seed rearing farm cum hatcheries (18.7 ha area) functioning with a cumulative internal spawn production capacity of around 223 crores. and the estimated designed capacity per ha farm size is 0.59 crore spawn as against 10.48 crores in private farm indicating the existing scope for both horizontal and vertical expansion of activity in Govt. farms. The spawn production capacities of govt hatchery range from 2 to 6 crores with a cumulative designed capacity of about 27 crores and of private hatcheries, one crore to 175 crores with cumulative production capacity of 195 crores. The share of govt. hatcheries is meager (12%) and private (88%). In terms of spawn production, the performance of Govt. hatcheries is 39% and private hatcheries 50-60% of their full designed capacity. The fish species that are bred are mainly Indian major carps and common carp.

State has altogether 32 **fish seed rearing** farms with farm area of over 200 ha and 8 farms under private ownership with nearly about 40 ha farm area. The annual production contribution of govt. hatchery is 11.38 crores fry (@5.7 lakh fry/ha or 2.3 lakh fingerlings considering survival from fry to fingerling as 40%) and of private is about 11.3 crores fingerlings of 35-40 mm (@28.25 lakh fingerlings/ha) indicating over 10 folds higher output in private farms over Govt. farms. The state has overall 40 farms with 240 ha of farm area in support of seed rearing. The average survival rate of spawn to fry (12-15 mm) and fry to fingerlings (35-40mm) in most of the state farms is around 40-50% and 50-60% respectively and the survival from spawn to fingerlings (35-40mm size) is around 25 % while in private sector farms survival from spawn to fingerlings (35-40mm size) is better (30-40%).

Overall fish seed requirement as fingerlings for 2016-17 was estimated at 56.11 crores (46 crores as fingerlings of 80-100 mm size) and 10.11 crores fingerlings of 35-40 mm size and was met both through internal production and also by outsourcing. Total internal supply was around 15-16 crores fingerlings (25%) contributed by DOF farms (4-5 crores fingerlings, 6.9% share) and private farms (11. 3 crores; 19.5% share). The state outsourced 75% mainly from neighboring state of AP, and other state to bridge the existing gap.

Overall fish production and growth trends of the state witnessed a progressive increase from 1.97 lakh tons during 2011-12 to 2.6 lakh tons during 2014-15. In the subsequent years the total fish production of the state witnessed decline in production to 2.28 lakh tons during 2015-16 and also in 2016-17 registering production of 1.94 lakh tons. The state has made a impressive strides in prawn production during the same period of four years starting from 2011-12 registering production 3774 tons and later increased production of 5037 tons in 2012-13, 6596 tons in 2013-14, 8352 tons in 2014-15, 8567 tons during 2015-16 and decreased to 5189 during 2016-17. Fish production has shown annual fluctuations during last five years, largely due to rainfall changes.

Cooperative structure: The DOF prioritized promotion of **Fishermen Cooperative Societies (FCS)** as one of the important grass-root level institutions for the development of sector activities, identifying and organizing fishers under the local institutional framework of Fishermen Cooperative Societies and three-tier-cooperative system (PFCS,DFCS and Federation). The primary FCS are Federated into 10 District Fishermen Cooperative Societies, which in turn are federated into the State FCS Federation, an Apex Body. There are as many as 4001 cooperative societies, with enrolled member strength of nearly 2.87 lakh. They comprise 3595 Men Primary Fishermen cooperative societies with nearly 2.59 lakh members (share of nearly 90% in number and member strength), 400 Fisher women cooperative societies (FWCS) with 22702 members and also 666 women groups identified as Matsya Mitra's involving actively in fish marketing and 6 Fishermen Marketing Societies (FMCS) with 3529 members. The FCS is managing all the fisheries activities under different arrangements. Both FWCS and FMCS deal with marketing of fish and work in close connection with main PFCS. The FCS function under the guidance and advice of the Department of Fisheries.

The PFCS resource development operations and handling of issues constraining development of allocated resources is highly unregulated. These societies are extended with a number of benefits like exclusive allotment of government tanks on lease, licensing of selected developed reservoirs to fishers for fishing to meet their livelihood, supply of fish seed, leasing of reservoirs to FCS, subsidized supply of fishing nets, Boats, mopeds, Pick up vans, of late support for cage fish farming etc. The contribution of **FWCS** to sector activities is observed to be substantial and is resulting in generation of additional employment within sector. The activities of **DFCS** in support of FCS development and community welfare are not visible. **Telangana State Fishermen's Cooperative Societies Federation Ltd.** is mainly focusing on marketing of fish and Fishermen welfare schemes. The hygienic fish marketing units and also fish canteen operated by Federation are well networked in support of business and supply of quality fish to consumers at reasonable price on a limited scale and is restricted to state capital.

Fish Marketing: In all, the state has over 83 **fish market** outlets. and three wholesale cum retail markets, two in Hyderabad of bigger magnitude both in terms of volume and value trade (Begum bazaar and Musheerabad) and one in Karimnagar town (Ramnagar market) providing access to consumers and linking produce of fishers with wider market network chain. The rest of the markets are of different magnitude and function with wider diversity and arrangements. Nearly 55% of the markets are retail and comparatively better organized with a market spread across tier 2 and tier 3 cities and major towns. About 45% of the markets are unorganized, and majority of them have no shelters. Fish trade in general is being carried out in unhygienic conditions. Increased economic status of people is adding to increase in fish consumption. As a traditional practice fish is preferred in fresh form and that too, in live condition. Consumers preference for processed fish/fish products is only limited. The consumer awareness on nutritional value of fish is increasing and simultaneously the growth of urban population and increase in spending on food is happening.

Department of Fisheries: All Fisheries related activities are being promoted, planned, monitored and regulated under the institutional frame work and arrangements. The sector Development activities are being implemented and managed by the Department of Fisheries through the District offices. Each District is provided with some minimum staff and is managed by a District Fisheries Officer. Due to shortage of staff, in many newly created districts, the FDOs are positioned as DFOs on an officiating basis. This has seriously affected the performance of the staff and implementation of sector development programs at the field level. The Department of Fisheries is imparting training on various aspects of sector on a regular basis through Inland

Fisheries Training Centre (IFTC), Hanumkonda, Warangal district. This apart, the National institutes (MANAGE, NIRD, NAARM) located in Hyderabad, State Agricultural and Veterinary Universities, KVKs, Fisheries Research Station, Divisional Training Centre (DTC) and central Fisheries centre's are also conducting need based training programs for the Departmental personnel with external funding sources on a periodic basis. They also provide technical support to the Department. The National Fisheries Development Board with its Central office at Hyderabad is supporting sector development through wide ranging schemes and programs. By and large, this sector has not benefitted with institutional credit.

Fisheries Infrastructure: In general, the **infrastructure** facilities for the sector growth are limited to **hatcheries, seed farms** in govt. sector and private for fish seed production and rearing apart from fish markets, landing spots/ centers and some ice plants mainly in private sector. Quality seed production and rearing in the department fish seed farms is mainly limited due to inadequate facilities related to land and water. Addressing the present '**Seed Deficit**' situation, efforts are being made by the DOF to restructure / improve the conditions in these units, the outcome remains to be seen. The private seed producers (barring one at Jagtial) have smaller capacities. It was seen that private participation in seed production is emerging mainly among young and enthusiastic fishermen/ entrepreneurs and this is expected to meet the demand for seed and facilitate to move forward for inclusive growth in the fish seed segment in years to come. The **landing spots/centers** have make-shift arrangements for landing of fish where spot sale also is carried out and trading takes place between the buyers and sellers. The state has 43 **ice plants** with capacity ranging between 1-20 tons/day. The existing total capacity of ice production from these private infrastructures is estimated at 272 tons/day. At present the demand for fish outpaces /outstrips supply, which leads to a fast turnover and hence there is absence of **cold storage facilities** in most of the districts. The present handling and transportation of fish limits to use ice where ever is available. There is clear absence of hygienic transport vehicles (Refrigerated vehicles) and the **cold chain**.

Schemes: The Department of Fisheries is supporting fishermen and their societies in their livelihood and welfare activities and promoting fisheries development through number of interventions. There are **specific schemes** supported under State Plan, **Centrally Assisted State Plan schemes**, Tribal Sub Plan (TSP) and Scheduled Caste sub Plan (SCSP) by GOTS, Blue Revolution program and Integrated Fisheries Development Scheme (IFDS) related to resource use, productivity enhancement, market development, institutional and market related aspects apart from the backward linkages. Central Scheme of personal insurance for fishermen is in operation under which an amount of Rs. six lakhs is paid by way of compensation to the family members/next of kin in the event of fatal accident or death due to drowning or any other reason. Similarly, **Group Accident Insurance Scheme** to support fishers in case of any eventuality while carrying out fishing. There is also a special focus on innovative schemes. Fishermen welfare is yet another aspect of promotional schemes that is given due importance.

Fisheries Policies: The GOTS has put in place several **policy guidelines** and Govt. orders in place aligning with national policies and programs to address many issues related to resource access, initiatives for input support, aquaculture, cage fish farming, exotic fish culture, conservation of fishery resources and governance, convergence and conflict resolution that are constraining sector growth, ensure optimum and judicious utilization of available natural resources with technologies, management led development approaches and sustainability for the benefit of human kind and with equity.

Fishermen profile: Historically, fisheries activities were mainly carried out by specific communities and their Socio-economic profile indicated unorganized nature with least social security benefits. Due to traditional practices, fishers are socially deprived; educationally weak with very high occupational rigidity and face high risks of life and means of livelihood. The socio-economic profile of fishers involved either as a primary/secondary source presents increasing participation of young or educated persons (belonging to fishermen communities) into various fisheries activities.

Enumerators Field survey: Profile of fishermen respondents participated in the enumeration indicated average family size of four members with one person per family actively involved in fisheries activities. Nearly 90% of fishers belong to BPL category. Illiteracy level is lower in tank fishermen and education profile at primary and secondary levels is better compared to reservoir fishers. Among reservoir fishermen about 35% and among tank fishermen about 46% report agriculture as supplemental to their livelihood. Higher reliance on agriculture among tank fishermen may be attributed to seasonality limitations of water availability as compared to reservoirs. Similarly, dependence of tank fishermen on business to a certain extent compared to reservoir

fishermen for earning additional income. Longer years of experience was conspicuous in case of tanks fishermen (>80% with over 10 years) compared to reservoir fishermen (51% with over 10 years).

Resource utilization- Reservoirs: The highlights are (i) allotment of resource to FCS on lease is predominant (70%) and amenability for fishing is throughout the year, (ii) both DOF and FCS have equal footing in fish seed stocking process, (iii) share of catla, rohu, mrigal along with common carp in stocking account for 80% and rohu predominates stocking, (iv) In small reservoirs, stocking of common carp is part of the species mix and assume priority, (v) stocking size range 70 to 100mm in over 80% cases with wide variations in terms of species, ratio, and size, (vi) instances of double stocking of resource both by FCS and DOF was high during 2016-17 compared to current year, (vii) use of boats is limited compared to the widely used thermocole theppam, (viii) usage of gill nets and drag nets was predominant and only in sporadic cases use of cast nets and traps is reported, (ix) duration of fishing/day ranges from 6 to 7 hours and the fishing days varies with size of the reservoir (about 140 to 150 days/ yr. in case of small reservoir and up to 230 to 250 days in case of larger reservoirs, (x) watch and ward is one major area where the FCS has been playing a key role (nearly 70%) while the department's role has the stocking as its centrality.

Resource utilization- Tanks: The findings indicate that (i) share of short seasonal tanks is highest at 61% followed by long seasonal tanks at 32% and the number of perennial tanks being only 7%, (ii) In 65% of the tanks, water availability is for <6 months and in about 30% tanks it is 6 to 9 months. Availability of water for >9 months is limited to the extent of perennial tanks, (iii) In more than 80% of tank resources traditional fish culture is practiced and fishing operations is being carried out since 30 to 40 years or even more, (iv) catla seems to be the choice species (30%) for stocking followed by rohu (27%), mrigal (15%), common carp (13%) and others (14%), (v) in > 60% of tanks stocking size of fish seed is less than 50 mm., (vi) stocking density/ha varies from 3000 to 5000 or even higher depending on availability of seed, size, varieties etc. on the perception that higher stocking will result in better fish production, (vii) low input based management with limited application of lime and manure and occasionally conventional feed ingredients as an input is in practice in about 34% of tanks, (viii) FCS takes a clear lead in the management (90%) and share of family labour for watch and ward and general activities is substantial (>75%); (xi) Usage of thermocole theppam is prevalent (>80%) and use of gill nets are common (50%) followed by drag nets (20%) and cast nets (30%); (x) average fishing hours per day is mostly 3 to 5 hours (>70%) with the total no. fishing days per annum being 50 to 100 days depending on tank category. In case of small GP tanks of <5 ha it is even less than 20 days.

Marketing aspects: In the field study, the various aspects of **marketing** have been covered in detail. The coverage includes 659 local/rural markets, 63 aggregators and 3 wholesale markets. Survey of consumers as an important dimension in marketing and feedback has been obtained from 718 rural consumers and 322 consumers in urban areas.

Local/ rural market: (i) majority of local/ rural market operators (>90%) are fishermen cum sellers and are into business for >10 years, (ii) major source of fish procurement (>70%) is from tanks followed by reservoirs (20%) and balance from other sources, (iii) fish species transacted comprise catla, rohu and mrigal (nearly 60%), common carp and grass carp (17%), murrel (2%) and balance by other species, (iv) most of the operators (60%) have continuing/ongoing informal arrangement of contracts/agreement with PFCS regarding procurement of fish, (v) variation across rural markets in annual trading days is about Av. 230 days, (vi) over 70% market operators face infrastructure constraints in procurement, handling and storage etc., (vii) generally operators (>70%) do not face much problem in marketing of fish as it is always in demand, (viii) buyers in the local market are mostly local households (60%) followed by urban consumers from nearby places (30%) and aggregators.

Wholesale Market: (i) Mainly procure fish from aggregator, FCS and outside state. Weekly internal procurement being 2 to 5 tons, (ii) generally adopt methods like traditional contacts, open market buying and advanced paid for procurement of fish from societies, fisher groups and aggregators, (iii) major whole sale operate for 270 to 300 days per year and the private for about 150 to 180 days, (iv) average daily turnover is around Rs. 1.00 lakh in two cases and slightly less in the third case, (v) wholesalers opine that in recent years the consumers' expectations are progressively changing and the demand for freshness of the produce, quality parameters, smaller size (about 750 gms) and local varieties are on the increase. Similarly, cleanliness of market surroundings and hygienic way of handling, (vi) shift from cost-based consumption to quality based consumption and the driving factors being awareness that fish is good for health and increase in disposable incomes in towns and cities, (vii) extensive use of mobile applications in their business to keep in touch with client's retailers, vendors and super markets and vouch for its usefulness in ease of their business, (viii) experience constraints of both fish glut and shortage during certain months which adversely affects their business and suggest support of construction of additional ice plants and new cold storage facilitation to mitigate the situation.

Market aggregators: (i) most of the aggregators are in the age group of 40 to 50 years (>40%) and education wise, most of them are beyond secondary school and up to matriculate (37%), (ii) nearly 75% of aggregators interacted are in business for >10 years, (iii) main procurement source for fish is tanks (63%) followed by reservoir (21%) and other sources (16%), (iv) average procurement of aggregators varies from 0.50 to 1.25 tons weekly, (vi) fish species transacted in the market comprise

catla, rohu and mrigal (>60%) followed by common carp and grass carp (24%) and murrel (8%), (vii) African catfish, tilapia and pacu are the exotic fishes which do not form part of regular market arrivals, (viii) most of the operators (50%) have continuing/ongoing informal arrangement with contracts/agreement with fishermen or co operatives regarding procurement of fish, (ix) carry out trading for over 240 days in a year, (x) over 60% of the aggregators expressed infrastructure constraints in procurement, handling and storage, (xi) request for financial support from institutional agencies tops the list of expectations followed by subsidizing cost of infrastructure facilities without which operators face several risks in their business, (xii) They also want regulatory measures to be introduced to curb unscrupulous and nefarious activities in the market.

Consumers Response: (i) More than 90% of consumer respondents (both in rural and urban) report that they are the head of household, (ii) among rural consumers, more than 60% state their occupation as agriculture while among urban consumers salaried group and business as an avocation is predominant (>75%), (iii) consumption pattern in terms of species indicated preference for catla, rohu, mrigal by 74% respondents, (iv) Fish consumption frequency and per capita consumption is higher in rural part compared to urban consumers, (v) over the period, consumption among rural consumers has increased by 4 times and similarly in urban consumers by > 2 times, (vi) weightage given by urban consumers for fish consumption is more on nutrition and health aspects, (vii) fish consumption has increased from 25 to 50% in last 5 yrs.

Institutional feedback: Gram panchayats: (i) of the total water bodies in the GPs 52% are allotted to FCS and the balance 48% involves use by individual fishermen, (ii) by and large the lease renewal procedure is as per normal procedure followed by government in allotment of water tanks, (iii) a majority of GP members (80%) responded that neither there is need for any change nor any amendments required for the present system of lease and ownership of water body with GP, (iv) suggestions are mainly on timely stocking of bigger size fingerlings and providing training and technical support to fishers.

Fishermen co operative society: (i) most of the FCS studied is older societies with nearly 60% of them in the range of 20-50 yrs since registration, (ii) resources operated by the FCS are either govt. owned reservoirs, DP tanks or GP tanks leased from panchayats, (iii) Av. FCS per capita in terms of owning DP tanks is about 140 ha, GP tanks about 28 ha and overall av. holding of 169 ha. (iv) Nearly 50% of the respondents informed that they are in office for 2-5 yrs while a good number of them (>20%) have reported to be holding the post for >5 yrs and even up to 10 yrs indicating that the democratic processes in the societies have not been effective, (v) number of members at registration and as of now shows that there is a nearly 60% increase over the period with per society average on the whole increasing from 72 to 115 members.

Women Matsya Mitra Groups: The membership in these groups at start was 675 (38 per group) which has now increased to 869 (48 per group) showing an increase of 30% in membership. (i) activities include dry fish production and marketing, retailing of fish (nearly 70%), door to door vending and post sale service like fish cleaning, helping members in obtaining loans, (ii) procurement of the fish is mainly from tank fishermen (50%) followed by reservoirs (30%), the balance being from others like aggregators, (iii) number of **days of trading** varies from 180-300 days in a year, (iv) nearly 60% of them operate in the market run by local municipal council while the others operate from the GP run market facilities, (v) nearly 70% of the cases the respondents say that they share the profits among the group members depending on their contribution, (vi) about 50% of the groups confirm having a bank account through which they route all the transactions, (vii) members are willing to take training in fishery related activities (86%) which can help them to commercialize their ventures and require hand holding in IGPs to be taken up on a larger scale, (viii) they are also involved in arranging exposure visits and to some extent in market intermediation. Some groups have involved themselves in arranging fishing equipment, (ix) requested for hand holding support for bank loans and revolving funds

Other institutions: (i) NGO is involved in tank fisheries and is actively involved in enrolling FCS membership, (ii) KVK is actively involved in organizing general awareness programs on fisheries and aquaculture activities and also involved in distribution of fish seed under Integrated Telangana Development Scheme. They are also conducting training programs for fish farmers, (iii) under the ATMA Programs, promotional activities are being carried out including promotion of poly culture of fish with prawn, popularizing Best Management practices (BMPs) in fisheries and value addition in fishery products.

Study findings: Scenario analysis - Resources and Activities: The resources are focus for new technology adoption, management led fish production, income and employment for rural fishers. The study findings have clearly shown major contribution of these resources to food and nutritional security.

The **reservoirs** in the command area of the Godavari and Krishna Basins and those coming under different agro – climatic zones have different characteristics in terms of water holding capacities, seasonality, inflows from catchment areas etc. **Morpho-metric and hydrological features:** All the reservoirs studied are shallow with high proportion of euphotic zone. The av. water depth at the time of visit by study team for the major reservoir was 20.5 m, medium reservoirs 18.25 m and small 9.4 m indicating a lower depth in the latter category. Reservoirs under-lift irrigation (**balancing reservoirs**) are characterized by high water level fluctuation within a short duration; high inflow and outflow resulting in high flushing ratio; loss of nutrients and flushing of plankton out

of the reservoir and have relatively low primary productivity. Fisher's feedback indicated slow fish growth and low fish productivity.

General Observations: (i) Most reservoirs studied are generally shallow, not well sheltered and reported high wind velocity during monsoon and pre-monsoon months, high water temperature throughout the year, continuous drawdown, low to medium wind and wave mediated turbulence, thermal stratification during the summer stagnation, (ii) Water replenishment was high in most of the balancing reservoirs eg. Sarala sagar and also in small reservoirs viz., ralivagu and Gollavagu, (iii) Main soil types are alluvial, deep and medium black, red and laterite. The principal type of soil present in the catchment area, apart from the red soil, is black cotton mixed soil, (iv) Age of the reservoir seems to have an influence on the macrophyte community, (v) Pocharam, Nizamsagar and Golla Vagu reservoirs appears to be productive as Oxygen exhibited strong clinograde distribution, which is due to high decomposition activity.

Highlights on abiotic parameters of tanks: Altogether 34 tanks were studied for abiotic factors representing three different situations. **Domestic sewage fed water bodies:** Musi river fed water bodies registered significantly high ionic concentration (Mean: 1025 μ S/cm) than Sewage fed water bodies (Mean: 548 μ S/cm); Alkalinity, a correlate of specific conductivity, showed similar trend (Musi fed: 344 mg/l; Sewage fed: 298 mg/l); Water transparency was marginally higher in Sewage fed (Mean: 58.2 cm) vis-a-vis Musi fed (Mean: 49.4 cm) and over all, mean ionic concentration for water bodies receiving high organic load was 774 μ S/cm and alkalinity is 319.6 mg/l. **Rain fed perennial and long seasonal water bodies:** Ionic concentration did not vary significantly between rain fed perennial and long seasonal tanks (Mean: 388 to 409 μ S/cm); Alkalinity was marginally higher in the case of long seasonal (Mean: 191.2 mg/l) as compared to perennial tanks (Mean: 114.7 mg/l). Over all, the mean ionic concentration and alkalinity values for rain fed water bodies was 388 μ S/cm and 156.5 mg/l respectively. **Domestic sewage fed water bodies vis-a-vis rain fed water bodies:** Mean ionic concentration for water bodies receiving high organic load was significantly higher (Mean: 774 μ S/cm) as compared to water bodies that receive only rain water runoff (Mean: 388 μ S/cm). The trend was mirrored in the case of alkalinity value also (Musi river and domestic sewage fed water bodies: 319.6 mg/l; Rain fed water bodies: 156.5 mg/l).

Fish production potential: Reservoirs: Gross primary production was estimated for seven reservoirs representing different categories. The predicted fish yield among small reservoirs is highest for Gollavagu (1072 kg/ha/year) followed by Rangasamudram (842 kg/ha) and lowest for Singetham (231 kg/ha/yr.). For Medium category, fish production potential is high for Saralasagar (1430kg./ha/yr.) and low for Pocharam (447 kg/ha/yr) and for large category, the predicted yield ranges from 731 kg/ha in LMD to 950 kg/ha in Nizamsagar.

Fish production Potential: Tanks: Mean estimated potential fish production for **sewage fed water bodies** is 809 kg/ha/year and is high for **Musi river fed water bodies** (4155 kg/ha/year) due to very high ionic concentration. Additional data is required to estimate the realistic production potential. Mean estimated fish production potential for **rain fed perennial water bodies** is 636.7kg/ha/year. The model has limitation for estimation of potential fish production for long seasonal water bodies and additional data on primary production, phytoplankton density & structure and water holding period are required. Further as present study being short duration, estimates obtained on Morpho-Edaphic index and tropho-dynamic models using Gross Primary Production (GPP) is a first approximation and needs to be fine-tuned based on the field experience and later with detailed scientific study.

Assessment of fish assemblage: Fish diversity of nine reservoirs indicated highest number of individuals sampled in Indiramma sagar (803) to lowest in Rali vagu (16) and the total number of individuals recorded from all reservoirs was 2073. Thirty eight species belonging to 11 families were recorded from nine reservoirs. Among the families, cyprinidae was represented by maximum number of species (17No.).

Resource Development: Fish seed stocking-Reservoirs: The reservoirs are stocked by the state and the stocking density is based on size of reservoirs. Stocking of large reservoirs @ 500/ ha, medium reservoir @ 1000/ha and small reservoirs @ 2000 fingerlings (80-100 mm size) is being followed. Fishing in reservoirs is banned for two months (June-September). **Craft and gears:** Thermocole theppam is most commonly used craft and lack of awareness, trainings and supportive programs has limited the use of coracle in most of the reservoirs. Mono filament gillnet with 50% hanging coefficient are in use by most fishers as the catching efficiency is high. Nets with mesh size of around 20 mm are in common use for minor cyprinids, 25 to 40 mm for medium catfish like *Ompok bimaculatus*, *Mystus cavasius* and greater than 100 mm for major carps.

Fish seed stocking-Tanks: Indian major carps (catla, rohu, mrigal) 70%, and common carp (30%) are the most commonly stocked species by the Govt. and Grass carp is stocked occasionally in selected tanks based on the requirement by PFCS. Freshwater prawn is also some time stocked in a few reservoirs and tanks by the PFCS through merchants. Generally, perennial tanks are stocked with fingerlings of 80-100 mm size @ 2000/ha and seasonal tanks with fingerlings of 35-40 mm size @3000/ha throughout the state. **Craft and gears:** Theppam is the most commonly used craft and both gill nets and cast nets for fishing. In most of the long seasonal and seasonal tanks, shore seine/drag nets are used for the final harvest during summer when water level recedes to the low points. Use of bamboo basket trap nets are in practice in some of the perennial tanks mainly focused for catching fish varieties like murrel and eels and are entrusted to skilled fishers groups who are generally nomads specialized in these operations. They are paid on the variety and value of fish basis.

Performance of water bodies: The reported productivity is low (ranges from 100 -300 kg/ha in case of Panchayat tanks, 300-800 kg in case of perennial tanks and 300- 400 kg / ha in case of small reservoirs, 150-250 kg in medium and 80- 150 kg in respect of large reservoirs. **Predicaments for resource development:** The major predicaments are associated with (i) Temporal and spatial distribution of rainfall- rainfall aberrations, (ii) Resource use for agriculture and other activities for which it is mainly designed, (iii) Soil erosion in the catchment/ water shed area, (iv) Weed infestation, (v) Encroachment, (vi) tree stumps in small reservoirs, (vii) Resource pollution, (viii) Natural and system related limitations in tanks (ix) practice related (x) Social conflicts associated to resource access, sharing of water for crop activities, non maintenance of dead storage level (sluice gate, different format of resource sharing/different scale of partnerships by colluding with merchants.

New opportunities: Predominance of smaller sized reservoirs offers good scope for better resource management and culture based activities. Medium sized reservoirs also offer better opportunities for fisheries activities, particularly for pursuing cage and pen cultures which are sun-rise segments of open fisheries where ever resource feasibility permits the practice. The large reservoirs which are in small number, are presently being harnessed for wide ranging purposes and cage and pen culture could be promoted in select reservoirs.

Paradigm in resource expansion: The state is also making efforts to increase its water resource through revival of tanks and reservoirs and positioning new irrigation projects (balance reservoir projects, lift irrigation projects ...) in support of irrigation, drinking water in the coming years. The utilization of water resources optimally is imperative to the growth of the sector and improving the resource productivity in the State. The on-going efforts of State government are directed towards harnessing river water through various major and medium irrigation projects as one of many mitigation strategies to address prevailing drought conditions and distress in agriculture sector.

Assumptions for Effective Water spread area (EWSA) and Projected fish production: DOF is considering EWSA for perennial water bodies as 75% of TWSA and for short and long seasonal tanks (under both Govt. and Panchayat) as 50% of TWSA for all its planning and development process. Based on proportionate allocation of resource loss to the set of constraints, the EWSA worked out under the study for reservoirs is 62-76%% and for long seasonal small reservoirs it is between 54-68%. Similarly, for perennial tanks is 70-76%, long seasonal tanks 62-68 % and short seasonal tanks 41-45%. The projected EWSA for resources is dynamic and vary with rainfall, draw down of water for irrigation and such other resource specific multifarious activities.

Projected fish production : As part of study, an attempt has been made to project fish production for the next seven years (from the base year 2016-17) based on observations, findings, stakeholders interactions at different levels carried out through field studies, FGDs, case studies and interactions in the selected/study districts. The Overall share to total fish production from reservoirs of the state is anticipated to enhance from present 0.29 lakh tons in base year to 0.56 lakh tons by 2022-23 (increase by over 93% and average annual gain of over 15.5%). Similarly of tanks from the present estimated production of 0.83 lakh tons to 2.40 tons (increase by over 189% and average annual gain of over 31%). Projection of over 5700 ha of small reservoirs with less than 500 ha water spread and over 69000 ha of tank area (as EWSA) of all the categories both under Department and GP is proposed for taking low input fish culture in phased manner. The projected production would come from combination of effects such as (a) increase in EWSA, (b) incremental stocking of seed (c) use of low input and reduction in loss due to mortality. The projections can be realized only with the condition that each of the conditions (assumptions) are put in practice. Any deficiency/ delays in implementation of any of the schemes/conditions would have proportionate negative impact on the fish production.

Aquaculture: The commercial aquaculture is in its initial stage of development as there only a few commercial aquaculture activities in the state and is mainly targeted to domestic markets. The normally grown species are Indian Major carps viz., catla and rohu and to a limited extent mrigal and common carp. The species share in farming vary from district to district and in general share of Indian carps catla, rohu is between 75% and 80% to total freshwater fish production, Common carp account for 15-20%, Grass carp (5-10%), Silver carp, catfish (Pangasius) and murrel account for <5%. Farming of murrel, tilapia, Freshwater prawn, vannamei which fetch better returns compared to conventional carps is the growing new trend among aquaculture entrepreneurs. Only varieties like vannamei is farmed in negligible areas in locations like few mandals of Wanaparthy and Gadwal districts and is destined for export. The produce is supplied to whole sellers of AP (Nellore).

The state offers huge potential for promoting freshwater aquaculture and has better opportunities for aquaculture development. It can grow as a sunrise segment, and has potential particularly in helping the rural poor and the women. Since the consumer preferences are changing towards murrel, catfishes, tilapia, smaller fishes, prawn etc., taking several crops in a year is becoming a reality. But the limitations of backward and forward linkages mainly (i) availability of commercially viable technologies with proven profitability, and sustainability, (ii) dependence on out sourced seed of cultivable fish species viz., Nile tilapia, sex reversed tilapia, GIFT, Cohert strains, hybrids of tilapia, murrel, other catfishes Indian catfish, singhi, Anabas, freshwater prawn, vannamei etc. for farming and seed quality issues, (iii) lack of awareness, trainings, technology hand holding, and limited supportive schemes, (iv) inadequacy in institutional mechanism, infra support, and institutional finance, insurance back up (v) lack of development approaches addressing complete production, supply and value chain etc. have constrained growth of segment.

Challenges of Aquaculture: (i) Limited availability of Tanks / ponds under private ownership constructed exclusively for aquaculture activities, (ii) Inadequacy in appropriate support system- Farmers receiving little or no help from Govt., challenges of power supply, limited access to quality water etc, (iii) Lack of managerial experience in bring down factor cost, enhancing cost effectiveness through better input management, (iv) Lack of hands-on -experience in maximization of water productivity, energy management, better health management, (v) Inadequacy in innovative marketing, improved post harvest, processing and value-addition are identified as key challenges that need attention.

Projected Aquaculture production: Aquaculture has high potential for development, given necessary encouragement and push through financial and technical support. The projected production of 60000 tons of fish and prawn (includes 15-20 thousand tons of freshwater prawn and vannamei) from 10000 ha is anticipated from land based aquaculture by 2020-21 followed by water based farming viz., Cage culture (20000 tons in about 400 cage batteries by 2021-22), pen culture (6000 tons by 2022-23 and RAS (400 tons by 2021-22). Of the 1.464 lakh tons of projected production from sources other than reservoirs and tanks, around 0.964 lakh tons is estimated to come from aquaculture sources (nearly 66%).

The State has envisaged to reach a production level closer to 4.42 lakh tons of fish by 2022-23 from all the sources and this projection is achievable only if the sector development is steward towards technology and management led growth approaches with appropriate investment, infra structure support and institutional arrangement backed up with pro sector schemes and policies/ guide lines.

Fish seed production and rearing: There is growing need for quality seed to meet the demand of both enhanced fisheries (stocking reservoirs and tanks) and aquaculture. Meeting the demand is one of the major challenges for the growth sector in the state. The state at present is producing seed of cultured species with more emphasis on catla and rohu (over 80%). The intensity and efficiency of seed production and rearing activities under govt. and private system is diverse and varied significantly depending on the scale of operation and the involvement. In Govt. hatcheries, utilization of designed capacity is about 40-50%. Achievement of govt. farms against target rearing of both for spawn and fry in general is poor. The overall performance of spawn rearing indicated achievement of over 50% target by only 21% farms and similarly for fry rearing only in 17% farms.

Seed supply chain: Most private seed growers procure their own spawn requirement directly from private hatcheries of AP for further rearing to fry/fingerlings and beyond and supply in support of fish seed stocking by FCS in the state. Within the state, the seed chain is not organized and the networks of seed hatcheries, seed growers are lacking. Fish seed marketing channels in the state is relatively short and simple, working well with private farmers wherein hatchery operator/seed grower are selling seed directly to grow-out farmers, either through delivery or pick-up and the role of middlemen or seed traders is limited. At present is no reliable

statistics on the seed flow of both fish and freshwater prawn as spawn/post larvae, fry and fingerlings at different levels of production chain.

State Fish seed demand and supply: The Est. requirement of spawn is about 319 to 336 crores to further rear to required size fingerlings for stocking different water bodies. Considering the projected requirement of spawn, the gap in designed hatchery capacity is estimated at 97 to 114 crores for the projection period. As per the projection plan, for technology led development of different water bodies the requirement of fingerlings will be in different sizes of > 10 cm, 80-100 mm and 50-60 mm and the estimated fingerlings in equivalence of 35-40 mm size for meeting the requirement is worked out to be between 57- 86 crores (on survival assumptions of 80%, 70% and 60% for further rearing of 35-40 mm fingerlings to 50-60 mm; 80-100 mm and >10 cm respectively).

Limitations of technologies, process and mechanisms in adoption/practices; lack of knowledge on various aspects of seed production including brood stock management and breeding practice; limited Infrastructure, structural problems and defunct rearing facilities; lack of effective technical guidance, information on management practices that are documented with adequate scientific evidence and field data, support of technical standards/guidelines for hatchery production and seed rearing; low awareness of hatchery and nursery operators of different scales on the options and opportunities available for under various schemes/ programs; lack of systematic approach to quality seed production by way of registration of breeding centers, multiplication centers, seed growers and seed suppliers; absence of monitoring of interstate movement of fish seed, ascertaining quality through proper assessment, fish seed policy prioritizing species to be bred, regulations on breeding policy, norms for stocking different water bodies are regarded as major constraints for the segment growth.

Initiative of Free seed supply: Free seed supply is a key component of DOF support service to fishers since two years. The DOF in a bid to boost state fish production and facilitate better stocking of water bodies has focused on free seed supply initially to stock reservoirs and department tanks during 2016-17 and later in the current year to all suitable water bodies (both DOF and GP tanks and reservoirs) with recommended levels. The intervention is perceived as one of the powerful tool to bring change in better resource utilization and scientific mode of development, ease out fishers /FCS from the hands of merchants/ any other hidden power groups within system (financers) wherever in practice, facilitate internal capital formation at FCS level by strengthening savings in FCS account to meet the future financial needs in support of activity during subsequent years.

Fishermen Co-operative Societies (FCS) : Enhancement of resource productivity and fish production in the state can happen only with shared goals and efforts of the DOF and PFCS. The states entire fish production activities are dominated by the Primary Fishermen Cooperative Societies by virtue of the GOTS policy of leasing the water bodies only to the societies. Although this system of leasing resources entirely to FCS for fisheries development is conducive from the point of equitable distribution of wealth and welfare, but over period has led to monopoly with no accountability, no data records and sharing. Most of the Societies are not maintaining transparency in their dealings and go unchecked. This may result in negative impact on the comprehensive sector growth. A good number of them does perform well and deliver their responsibilities. The FCS have been admitting/associating some of their community men as an obligation and with a view to helping them get benefits from schemes and income. Most of these societies have not built any reserves and have fragile financial standing/status since the annual income from the water bodies allotted to them is distributed among members (in some cases non-members and community members). Most of them claim to be financially weak and in majority of cases, report losses in their reports. Maintenance of secrecy in operations and dealings, and inadequacy in sharing right information by the FCS has limited the conclusive observations on working of the institutions.

Gaps in FCS organizational functioning: Many societies are controlled by merchants /market intermediaries/ Trade Lobbies resulting in less organizational powers for members in the societies; and lack of ownership in development of resources, high level of absenteeism, limited involvement of members, less participatory functioning, minimal transparency in dealings and poor entrepreneurial leadership.

Constraints: Lack of knowledge on resource productivity potentials, new technologies, process, and management tools & approaches to harness potentials; huge deficit in **social preparation** of members through trainings, technology mainstreaming, managerial capacity building on leadership, operational efficiency, and compliance to regulations etc. Scarcity of multi-skilled man power in FCS for pursuing diversified activities of the sector using the available resources, vulnerability to illegal fishing as evidenced by rise in incidences of theft /pilferage of fish (apparently due to rivalry between villagers and communities on issues of resource sharing, conflicts with other users and social problems) are regarded as main constraints. Absence of involvement by DFCS and State Federation for the welfare of society members,

Poor in-house mechanisms for resolving conflicts within group; high cost on purchase of fish seed and nets; problems of storage and marketing resulting in distressed sale for lower prices; lack of access to finance and absence of institutional finance services are other constraints limiting the better functioning of FCS.

Key challenges: Declining productivity and profitability are working as disincentives for the younger generation of the PFCS resulting in change of profession and migration to semi –urban/ urban areas in pursuit of new jobs. Hence, ensuring decent income to the members of FCS for the efforts and investment put in and strengthening of PFCS in both the factors of cooperative success viz., functions and management, economic factors and governance with more participatory approaches in societies; ownership of members in development of resources and inclusive institutional growth are the key challenges the DOF have to address.

Performance of Women Fishermen Cooperative Societies: No major issues were observed in the working of these societies, though they experience financial crunch for expanding their operations. Some of them have performed well, playing a dominant role in fish marketing at primary and secondary level, built up their own financial resources by pooling part of their incomes which is according to the cooperative spirit. Women's awareness in sector activities was good and is mainly supporting the family income meeting the diversified needs including asset building in a limited way. The Women Mastya Mitra Groups is handling substantial volume of fish for marketing and actively facilitating channelization of fish from producer to consumer. On an average, a fish marketing woman sells anywhere between 25 to 40 kgs of fish in a day if it is a rural, while this quantity goes up in semi-urban/ metro markets where average sale may go up to 50-100 kg/day. Over the years there is an increase in participation of women in sector related activities mainly in fresh and dry fish marketing and also in a limited way fish product development and marketing. Activities of WMMs are mainly constrained by lack of finance support, infrastructure like cold storages / better markets etc. Empowerment of WMM's on various aspects of value addition can bridge the gap in gender inequality.

Performance of District Fishermen Cooperative Societies: DFCS is operating at low key and their presence/ activities in terms of outreach and extending guidance to its member societies, formation of new FCS, marketing of fish collected from FCS, liaison between line departments and FCS is not visible. Interactions with PFCS also showed that they do not see any reason or benefit in joining the DFCS. There is both visible and operational disconnect between these institutions.

Performance of Federation: Federation is registered with FISHCOFED at the national level and is representing member societies to protect the interest of members. The NCDP project of the DOF is being implemented through the Federation with active participation of DFCS in routing the benefits to the members of PFCS. All the FCS members have to necessarily become members of Federation to avail benefits of the Scheme under Integrated Development of Fisheries. The focus of Federation on strengthening of member FCS's is very limited. However the Federation has made good profit from its marketing operations.

Constraints: Acute shortage of exclusive staff and in adequacy in field level functionaries positioned at district level to reach out to FCS for undertaking various activities in support of fisheries and aquaculture development are the main constraints for effective functioning.

Per capita resource availability: Higher per capita availability of reservoir resource is observed for licensee fishers (10.84 ha) compared to leased fishers (2.07 ha). The Av. availability of tank resources / FCS in respect of study districts is 120.98 ha as against state 76.13 ha and the availability per FCS member is 1.83 ha against state average of 1.64ha. In overall terms, the per capita availability of both reservoirs and tanks to FCS under lease system is 527 ha and to member it is nearly 3.9 ha; Under license system per capita availability/fisher is high (10.84 ha) for the existing licensees and will further reduce to 8.23 ha with the increase of licenses to the fishers as targeted.

Fish Trade and marketing: In view of the fact that larger majority of the population are meat and fish eaters in the State, availability of hygienic outlets for customers in their vicinities goes a long way in balancing demand-supply conditions. In broad terms "Marketing of Fish" assumes different dimensions in the state.

Marketing channels: One common practice /system is spot-sale of fish on the tank / reservoir shore and a "make shift" market exists on the shores of each water body. After the first point of sale (depends on reservoir and tank production), the fish is taken to the local markets within the villages/nearby smaller towns by **fisher women** to consumer (vending & supply at consumers door step) or unorganized (road side) market. Generally

bulk of the produce is sold to “aggregators” “agents of retailers/wholesalers. In case of tanks role aggregators are minimal. The existence of large number of “Rural Fish Markets” indicates that fish markets are highly dispersed across the State. The retail markets and unorganized markets are key platforms for the daily transaction of fish trade and are the important transaction points between consumers and traders. Study of the system of marketing shows the imminent/prominent role of **Merchants** located at Metro and Districts. As per estimate almost 80-90 per cent of fish produced in the state is sold under this system. The merchants have deep-rooted links, perhaps for decades, with the FCS/fishermen. The FCS/Fishermen also find it convenient to supply their catch to the merchants since they do not have to worry about transport, storage, marketing, price realization etc.

Fish marketing arrangements: Where Aggregators and wholesalers agents operate, they have financial dealings with the fishermen by way of advance and do not carry any interest. Price is invariably 10-30% less than the market rate. The aggregators also consolidate the fish from different supply sources, segregate on variety and size wise, meet the local market needs by way of supplying smaller and less expensive fishes and supply high value to other states. Large number of village markets does exist and they work twice a day. The aggregators advance money free of interest in return to assured supply of fish to them at 20-30% lesser than prevailing market rate and deduct advance amount paid in installments. Generally, market price of fish is high during July to February and low during March- June based on supply and demand.

Fish Markets: In most districts integrated markets with provisions for selling fish, meat, chicken, vegetable is common. Both wholesalers and retailers operate in these markets. As per the available information, there are three wholesale cum retail markets, two in Hyderabad and one in Karimnagar. Other smaller markets are constructed by the traders themselves and some leased by the Panchayats/local bodies/ private owners. Each of these markets handles any quantity between 1 to 10 tons every day. Average daily transaction per trader is around 100 kg. Each trader has 6-7 agents who collect fish from landing points and tanks. In Hyderabad Wholesale cum retail markets, the daily volume of fish traded (bought and sold) vary on a season to season basis. The overall average is 10 tons on week days and around 20 tons on holidays and festival/marriage season. Some of the markets are managed by women societies (Eg. Ramanagar whole sale fish market, Karimnagar district). Fish is procured from nearby tanks/reservoirs. Each woman sells between 40-50 kg. There appears to be a Sellers’s market in the state. In recent years demand for live Fish is on the rise and this is happening rapidly. The quantum of fish traded in these selected markets, indicated that over 2.03 lakh tons of fish is being traded in the state on an annual basis. The estimated share of outsourced fish on a day to day basis accounts for 75-100 tons.

Fish trade – inflow and outflow: While precise figures on this could not be determined, a trend analysis indicated that during peak harvest season (March to May-June) around 5-10% of fish captured finds market outside the state through the intermediaries, even in the face of local demand and this is purely on commercial consideration as also long standing links and commitments between the trader in two or more states viz., Kolkatta, Karnataka, Maharashtra etc. Approximate assessment shows that annually on an average between 20-25 thousand tons of fish could be crossing over to other states. During lean season (also when festivals and marriages are celebrated across the state), the middlemen have invariably to outsource fish to meet needs of urban markets and to keep the marketing going. An estimated 10-20% of the fish thus comes from outside the state (Mainly AP, Karnataka). Precise estimates need to be worked out through structured and focused market research.

General observations: Due to lack of transportation and non-availability of proper storage facilities, harvested fish from tanks and reservoirs is not evenly distributed to interior areas leading to distress sale. Entire fish catch is marketed fresh and only small quantity of fish in reservoirs that is rejected by the merchant for reasons of quality goes for drying, preparation of dried fish meat cubes etc. for family consumption/marketing. Domestic market is generally supportive of low value fish; Wholesale fish markets are witnessing more consumer foot falls, wide species diversity ranges over fish varieties at different levels of market and is being sold in formats of fresh, live, fillets, cubes etc. depending on species and consumer needs. No auction system of fish in any of the market channels was observed. The fish markets though unhygienic are still patronized by the fish eating population, perhaps because they get fresh fish at reasonable costs.

Fish consumption and per capita fish availability: The state has the potential to boost **fish consumption** considering its huge non vegetarian population as its economy is expanding with better purchasing power of people. The consumer awareness on nutritional value of fish is increasing; simultaneously the growth of urban population and increase in spending on food is also happening. The **annual per capita availability** of fish (for

fish eating population) is estimated as 7.88 kg and for total population as 5.5 kg in the state. However, considering the recommendation of ICMR (12 kg/ fish eating person), there a deficit of over 4 kg /person and this could be the new challenge for the state. The weighted average fish consumption among rural consumers was 9.66 kg annually while in case of urban consumers it was 4.88 kg. The gross annual consumption is estimated to range between 1.83 lakh tons and 1.98 lakh tons. The volumes of fish transacted in different markets across the state indicate that the estimated trade was around 1.95 lakh tons (except unreported sale/trade). There is striking match between the consumption estimates made through the Survey and market studies carried out independent of the survey.

Constraints: Most fish markets operate under unhygienic conditions - lack of drainage facilities, quality water with less sheltered area and not backed up with facilities of cold chain, limited ice and storage facilities; inadequate marketing services; weak retail marketing chain; limited awareness and lack of emphasis on timely supply of quality fish to meet market demands. There is inadequacy in markets management and very few local institutions of collective action with market oriented framework are in operation. Use of technologies in fish markets and marketing viz., e-marketing and Mobile apps and websites etc are very minimal and limited to major markets in urban parts. There is absence of formal market networks (online trading portal). Institutional support in marketing of fish is very limited or none in many districts. Similarly PPP models in promoting fish markets to enhance share of producers in consumer rupee, ensuring increased benefits to producers in the entire value chain are non-existent.

Institutions and Human Resource Development: Department of Fisheries: On an average there are between 16-20 mandals in each district and the DFO is required to monitor the fisheries activities in each mandals apart from carrying out multifarious responsibilities beyond fisheries tasks. The present staff at district level is inadequate in the context of expanding fisheries sector activities, introduction and implementation of new schemes that call for close links / contacts and effective monitoring and follow up, keeping track of the same and documentation and data management etc. The Department of Fisheries has one **Training Centre** at Warangal (Inland Fisheries Training Center, Hanumakoda) where young and aspiring educated boys and girls are imparted training in various aspects of Fisheries science/management. The **National Fisheries Development Board, Hyderabad** is supporting fisheries sector development activities related to enhancing fish production and productivity, marketing, processing and value addition, trainings and demonstrations. The KVK's, Federation and other outreach institutions are also availing support from the Board and are organizing several sector related programs involving fishers and women MMs on aspects of fish production, processing, value addition. Additionally, institutions/ organizations viz., National Cooperative Development Corporation (NCDC) and National Federation of Fishermen's Cooperatives Ltd. (FISHCOPFED) are also extending supportive hand for the fisheries sector growth in the state. The state is a hub for many professional institutes viz., MANAGE, TSPARD, NIRD, EEI and ICM that have both national and international stand and the services of these institutions are also being used for complementing fisheries sector related activities. A few KVK's are also complementing the efforts of the DOF in Technology transfer and Skill up-gradation. However, financial constraint has limited their role play in providing effective backward linkage support.

Institutional constraints: Lack of integration and effective interaction with sharing networks between local institutions, their members (PFCS, DFCS) and supportive institutions including R&E institutions etc; lack of mechanisms and approaches in position to facilitate better coordination between institutions for better solutions and inadequacy in the availability of qualified manpower in sector supportive institutions are the main constraints flagged.

Institutional trainings: The HRD activities organized by DOF related to training of fishers and other stakeholders on the fisheries and aquaculture activities are limited. There is wider and also growing skill gap at all levels of supply and value chain. Gap in skilled labor force in the sector is on rise. The young and overwhelming members of most FCS have eagerness to pursue sector related activities provided the DOF supports and handhold them. Similarly the women fisher folk are interested to participate in the sector related activities and are looking out for opportunities to work. Empowerment of DOF field personal, fishing communities and other stakeholders on a continuous basis is receiving consideration under the IFDS program. In the direction of bringing change (both structural and functional) to the existing DOF staff pattern considering sector expansion, new growth opportunities and anticipated paradigm shift in both activities and stakeholders, commercial activities etc. several training programs and exposure visits are planned to enhance the capability of existing staff.

Constraints: lack of on- site technical hand holding and inadequacy in State level programs for promoting relevant and concerned institutional convergence in support of HR. Inadequate information and monitoring support by DOF, lack of information support at local levels on production enhancement technology and approaches, harvest, hygienic handling, post sale services in marketing and post harvesting etc; Lack of field level mechanisms to monitor the activities that are in

progress; absence of self reporting system as mandatory requirement to avail benefits of Govt., Lack of simplified methods for data collection, productivity estimations, production estimation and reporting process.

Infrastructure & input supply: Considering the anticipated growth trends and potential available for development, the present level of infrastructure viz., hatcheries, seed rearing and fish farms, feed mills, landing centers, ice plants, cold storages, hygienic markets, processing and value addition units is inadequate to meet the growing demand of the sector. The DOF is taking lead for the establishment of seed production, rearing and farms; retail markets, Ice factories, crates, Kiosks, mobile fish vending units, insulated fish transport vehicles and plants for processing of fish through Fishermen cooperative Societies and private entrepreneurs.

Schemes and programs: The state is implementing six centrally sponsored and over 20 state plan schemes. Under welfare scheme, only Group Accident Insurance Scheme (50:50) is being continued since 2014-15. Major efforts of DOF are going on for the implementation of Blue Revolution program on Integrated Development & Management of Fisheries. Implementation of Inland fisheries /aquaculture programs had good financial provision but achievement side was not encouraging. **Under the State Plan**, over 20 Schemes are in implementation and the major focus is on strengthening of seed farms; stocking of seed in reservoirs and tanks; cage culture and construction of community halls. The State is also implementing National Cooperative Development Corporation (NCDC) New Delhi funded Flag ship program on Integrated Fisheries Development (IFDS) with a financial outlay of Rs.100,000 lakhs during the current year. The activities are being implemented under the institutional Frame work of Telangana State Fishermen Cooperative Societies Federation Ltd., Hyderabad. Under the program on cage fish farming, installation of about 67 cage batteries (670 cages) has been targeted for the current year with a financial outlay of Rs. 29.30 crores under Blue Revolution program. The Installation of cages is under various levels of progress. The free seed supply program is being implemented in all the districts supporting stocking of all water bodies. Under the program it was targeted to stock 24372 water bodies including Reservoirs, Departmental tanks and Gram Panchayath tanks with seeds of Indian major carps and common carp for the current year. The targeted seed stocking was 67.70 crores and the achievement made till mid Oct. 2017 was Rs. 4711 lakhs.

Technical progress and impact of schemes on the sector in terms of productivity gains, income and employment, community benefits, welfare gains etc. could not be assessed due to absence of related documents.

Fisheries Policies- Review: In the absence of comprehensive state Inland Fisheries Policy, the GOTS has put in place several policy guidelines and Govt. orders in place to address many issues that are constraining sector growth. Aligning with national policies and programs, the state govt. has initiated interventions on Access rights and property regimes; Livelihood safeguards of communities and others exclusively dependent on the activities; Food and nutritional security; Protection to ecological diversity of resources - observation of closed seasons, restrictions on use of destructive craft and gears, regulations on mesh size, biodiversity conservation; Enhancement of production and productivity; Diversification of production systems and species; Registration of farms and compliance to set guidelines; Effective monitoring, control and surveillance mechanism; Environmental sustainability, etc. These related policies are anticipated to ensure optimum and judicious utilization of available natural resources with technologies, management led development approaches and sustainability for the benefit of community and entrepreneurs involve in the activities with equity. Accordingly, the GOT has come out with over 56 GO's at different points of time and on wide range of issues related to inland fisheries sector. These policies have been reviewed and detailed suggestions are given in the main report.

Suggestions, strategies and action plans: In view of dwindling EWSA, the DOF should draw up a plan for retrieving the lost WSA on account of siltation, weed infestation and encroachment. The GWSA - EWSA gap should be reduced through desilting, removal of weeds and retrieving the area through evacuation of encroachers. This program should be dovetailed with fish stocking and projecting of fish production. The DOF needs to formulate a **Detailed Action Plan** for this purpose. Suggestions are also made on management of tree stumps, spillways, water pollution, utilization of water bodies used for drinking water purpose for fishing activities and use of non conventional water bodies in the report. The Projected year wise targets for the state could be broken into district wise targets. Modifications in annual phasing could be effected depending on local conditions and during the process of implementation of Action Plans.

Production enhancement: Use of non conventional water bodies: It is necessary to hasten survey process for identification, resource characterization, assessment, documentation and inclusion of new/non-conventional bodies for fisheries and aquaculture activities. **Promotion of low input based fish culture in natural water**

bodies: The DOF will be required to carry out a quick study of resources and areas in each district and identify water bodies that can be used for low input based aquaculture in natural resources under the management of FCS. Since vertical growth is need of the hour, a time-bound program should be formulated and implemented in association with the PFCS across the state.

Development of Large and medium reservoirs: The suggested activities for development of Large and medium reservoirs are (i) positioning system specific management practices, stock enhancement, stocking on regular basis, staggered and multiple stocking, (ii) conditional use of shore seines to reduce pressure of weed and predatory fishes, (iii) promotion of inclusive activities–cage/pen fish culture strategies, (iv) support for infrastructure, promotion of fish aggregating support, (v) Inter institutional coordination to tackle common problems of mutual interest, (vi) Proper maintenance of fish catch data (use E-Das of CIFRI) and (vii) Good governance etc.

Development of small reservoirs and tanks: (i) Short seasonal tanks retaining water for 3- 4 months using them mainly for fish seed rearing and fish culture by stocking bigger sized fingerlings/ stunted fish seed, (ii) Short seasonal tanks retaining water for 5-6 months using them both for fish seed rearing and residual fish culture, (iii) Long seasonal water bodies (> 6months but <12 months) through promotion of conventional fish culture by stocking advanced fingerlings/ stunted fingerlings, low input fish culture wherever feasible and promotion of Self Populating Species (SPS) culture of high market demand, (iv) Perennial tanks and small reservoirs by manipulation of seed size, age, stocking density, species mix in accordance to resource characteristics; multiple stocking and multiple harvesting; low input fish culture where ever feasible; sewage fed fish culture by promoting air breathing fish culture, common carp (amur), stocking of silver carp (5%) as system service species; fish culture of indigenous fishes of high value [A. mola, P. sarana (buddavarka)]; stocking of freshwater prawn; in situ seed rearing etc; small reservoirs by promotion of culture-based fisheries regime of regular stocking, adoption of BMP in resource management and low input based fish culture; Distribution of Water productivity Health Cards (WPHC) to the resource users. River restoration by ranching of rivers with local fish species, declaration of fish sanctuaries, maintenance of minimum water flow; eco-tourism and sport fishing etc are also highlighted in the main report.

Aquaculture development & promotion: The DOF needs to take up multi - pronged approaches to promote production of both high value fish and prawn farming eg. Murrel, catfishes, prawn etc in support of meeting niche market demand and also production of IMC and other common cultivable fish species for the open market. The Aquaculture activities that need immediate attention for promotion are (i) Commercial seed rearing & fish culture, prawn farming, cage farming, In situ seed rearing for desired size in cages, ornamental fish farming etc.,(ii) Farming of both vannamei in inland saline water culture and freshwater prawn, (iii) Positioning of supportive programs/ incentives to facilitate farmers and entrepreneurs, (iv) Promote farming activities on economy of scale to make it more economically viable and profitable, (v) Create exclusive awareness activities on the schemes and programs (vi) Organize trainings on technologies, better management practices and sustainable aquaculture solutions and (viii) Promote on a special drive mode the use of marginal areas for enclosure culture, especially pens for raising in situ seed raising and production of table fish as well.

Utilization of water logged land in irrigation canal fed zones- aquaculture in private farms: Saline and waterlogged area and derelict water bodies in canal fed mandals are important resources for promotion of aquaculture activities in the state and hence suitable action plans need to be developed to promote the activity. Establish **aqua farming clusters** and **aquaculture hubs** in different districts of state where potential exist and promote '**Cluster Farming**'; support and facilitate establishment of infrastructure including post harvest facilities in identified regions.

Fish seed production: The state has to show the way to produce and supply at least a major portion if it's requirement through internal production. This will encourage private sector to take up seed production and rearing to meet its demand internally fully on the long run. Unless decentralized fish seed production includes appropriate breeding strategies to maintain genetic quality of brood stock, the performance of the production stocks will decline. **Quality seed production:** Upgrading existing govt. farms into integrated fish seed farms; promote private seed hatcheries and rearing units; support private participation through workable buy back system; Registration of seed producers and suppliers to enthuse local farmers and entrepreneurs to take up seed rearing on more scientific way to achieve economy of scale; quality seed production of species other than IMC also need to be promoted by providing special incentive in the form of financial assistance for setting

up of fish/prawn seed farms or fish hatchery. DOF need to focus on production of new varieties such as Amur common carp, Nile tilapia (mono sex tilapia- all male technology already available) murrel spp and other medium and small carps and other local fish breeds of high market value and consumer demand which are suitable for short and long seasonal tanks. State govt. may identify selected center/s exclusively for murrel breeding and seed rearing /seed holding collected from wild with required infrastructure and well trained staff or support private participation by providing infrastructure and required incentives.

Strategies to internalize spawn production: (i) Phased improvement of existing hatchery performance of both Govt. and private seed production units to their designed capacity, (ii) Government hatcheries should be renovated and strengthened with all necessary infrastructure, needed technological up-gradation of fish seed production units, ensure minimum man power, (iii) Financial support should be ensured for each of the hatchery, (iv) Performance of each hatchery should be monitored, (vi) supportive programs for the establishment of new hatcheries mainly under private sector, (vii) outsourcing of part of spawn requirement from recognized hatcheries in support of seed rearing to meet requirement of fingerlings.

Strategies to internalize fingerlings production: (i) Development of data base of existing seed growers and extend needed handholding in support of the activities, (ii) Roping in of new seed growers and providing needed support to pursue seed rearing in diversifies resource types through existing schemes and also positioning new schemes, (iii) Explore new fish seed rearing opportunities viz. feasibility of seed rearing in short seasonal tanks where water is retained only for 3-4 months and also in situ rearing in perennial tanks (in pools separated from main water body) and pen rearing in some of the reservoirs and perennial tanks, (iv) Networking of seed producers (spawn), seed growers (fry and fingerling production) and fish farmers, formation of Producers Associations, technology handholding, diagnostic services and support of schemes and programs for sustainability of activities need attention, (v) Identification of Mandals wherein Canal Fed irrigation is prominent where the tanks are canal connected that offer excellent opportunities for seed rearing; establishment of seed hubs (villages) and linking resource stocking under various government programs.

Fish seed demand: The estimated requirement of fish seeds during the projected period would range from 56.58 crores in the base year to 85.74 crores as per stocking norms/densities provided. However, it is necessary to have an extra provision of around 10% to make good the loss on account of mortality/damages etc. The present share of Government farms in fingerling production is estimated at 8% and this needs to be enhanced to at least 30-40% during the projected period. Similarly, the share of private sector farms has to be increased from the existing <20% to 50-60% over the same period. This will result in fingerling production of nearly 20 crores from Govt. farms and about 28 crores from private farms (total share of 56%). With the addition of new seed growers over the period well supported under the DOF schemes and programs it is anticipated to produce additional 20-30 % seed in support of fish production activities.

Support system for seed production: Training and capacity building: The breeding and seed rearing is a skilled work and need to have sound knowledge on hatchery management and is a full time job. There is a need for exclusive staff for hatcheries and equip them with required knowledge and skills on genetic aspects as well as husbandry practices, breeding techniques, hatching and rearing practices, good management practices in hatchery and seed rearing to bring in confidence in them. Development of technical standards that are standardized, validated and agreed upon by the hatchery operators, both by large-scale and small-scale producers, and promote entrepreneurship development in the chain for profitability and sustainability of activities.

Strategies on fish seed supply program: The GOTS need to work out a sustainable strategy for inculcating capital build up within FCS through sharing by members, depositing part/ full amount of present savings made on fish seed purchase in FCS account etc., technical strengthening through diversifying activities of fish seed rearing both to meet internal requirement and for business, financial strengthening of FCS. Registering of the FCS who intends to avail benefits of the initiative need to make application, mentioning WSA, EWSA, water usage, water depth during different seasons, previous stocking details and fish production, stocking by merchants/FCS need consideration and similarly for undertaking on commitments expected under the program.

Strengthening PFCS: Initiating measures for motivation, educating members and taking stronger actions by the DOF are the key for strengthening societies. Making special provisions for strengthening better performing PFCS's with exclusive financial provisions for incentivizing their activities need active consideration. Rewarding the responsibility and better managed PFCS by grading of PFCS based on set of developed indicators, categorization and ranking, working towards improving the functioning of PFCS need attention. Incentivize FCS

based on performance by way of providing higher benefits of welfare schemes viz. share capital, fishing inputs, awards and recognitions, managerial subsidies, monitory/sector related infra support, other amenities viz., drinking water facilities, community halls etc. Equally importance is to bring about needed transparency, accountability and discipline in the FCS through performance evaluation mechanism and ranking.

Women Fishermen Cooperative Societies: Women are playing dominant role in fish trade through their MMs network and there is need to improve their lot by creation of supportive environment in each of the district through (i) organizing more gender sensitization activities, (ii) strengthening of women participation in the sector related activities to improve access to resources and activities, (iii) facilitation for institutional credits, funds and such other facilities including joint rights wherever feasible. Empowerment of Women FCS members through continued hand holding support by way of training, exposure visit, skill up gradation on value addition, product development, branding and marketing; Organizing specialized trainings in fish handling, grading, preservation, value addition, techniques to minimize quality loss/prevent deterioration; Mainstreaming WMM's facilitation for institutional financing; facilitation to avail credit. Stepping up funding support for their sector related activities by way of revolving fund as one time support for improving their market infrastructure is suggested. Positioning supportive programs /initiatives to mainstream them for pursuing opted activities need priority consideration.

Federation: The Federation need to develop plans and programs in support of assisting the DOF in accelerating fisheries sector growth through promoting and facilitating optimum productive use of available water bodies, developing and demonstrating the exploitable potential of limited resources on a sustainable basis, ensuring vertical growth to achieve higher productivity levels so as to add to the production of fish, facilitating DOF in reaching out to the larger fishermen communities. The role of Federation under the proposed strategies is envisaged to be two-dimensional namely (i) complement Government efforts in fisheries sector growth and (ii) provide technical, managerial, financial, marketing and other supportive, facilitative/advisory services to the Fishermen Cooperative Societies for the holistic development of its members. There is need for the Federation to (i) Develop its own **Road Map document** in support of implementation of its defined programs and activities as per the objectives and goals, (ii) Networking of FCS-DFCS- Federation to minimize exclusive dominance of merchants in the entire production, supply and marketing system, (iii) Facilitate members of primary and district level societies for better access of quality inputs viz., nets, boat, feed, accessories, life jacket etc In the interest of FCS, (iv) Kiosks construction and positioning them in strategic locations through identified members of PFCS both at resource level and in existing markets, (v) Organize training programs on varied aspects of value addition including fish dressing, use of fish waste generated during cutting operation for preparation of manure on a continued basis, (vi) Facilitate social business start-ups with an aim to create woman entrepreneurs in rural and urban parts and support them with market linkages, (vii) Federation need to get into business mode and perform so has to make its presence felt both at PFCS level and beyond.

Fish marketing and consumption: Revamping of Fish marketing arrangements: Need for sharpening regional approaches viz., (i) Provision for amenities like hygienic stalls and platforms for trading, potable water, ice facility, proper civil structure, roofing and flooring, suitable equipment for washing, weighing, communication, toilet facilities, etc. need priority in the proposed market expansion initiatives of the govt., (ii) Strengthening of marketing channels, facilitating organized networks of fishers and market intermediaries, (iii) Promotion of direct marketing- on site fish marketing, marketing by fishers through integrated KIOSKS to minimize role of merchant aggregators with empowered youths of societies for the activity, (iv) Support for enhancing market price prevailing for live fish in the domestic market, (v) Organizing promotional activities relating to increase domestic fish consumption through awareness programs, (vi) Promotion of use of vending items required for retailing of fish at subsidized costs in support of hygienic handling and better service to consumers. DOF should focus on curtailing / discouraging monopolistic tendencies and exploitative tactics of middlemen with stringent rules and stricter executing mechanisms.

Marketing in support of new farmed fish species: Considering the new focus of state on cage fish farming of introduced fish species viz., pangasius, tilapia etc. where in production in volume may out beat the market demand; it is anticipated to pose threat for the profitability and sustainability of such farming activities of great future from the point of enhancing state overall fish production. In this backdrop **Multi-market fish model** with well net worked producers, consumer and trade cores is proposed. **Value addition:** The product diversification, venturing into the preparation of ready-to-eat food and networking with innovative marketing centers is the key and the future to promote the segment growth.

Institutional arrangement in support of marketing: (i) Promote greater involvement and participation of FCS, DFCS and Federation in fish marketing, (ii) Focus on curtailing/discouraging monopolistic tendencies and exploitative tactics of middlemen with stringent rules and stricter executing mechanism, (iii) In respect of on-site sale and disposal of fish, DOF should bring out transparency in trading of fish between the aggregators and FCS or between Aggregators and individual fishermen.

Promotion of fish consumption: Domestic market promotion, awareness on fish eating, increasing consumer base need focused activities and programs of the government. Value addition by way of de-skinning, fish meat cubes, fillets etc of Tilapia, murrel, IMC etc is emerging to support high-value fish products and are to be supported for scale up as commercial activities. Development of diversified fish products keeping in mind the changed food styles of youths, semi urban and urban markets and consumers in general will result in better price, higher profitability and good technology adoption in the entire sector. There is need to position institutions to facilitate collective action in support of new initiatives of product development, timely supply of products and supplies etc. on business models and marketing. This could be an exclusive activity of Federation to pursue in collaboration and networking with PFCS, DFCS, WPFCS and MM's functioning at different levels on a market-oriented framework.

Accountability & Data base: In respect of outsourcing of fish from other states or exporting of fish to other states, the DOF/Federation should introduce a system under which all the traders irrespective of volume of operation or location of their operation, should necessarily provide data on volume, value and per unit price of procurement or sale outside. This should be used only to assess the demand-supply situation and should not be used for any other purpose. The DOFs/representatives of Federation in respective Districts should ensure that they collect information /data on trade in fish and other products on a weekly or monthly basis using structured formats and build up data base for reporting to the Commissioners' office. The DFCS should be involved in this process since they have better access to the production clusters/centers and also proximity to FCS/fishermen and Federation.

Reorganization of DOF: It is necessary to strengthen the departmental set up to cope up with new challenges of sector growth in time bound manner. Broadly, there is need to re-organize the department in the following manner. The Department shall have five technical divisions/units apart from Admin and finance Division: Technical, (i) Resources Management Division, (ii) Production Systems Division, (iii) Inputs, infra and services Division, (iv) HR Division, (v) Planning and Monitoring Division. Each division should be headed by a Deputy Director assisted by an officer of the level of Fisheries Development officer with ministerial staff (computer operator/programmer). This staff could also be drawn from the pool (specific tasks of each divisions are detailed under chapter -6 of main report).

Strengthening at District level: There would be need to ensure constant presence of the DOF staff at field level. Hence, the present staff pattern at District level should be reviewed on the basis of Total water spread area/ number of water bodies existing and likely to get added, number of schemes being implemented and also envisaged in the short run, present staff strength i.e. sanctioned vis a vis positioned posts and need for increased availability of technical services by the dept. Each District should be invariably headed by (i) District Fisheries Officer, (ii) Each revenue Mandal should have minimum one Fisheries Development Officer, (iii) Each hatchery and seed rearing should be managed exclusively by an officer of the rank of FDO and in case of exclusive seed rearing farms, each farm should be managed by an Asst. Fisheries Inspector, each hatchery unit should be supported with field level/ support personnel, additional staff of supervisor (1or 2) and fishermen (4-6) depending on the capacity of hatchery. Similarly supervisor and fishermen (2-4) depending on the capacity of seed rearing farm. The positioning methods could be by i) Filling up all vacant positions in phases and within 2-3 years, (ii) Engage scheme/program based contractual personnel, (iii) Outsource the services from recognized /reputed agencies.

Promotion of Mastya Mitra Groups within FCS by roping in of active, interested youths selected through a set of criteria could be explored. These groups would serve as an extended arm of the DOF in each mandals of the district, facilitate implementation of DOF activities- sensitization and awareness on DOF programs, convey messages of DOF to all the user groups in their jurisdiction of operations, mobilize fishers for the trainings and extension programs/activities, extend field level facilitation to DOF in implementation, perform special tasks of DOF viz., data collection related to resources, activities, markets, status of progress, feed backs of user groups.

Empowerment of stakeholders: The policies and programs of DOF on empowerment of DOF field personal, fishing communities and other stakeholders on a continuous basis both at mandal and district level need focused attention. The district staff needs additional technical hand holding for effective implementation of activities and programs. Training of fishermen and other stakeholders need long term strategies of the DOF under which round the year training programs are to be organized to accommodate large number of fishers. Similarly, for the planned activities on extension methods/ approaches in position for dissemination of technologies diagnostic services etc. are needed.

Strategies for Training and skill development: The focus need to be towards bringing structural changes in skilling and training programmes, regulation of trainings and catalyzing the efforts of DOF in training space dedicated for sector holistic growth. In this regard the following need attention (i) Development of institutional level Trainers through organizing specific Training of trainers programs with a major focus on imparting of improved technologies,(ii) Institutional reforms and improving of quality, market relevance of training programs, (iii) Setting up State and district level HR units and networking, (iv) Development of exclusive training frameworks, modules/ capsules, (v) Innovativeness in imparting process and post training handholding, (vi) Standardization of skill delivery and content,(vii) Training quality assessment based on feedback and prioritization on rescheduling of activities in accordance to need response, (viii) Assessment of Training output.

Specific dissemination programs: Organizing front line demos, field trials, participatory extension approaches in creating awareness, involving fishers as partners in the process of development; use of social media and ICT enabled services – What's app groups, web enabled system, dedicated web portals, customized Mobile Apps, voice and text based programs to link technologies, schemes and share information, and also extending of information and technical supports through **Call free HELP LINES**.

Model skill development: There is a need to link training of fishers and other stakeholders to the ongoing skilling mission programs with loan schemes and facilitate availing benefits of institutional credit and linked to market chain. They also need to be provided with extensive hand holding support in order to improve their talent to sector activities.

Strengthening of Institutional arrangement: Ensure network of institutes under different organizations to support / conduct trainings and capacity building of all stakeholders of sector. KVKs in the region with fisheries specialists are to be identified as resource institutions and knowledge partners on the zonal service area basis and extending / facilitating funding support to these institutions under the programs of NFDB/IFDS. The DOF should tap KVK sources for accelerated implementation of programmes like i) Demonstrations, ii) Trainings and capacity building, iii) Awareness creation, iv) Transfer of technology and v) Technology support etc.

Institutional convergence: There is need to explore the scope for networking with academia, SAU's, other Universities and Colleges; ATMA, Central Fisheries Institutes, R&E institutions, line departments, insurance and financial Institutions in support of better collective actions, common decision making process and mechanisms supporting integrated and comprehensive development with minimal user conflicts and efficient use of resources for multiple activities and harnessing better overall resource productivity.

Infrastructure and logistics: There is a need for an increase in production of ice, cold storage facilities - at landing centers, more distribution centers, and effect improvement of refrigerated transportation methods and facilities at retail market. In view of emerging aquaculture activities/ low Input aquaculture demand for feed would rise though gradually. DOF should formulate strategies for establishing **Fish Feed Mills** to meet feed demand and introduce guidelines to the feed suppliers based on feed market potential within and beyond the district. Similarly, resource wise systematic assessment for positioning **Fish landing centers** is suggested. Programs and initiatives are required in support of better utilization of designed capacity of existing **ice plants** from the present 60% to 80-90%.

Development of **processing and value addition units** with appropriate technical know-how under the private / PPP platform deserve attention of the Government. The product diversification, venturing into preparation of ready-to-eat food and networking with innovative marketing centers is the key and the future to promote segment growth.

Suggestions on Department initiatives, schemes and programs: Studies on impacts of schemes, problems encountered in implementations, gaps related to process, targets v/s achievements, beneficiary's feedback and learning's are very much lacking and need further focus. In order to ensure positive growth trends in the sector, the existing fisheries development programs have to become more responsive and need to be organized to push sector growth forward. Details are given in the main report.

Suggestions on Pointers for action: There is a need for directional target to mobilize DOF focus on-ground in order to achieve projected fish production of over four lakh ton by 2024-25. It could be driven only by right policies and approaches both to address horizontal expansion and vertical integration in support of area expansion under fish production activities, and right use of technologies, production enhancing inputs, management, monitoring, capacity building at all levels and appropriate institutional arrangement to address and hand hold backward and forward support services. The details of action points that need attention of policy makers are highlighted in chapter-6 of main report.

Resource access, enhancement of fish production and conservation: In respect of access rights of water bodies followed as of now, the present policy is in tune with the need but the number of license seekers has not shown any encouraging trend. This needs to be studied in detail to identify reasons for such lukewarm response. The following issues need consideration (i) Issue of number of license to a particular reservoir need to be on the basis of EWSA rather than TWSA in the context of climate aberrations, frequent rainfall failures and such other weather related issues, (ii) extending eligibility for Fisher women to avail resource access on license/lease basis addressing issues of gender mainstreaming in forefront of development agenda, (iii) Sharing of actual fish catch data by license fisher/FCS need to be made mandatory in accordance to terms of licensing and similarly for the leased resources, (iv) Conditional issue/renewal of license/ lease of resources and monitoring compliance with exclusive mechanisms, (v) Inter institutional convergence, coordination and collective actions for integrated development of resource, (vi) curtailing ongoing practices of drawing of water from tanks through mechanical means like use of motor engines etc where ever complained, (vii) checks & control on digging of bore wells in tank shore area, (viii) Dumping of municipal waste etc, (ix) Implementation of clause on sub-lease or assigning the leased water body to any third party including right for fishing either full or part of the leased water body without prior and explicit permission of the Lesser, (x) Modifications/amendments to present stipulated conditions of irrigation/PWD/Forest departments etc. so as to transfer fisheries management rights to DOF.

Enhancement of fish production: Positioning of specific policy measures for resource productivity and fish production enhancement in support of **Horizontal expansion of resources viz.,** reclaiming available resources to enhance effective water spread area; Positioning of utilization strategies for non conventional water bodies and developing data base on resource characteristics and use status and **Vertical integration approaches viz.,** promoting low input technologies, fish seed stocking manipulations in accordance to resource typology, promotion of better management practices and participatory approaches in resource management and better governance are suggested.

Aquaculture and cage fish farming: Need for sector reform approaches to address various factors of aquaculture growth and bring better sector growth. Positioning of proactive new initiatives related to business friendly policies and operational system for improving ease of doing activities in aquaculture that facilitate private investment for expanding aquaculture activities; positioning set of regulators viz., cheaper land, tax exemptions for import of equipment & accessories, facilitation for institutional credit support, declaring tax holidays etc. in support of promotion need focused policy attention.

Policy on promotion of activities: The state need to take a new and proactive stand in support of registration of new aquaculture units in freshwater lands, regularization of existing freshwater aquaculture units in operation, promotion of cage and pen culture in inland open water bodies viz., reservoirs and large perennial tanks of Telangana, Tilapia fish farming etc. on a sustainable basis. Positioning of locally suitable and pro-entrepreneurial policies would be appropriate and necessary in the initial phase of development.

Cage fish farming: Policy considerations are required to preferentially promote commercial cage fish farming of high value fish through **public-private- and community partnership mode.** Focus on demonstrations convincing techno- economical feasibility in support of further replication and scale up both for cage and pen fish farming need increased focus and effort.

Free fish seed supply initiative of DOF: The state need to pursue the program with some changes in respect of timely supply, size and species, stocking density and ratio in accordance to resource type. Increased emphasis is needed for promotion of participatory resource development process and capacity building.

FCS Governance: FCS across the state have been admitting “non Members” in large number. Economic viability of enhancing membership needs consideration from the view point of financial sustainability and retaining members actively in the sector.

Fish Marketing: Under IFDS program of DOF, multiple components are positioned for supporting the fishermen and fisherwomen in marketing. Organizing awareness programs to fishers on market dynamics, priority on establishment of hygienic markets and better supportive and facilitative role play by Federation and DFCS in assisting PFCS need priority attention.

Conservation of fishery resources and fish biodiversity: There is a need for strict enforcement of existing regulation on closed season and mesh size regulations, and also promotion of conservation measures to protect brood fish and juveniles from being caught.

Sector reforms: Reforms to bring Inclusiveness in sector growth model with appropriate backward and forward support systems, supportive institutional arrangements, schemes/ programs, pro sector policies need special attention.

Chapter – I

Introduction

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1.1 Telangana State- background, economy

Fisheries and aquaculture is regarded in Telangana as one of the promising primary sectors along with agriculture, livestock, forestry, mining & quarrying sectors and contribute to the state's economy with an estimated share of 0.6% of GSDP and 3.47% of agriculture GSDP (2014-15). The sector contributes considerably for food, nutrition, and health and livelihood security in the state. It generates substantial income and employment to rural population and provides for welfare of fishers.

The State is located in the southern peninsula and is carved out as a new State from erstwhile integrated Andhra Pradesh. The Krishna River forms geographical boundary between the two States. It is the 29th Indian State which has come into existence on 2nd June, 2014. Located on Deccan Plateau, this land locked State shares borders with Andhra Pradesh in the south & east, Odisha and Chhattisgarh to the north, and Maharashtra and Karnataka in the west. The State is blessed with two major river basins of Godavari and Krishna along with Yerrakalva and Ramileru basins. The State has nearly 80% of the Godavari catchment area and about 70% of the Krishna river catchment and there are several minor rivers viz., Musi, Manair, Bhima etc. With a semi-arid climate and large dry land tracts, most parts of the state receive low to medium monsoon rainfall.

Despite being youngest State, the average growth rate of the State economy in the last five years (2012-13 to 2016-17) is about 7.3 per cent as against the national average of 6.8 per cent. The share of Telangana's economy in National GDP is 4.28 per cent in 2016-17, as against 4.21 per cent in 2015-16. Thanks to the proactive measures of the Government to spur economic growth, after formation of the State. Telangana since 2014-15 has picked up its pace and registered higher growth than all India growth rate. It is notable that the State Domestic Product has surpassed the national growth rate and is poised for a double digit growth in the current financial year 2016-17. The Gross State Domestic Product (GSDP) at current prices for the year 2016-17 was estimated at Rs. 6.54 lakh crore, as against Rs. 5.76 lakh crore in the previous year, indicating a growth rate of 13.7 per cent. Telangana's GSDP at constant (2011-12) prices is estimated at Rs. 5.11 lakh crore in 2016-17, compared to the previous year estimates of Rs. 4.64 lakh crore, thereby registering a growth rate of 10.1 per cent¹.

The land use and land cover data of the State indicates 51.38% area under agriculture and plantation crops followed by a forest cover of 22.9%, fallow land of 10.36% and water bodies 6.15% (7.06 lakh ha.)². The salt affected lands account for over 25000 ha mainly spread across the districts of Rangareddy, Warangal and Nalgonda and inland wet lands of 1270 ha, both these resources being potential for the development of fisheries in the state.

1.1.1 Demography

The State population of over 36.34 million represents nearly 10.19 million households³ and a significant population is below poverty line having very low 'Human Development Index'. The backward communities represent 18.5 million of the population and there are 7.8 million SC, 3.6 million ST and 5.2 million minorities. The overall sex ratio reported for the state is 988 females: 1000 males (2011, Census) and the literacy rate is over 66%. More than 65% of population lives in rural areas with inadequate alternative and remunerative economic activities. Agriculture has been the mainstay of rural folk in Telangana and the diversified activities include animal husbandry i.e., production of milk, meat, poultry, fishing, agro-processing industries etc. More than 65% workforce is dependent on agriculture for livelihood.

1.2 Fisheries sector

As an integral part of agricultural food production system and rural economy in the State, fisheries and aquaculture is the potential and regular income-generating activities to the rural and semi-urban communities apart from providing direct livelihood to many. There being no coast line, the State has to exclusively depend on inland water bodies to meet its fish demand. The livelihood of most of traditional fishermen in catchment areas of tanks and reservoirs is therefore inseparably linked to fishing and related activities.

The State is ranked 4th with 6.14 lakh ha of water spread area accounting over 11.6% of total inland water resources of the country and is next to Odisha (9.89 lakh ha), Karnataka (7.4 lakh ha) and Tamil Nadu (6.93 lakh ha). In terms of total fish production, at 2.37 lakh tons (2015-16), the State ranks 9th position in the country. The livelihood of traditional fishermen in catchment areas of tanks and reservoirs is inseparably linked with fisheries and hence the sector is critical to the lives of many in terms of their economic upliftment and additional income. Among the fisher population, over 3.20 lakh active fishermen (about 17%) depending on fishing for their livelihood activities, makes this sector important for the direct income and employment to a large number of rural households and tribal population.

Inland fish production of top ranking states (2015-16)*		
Sl. No.	States	Production (in lakh tons)
1.	Andhra Pradesh	18.32
2.	West Bengal	14.93
3.	Bihar	5.07
4.	Uttar Pradesh	5.05
5.	Odisha	3.77
6.	Chattisgarh	3.42
7.	Assam	2.94
8.	Tamil nadu	2.43
9.	Telangana	2.37

*Note * : Department of Animal Husbandry, Dairying & Fisheries, GOI, 2015-16*

In recent years, the sector is witnessing a changed scenario from its traditional role as subsistence supplementary activity to sustainable viable economic activity. Fisheries and aquaculture is now gaining importance as an attractive investment destination and a lucrative business activity in some of the districts / mandals having canal fed areas. Notably in some of the districts, it is gaining much attention as an important commercial activity holding promise for entrepreneurial ventures. The diversified agro-climatic regions and the availability of potentially rich and varied aquatic resources has also thrown open bigger opportunities to spur the development of fisheries sector. With the changing consumption pattern, emerging market forces and recent technological developments, the sector has assumed increased importance with farmers and other stakeholders in the State. The sector is also opening up with many new business opportunities in fish seed production and rearing. Similarly fish culture in tanks and own ponds, reservoir fisheries, fish harvesting, net fabrication, transportation and distribution, marketing and supply chain management are also emerging as important commercial activities. The State is making all efforts addressing twin goals of exploitation of all possible resources both under capture and culture fishery base for increasing fish production and productivity through an approach of sustainable development and development of aquaculture by way of attracting private participation and investment, achieving doubling of fish production in 5 -6 years, enhance livelihood and employment opportunities by 2-3 folds, increase per capita availability of fish from the present 7.9 kg /yr. to 12-13 kg / yr.

The prevailing uncertainty of returns from agriculture is constraining the farmer's income and is yet another factor that is driving the mindset of farmers owning resources in canal areas to look towards aquaculture sector which is in an expansion mode having immense scope for further development. The major focus of Govt. is on facilitating development in line with the technological advancement in the sector to achieve inclusive

socio- economic growth, meet community aspirations for their livelihood and economic progress, entrepreneurs expectations on fisheries and aquaculture resources, and to enhance the present share of sector both to state and national economy to become one of the front runners in '**Blue Revolution**' drive going on in the country.

1.3 Fisheries resources

The State is endowed with a rich and wide variety of water bodies both seasonal and perennial. The resources are vast and diverse, and are in the form of tanks/ponds, reservoirs, rivers and canals, water harvesting structures, non-conventional water bodies viz., coal & quarry tanks/pits, irrigation wells and small water bodies constructed under MGNREGA, Mission Kakatiya, NMPS, NHM, NFDB and such other programs of Government of India and the State.

The country has vast inland water resources in the form of rivers and canals (0.2 million km), reservoirs (3.1 m ha) and tanks and ponds (2.2 m ha). As compared to this, the State is bestowed with rivers and canals (1808 km) with a national share of only 0.9%. The reservoirs (103 with TWSA 2.10 lakh ha) represent 6.8 % of national resource and tanks/ponds 4.04 lakh ha with a share of 18%. The Department of Fisheries under its jurisdiction is supporting development of fisheries in about 4,426 tanks (having > 40 ha ayacut) with TWSA of over 2.25 lakh ha and the village panchayats 19,216 tanks (<40 ha ayacut) of over 1.78 lakh ha TWSA supporting development. The other water bodies of over one lakh ha and private tanks of over 780 ha where fish culture and other aquaculture related activities are being pursued also contribute to the inland resource wealth of the State.

The State is also known for its rich fish biodiversity harboring over one hundred and sixty five species of fishes in its diversified inland waters. The State is depending on few species like Indian Major Carps and Exotic fish species and freshwater prawn for stocking natural water bodies to increase fish production from these water bodies.

1.4 Fish production and growth trends

The fish and prawn production of State rose from 2.43 lakh tons in 2013-14 to a record high production of over 2.68 lakh tons in 2014-15 (2.6 lakh tons fish and 8352 tons of freshwater prawn). But in the subsequent years, total fish & prawn production reduced to 2.37 lakh tons (2.28 lakh tons fish and 0.09 lakh ton freshwater prawn) in 2015-16 (- 11.6%) and also in 2016-17 (1.99 lakh tons comprising 1.94 lakh tons fish and 5189 tons of freshwater prawn production; decline by - 25.7% from the base year of 2014). In value terms, the fish production accounted for value worth of nearly Rs.1825 crores at average farm gate price of Rs.80000/ton irrespective of the species and size of fish and Rs. 700 crores at estimated factor cost of Rs.30000/ton fish production.

1.4.1 State's share in country's fish production

The State contributed about 2.2% of country's total fish production (10.76 million tons) during 2015-16. With respect to inland fish production, the State's contribution was about 3.3% of country's inland fish production of 7.16 million tons

1.4.2 Profile of fishermen

Telangana presents a unique spectrum of fishermen profile with a number of traditional communities like Bestas, Gangaputras and Mudiraj. They constitute major communities who claim fishing as a sole and monopolistic right in the water bodies owned by Government and Panchayats, though today there are inroads made into their domain by others here and there but only as exceptions. People of various castes and sub castes viz., Agnikulakshatriya, Palli, Vadabaliya, Bestha, Jalari, Gangavar, Gangaputra, Goondla, Vanyakulakshatriya (Vannekapu, Vannerreddi, Pallikapu, Pallireddi, Neyyala, Pattapu etc) are also actively pursuing the fisheries activities.

The State has fishermen population of 19.04 lakhs accounting for over 5% of demography. An estimated four lakh persons (>20%) are directly and indirectly engaged in various fisheries related activities across the

State. The livelihood of traditional fishermen, ethnic and community groups like Mudiraj, Gangaputras/Bestas who constitute major stake holders is still dependent on fisheries.

1.4.3 Fish consumption, demand and supply

The State has the unique distinction of topping other states by having highest non-vegetarian population of which 98.8 per cent men and 98.6 per cent women consume meat, fowl and fish followed by other states viz., West Bengal (98.55%), Andhra Pradesh (98.25%), Odisha (97.35%) and Kerala (97%). This is against the national average of 71 per cent⁴. The fish eating segment is almost alike in its preferences as a consequence of which, demand for fish is constantly rising. The estimated fish eating population is over 3.15 crore i.e., 90% of its total population as against mere 30-35% fish eating population in the country. Although, wide variations do exist in fish consumption across regions, and income classes, irrespective of variety and size, fish is a preferred item in their menu.

The State is witnessing continued supply-demand gap of 20-30% and the present shortfall in fish supply is being met mainly from neighboring Andhra Pradesh and other states. Thus, meeting the growing demand for fish always holds the key and is regarded as one of the important constraints and a major challenge in the development of the sector.

1.5 Study context

The State is continuously facing innumerable challenges for achieving sustainable growth. Newer challenges due to climate variability, resource related issues, labor, finance, knowledge and attitude related to farmers and other stakeholders, biotic factors (diseases, etc.), policies and institutions constantly constrain sustainable growth of sector. The key predicaments that continue to constrain sector development are mainly resource related viz., rain water dependence, government ownership, common property resource supporting multiple activities; institutional related in support of HR development, roping in of technologies, process, management and governance; supportive initiatives, schemes / programs; support of policies and guidelines; reliable database and sustainability related issues.

The State is pursuing fisheries activities with a clear vision of enhancing sector growth in support of nutritional security, economic prosperity, and gainful employment and step up social status of those involved. Judicious use of available water resources for sustained fish production, enhancement of resource productivity and fish production are the **key mission approaches** that are being pursued presently.

The DOF is making significant strides to meet the multi – faceted challenges by way of bringing modifications to the existing approaches, planning to rope in new technologies and practices to suite local resources & conditions on a continued basis, strengthening of local institutions as supportive and complementary systems for achieving continued and significant growth in the sector. In recent years, the DOF has spearheaded series of initiatives to place the State fisheries sector on the National scenario with better contribution both in fish production and community welfare front.

In spite of all the efforts and many interventions, per hectare productivity still remains at sub-optimal levels. Low fish production in the last couple of years owing to drought conditions has led to distress among rural fishers pursuing the activity. The Government has launched several programs to enable optimal utilization of water resources, create new infrastructure under different segments of the sector and provide connectivity from water bodies to market. Several resource specific initiatives to enhance production and productivities of different water bodies under various schemes, also support to reform and transform fish markets and promote climate resilient practices of deepening the tanks through Mission Kakatiya, MNREGA etc are being pursued.

The DOF has used a combination of policy levers, positioned several pro-fisher policies and guidelines with appropriate schemes, programs and initiatives for boosting the overall sector growth. Providing better resource access to fishers associations on priority, free seed supply, positioning of needed infrastructure and support system to address backward and forward linkages including knowledge awareness, skill strengthening, training and capacity building are being taken up. Further initiatives in entrepreneurship development, markets etc for both livelihood promotion and business for profits top the focused areas for accelerating sector growth in the

next 3-5 years. The entire thrust of the DOF would be on implementable decisions and extending input support to enhance resource productivity and production and livelihood promotion.

In the backdrop of the present status and near stagnation in many respects of fisheries sector activities, the Government of Telangana intends to enhance the sector growth in an accelerated manner by addressing identified Key Resulting Areas (KRA's) viz., Integrated Resource Development (IRD), better resource expansion & utilization, vertical resource productivity enhancement, improved fish culture and management practices, positioning appropriate backward and forward linkage support for production, supply and value chains to drive inclusive growth of the sector with improved resource productivity, enhanced fish production, profitability and community socio- economic benefits in a holistic way.

In this context, GOT prioritized profiling of sector through a well structured professional baseline / benchmark study to understand status of resources, stock enhancement and farming practices, support systems, institutional arrangements and networks, schemes/programs and policies to promote fisheries and aquaculture, identify gaps at varied levels, explore new opportunities, develop road map and strategies to build a new landscape for sector growth in the State.

In the light of the above, the Government of Telangana vide letter no. No. 954/B1/2016 dated 29th April, 2017 has requested Agricultural Finance Corporation of India (AFCI), Mumbai for consultancy services to assist Government in conducting baseline study of fisheries in the State focusing on resource status assessment, potentials, feasibility for pursuing new activities, infrastructure needs, HR development and existing institutions, policies and programs related to resource access to community and others, and assessment of socio-economic issues etc. defining the **Broad Terms of Reference** for the assignment.

1.5.1 Broad Terms of Reference

- Baseline Assessment of water body resources
- Aquaculture production systems and practices
- Status of fish seed production in the State
- Functioning of Fishermen/ Fisherwomen /cooperative societies and Federation
- Status of available infrastructure in the entire supply and value chain of the sector
- Assessment of domestic fish consumption, demand & supply
- Fish marketing trends, market potential, scope and opportunities for exports and imports
- Institutional arrangement/support services in position in support of backward and forward linkages for the entire supply and value chain
- HR development; Finance and credit related support of banks; Policies in practice
- Documentation of socio-economic issues of fishers and others involved in fisheries and aquaculture activities
- Issues to ensure accelerated growth in sector; recommendations for the overall sector growth

The study was taken up from June 2017 and field survey of selected water sources in the nine selected districts was completed from July- October 2017. Two Interim Reports were submitted to the GOTS during October and December 2017. Further, the draft report covering all aspects of study carried out by the expert team with the support of field enumerators as per TOR was presented and submitted on 23rd January, 2018. After complying with the suggestions and observations of the Department of Fisheries, GOTS, this **Final report** is now being submitted. The copy of TOR is given in **Appendix-A** for reference.

¹Telangana household survey report & results,2015; www.telanganastateinfo.com

²Andhra Pradesh State Remote Sensing Application Centre, 2011-12

³GOT Samagra Kutumba Survey, 2014

⁴Sample Registration system (SRS) baseline survey, 2014 Registrar General of India

Chapter – II

Study methodology

2.1	Study background
2.2	Assignment and Terms of Reference (TOR)
2.3	Study area and sampling
2.4	The study plan

2.1 Study background

The water bodies in the State of Telangana are vast and diverse and tanks / reservoirs form the major focus of fisheries and aquaculture development. The sector is supporting generation of additional employment and income to a large number of rural households involved/assisting the activities viz., fish seed production, harvesting, net and boat making, transportation and distribution, marketing and such others related to entire supply chain. The sector has made rapid strides in recent years and has immense scope for development and contribution to the State economic growth. The State is hence looking forward for the sustainable pathways to build a new landscape for the growth.

For accelerated growth of the sector, Profiling of sector through a baseline study of resources, stock enhancement and farming practices, positioning of appropriate support systems, strengthening of institutional arrangements and networking, pro sector schemes/programs and policies to promote fisheries and aquaculture are perceived as felt need of the hour for the future growth and hence the present study to benchmark the developmental initiatives in the state.

2.1.1 Study rationale

The State is making efforts to bring about sustainable growth in fishery sector through judicious use of available water resources for fish production, enhancement of resource productivity and fish production and providing nutritional security, economic prosperity, and gainful employment and step up social status of those involved. It is imperative to establish benchmarks in order to address issues and draw up short and long term plans.

2.1.2 Objectives

- Afford better understanding of available fisheries and aquaculture resources of the State, the prevailing practices, need for augmenting productivity and production, institutional network and support services apart from programs and policies through a baseline study.
- Facilitate development of data base for each of the tasks to be accomplished so as to provide a sound basis for planning, implementation, progress monitoring and evaluation to support accelerated growth and sustainability.
- Enable to describe and characterize existing conditions, identify needs and priorities as well as suggest appropriate developmental strategies in the context of a progressive policy outlook.

2.1.3 Study focus on

- Technological profiles of fisheries and aquaculture- emerging demand and expected supply of fish production, policies, programmes, institutions and support system understanding the fishery sector from the viewpoints of its problems and potentials.

- Analysis of technology, trade, stakeholders and institutions including policies.
- Resource status assessment, fish diversity assessment, estimation of production potentials of water bodies, feasibility for pursuing new activities.
- Resource specific species for fish farming.
- Promotion of aquaculture; feasibility of cage and pen culture in reservoirs & tanks for fish seed rearing/fish culture.
- Infrastructure needs.
- HR development and requirement at different levels, strengthening of existing supportive institutions.
- Policies and programs related to disposal of fishery wealth, resource access to community and others.
- Private participation and investment in sector related activities.
- Environmental and ecological sustainability.
- Assessment of socio-economic issues etc., with an objective of boosting production and productivity of water bodies, harnessing natural resources to optimum level and to achieve overall growth of sector.

2.2 Assignment and Terms of Reference (TOR)

2.2.1 Assignment

For the purpose of the study, Agriculture Finance Corporation of India (AFCI) positioned a Study Team comprising 'Core Team of Multi-disciplinary Experts'.

Fisheries experts: Two; b) Extension & Training Expert: one; c) Surveys and Field Studies Expert: one; d) Fisheries Economists and Sociologist: Two; e) Data analyst: one and f) Documentation expert: one

Support Team for field survey: a) Field team managers-3 (@ one/stratum) and b) Field level enumerators-9 (@ three/stratum) positioned to carry out the tasks as per TOR. Enumerators were positioned in each of the selected districts to work under the guidance of Field team managers and over all coordination and Technical support of Core Team of Multi-disciplinary Experts. The study co-ordinators Dr. D. Seenappa, Senior Fisheries Consultant AFCI and Dr. Murali Krishna, Deputy Director of Fisheries (Planning) representing the AFCI and Department of Fisheries, GOT respectively, and Core Team of Multi-disciplinary Experts' are Sri. D.V. Jahagirdar, Fisheries Economists and Sociologist; Dr. Y. Basavaraju and Dr. D.S. Krishna Rao, Fisheries experts. Study design and documentation –Sri. H. S. Subramanya, Project Consultant, Agrinsights Consultancy Services, Bangalore, with team members Dr. K. Sujatha, Smt. Savitha Narasimha, Miss Shilpa and Miss.Manasa. Other outsourced experts – Sri. G.P. Praveen, Sri. Dilip and Sri. Manoj, Resource Assessment Specialists.

2.2.2 Terms of Reference (TOR)

Framing the title as 'Baseline study for Fisheries development in Telangana state' the TOR provides background and context in the preamble and later delves on the broad tasks which are listed here under the scope of study.

■ Scope of the study

- **Assess water body resources**, feasibility for pursuing new activities and suggest strategies for enhancement of resource productivity and its economic share.
- **Document status of Aquaculture production systems** and practices-Resource specific species diversity for fish farming, feasibility of cage and pen culture in reservoirs and tanks for fish seed rearing/fish culture and suggest strategies for promotion.
- **Study status of fish seed production in the State**, analyse gap between requirement and production; suggest strategies for species priority and quality fish seed production to meet the present and future demand.
- **Evaluate Functioning of Fishermen cooperative societies and Federation** and suggest strategies for strengthening.
- **Study functioning of fish markets** and market players and intermediaries, process mechanisms, regulations and performance. Assess **domestic fish consumption, demand & supply**, Markets and Marketing and suggest appropriate measures/strategies for improvement.

- **Institutional arrangements:** /Support services in position in support of backward and forward linkages, assess manpower requirement (at HQ and field), finance, credit, and insurance related support and suggest HR development programs and HR policies.
- **Assess the status of available infrastructure** in terms of their extent of use in the entire supply and value chain of the sector and suggest strategies for revitalization/ strengthening of existing infrastructure facilities.
- **Study present policies in practice** to mitigate constraints related to sector supply and value chain and suggest appropriate policies and programs.
- **Document socio-economic issues of fishers and others** involved in fisheries and aquaculture activities and suggest ways and means to enhance community benefits and improve socio economic standards.
- **Identify scope for sharp focusing on any other aspects/issues** so as to ensure accelerated growth in sector.
- **Provide recommendations** for the overall sector growth in the state.

Some of the **specific items that stem from the scope of the study** which find a mention in the broad task of the TOR are:

- **Resources:** Departmental tanks and Gram Panchayat tanks that are either linked/not linked to society need to be studied. Fish ponds constructed under NREGA, NHM, etc are to be studied with respect to their usability and linkages required. Use of non-conventional water bodies for fisheries is to be explored.
- **Aquaculture production systems :**Inclusion of vannamei (white prawn) species to be studied, including a study feasibility of Pen and cage culture for fish farming /fish fattening in reservoirs and large water bodies and suggest strategies for promotion; review backward and forward support system available.
- **Fish seed production:** Suggest strategies for quality fish seed production of carps and other cultivable species viz.,murrel, Nile/Gift Tilapia, Amur common carp, Pangasius, scampi, ornamental fish and indigenous fishes for self-sustenance.
- **Fishermen Cooperative Societies:** Suggest strategies for strengthening of Fishermen Cooperative Societies. Matsya Mitra Groups (MMG) and disadvantaged groups (like widows, physically challenged members of society) are also be part of the study to identify creation of fisheries related livelihood options, including study of working of Fisherwomen Cooperative Societies, which are engaged in fish marketing.
- **Infrastructure:** Suggest strategies for revitalization/strengthening of existing infrastructure facilities.
- **Market potential:** Suggest policies for ensuring increased benefits to producers in the entire value chain; suggest strategies to avoid prevailing intermediary system in marketing at different levels by facilitating direct involvement of FCS in marketing at different levels; explore promoting fish markets through PPP mode, e-Marketing and use of Mobile apps and websites etc.
- **Institutional arrangement:** Study present Institutional arrangements to help fishermen, private entrepreneurs and creating synergy in the activities to be looked at, as also, status of convergence with irrigation and other line departments for improving infrastructure related to fisheries. Suggest mechanism to handle conflicts/ issues between fisheries, irrigation, tourism departments where resources are shared between stakeholders, user groups, KVK, Research institutions, Veterinary institutions to be studied.
- **Policies in practice:** Suggest appropriate Fish seed policy to regulate quality of seed and issues involved. Revisiting HRD policy, identify and determine changes/new policies needed to empower fishing communities, policy support to encourage private participation in entire aquaculture related activities, suggest appropriate mitigating strategies to restore /protect both environmental and ecological sustainability.
- **Socio-economic issues:** Identify Socio- economic issues emerging out of changed resource use pattern, access rights, and multiple uses of water bodies by different stakeholders.
- **Accelerated growth:** Explore scope in investment opportunities for promoting commercial fish farming, post-harvest and value addition and marketing; Entrepreneurship development- business promotion.

2.3 Study area and sampling

The existing 31 districts of the state are divided into three nearly homogeneous strata (each stratum with a given a number of districts-10-11) based on climate, rainfall, soil quality, resource spread, intensity and diversity of fisheries and aquaculture activities. The strata formed takes into account, the geographical contiguity of districts as follows:



	All Districts		Selected Study districts
Stratum – I	1. Adilabad	6. Nirmal	1. Kamareddy
	2. Kumuram Bheem	7. Mancherla	2. Karimnagar
	3. Nizamabad	8. Jagtial	3. Mancherla
	4. Kamareddy	9. Rajanna Sircilla	
	5. Karimnagar	10. Peddapalle	
Stratum – II	1. Sangareddy	7. Medak	1. Medak
	2. Siddipet	8. Vikarabad	2. Rangareddy
	3. Rangareddy	9. Hyderabad	3. Wanaparthy
	4. Medchal	10. Mahabubnagar	
	5. Wanaparthy	11. Jogulamba Gadwal	
	6. Nagarkurnool		
Stratum–III	1. Jayashankar	6. Bhadradi Kothagudem	1. Bhadradi Kothagudem
	2. Mahabubabad	7. Warangal (Rural)	2. Mahabubabad
	3. Warangal (Urban)	8. Jangaon	3. Yadari Bhuvanagiri
	4. Yadari Bhuvanagiri	9. Nalgonda	
	5. Suryapet	10. Khammam	

The field study was extended beyond the selected nine districts for ensuring proper coverage of various resources and activities. Jagtial is one such district for its predominance in private seed production and seed rearing activities. Similarly, Training Centre at Hanumakond, Warangal district was covered for studying Inland Fisheries Training Centre, HR activities and infrastructure facilities. Hyderabad metropolitan centre was covered in the study as a major whole sale fish marketing centre in the State.

2.3.1 Sampling

For sampling, three districts from each stratum were selected in consultation with the Department of Fisheries, GOT based on critical aspects of resource spread, diversity, sector related activities and performance, contribution and untapped potential etc. Within each selected districts, nine village clusters (each cluster with 5 contiguous villages and each village having at least one resource type) spread across different Mandals were selected randomly for the detailed study. Thus altogether 45 villages / district formed the study units.

	Stratum - I			Stratum - II			Stratum - III			3
► Telangana State	10 districts			11 districts			10 districts			31
▪ Study districts	1	2	3	4	5	6	7	8	9	9
▪ Study Clusters	9	9	9	9	9	9	9	9	9	
► Total Clusters	27			27			27			81
▪ Villages/cluster	5	5	5	5	5	5	5	5	5	
▪ Villages/district	45	45	45	45	45	45	45	45	45	
► Total no. of villages	135			135			135			405

Note: The selection of study districts and the sampling units (village clusters) as above has been made in consultation with the DOF officers to make sure that these sample sites satisfy defined criteria.

2.4. The study plan

The study plan documents prepared in the initial phase of commencement of work in terms of a draft work plan, suggested frame for work plan, data matrix and modalities are given under **Annexure-1.1 to 1.4**.

Details of data matrix for work plan, categorization of data requirement and classification of data structure, work plan modalities, study schedules, posers and pointers and Geographic tagging etc are given under **Annexure-2.1**. The study design and modalities are given in **Annexure - 2.2**. The information related to compilation of secondary data is given in **Annexure - 2.3**. The details on Field survey and primary data that includes Enumeration work, Field trip and expert interface, FGDs and case studies and Stakeholder interface are given in **Annexure- 2.4**. The information covering studies on resource productivity is given in **Annexure-2.5**. The study limitations and constraints are outlined in **Annexure-2.6**.

A concept of location / geographic tagging was developed for proper data management where in a coding was adapted right from district level to Mandals and villages. Further, based on the geo- tagging an operational map for each study district showing the distribution of Mandals selected in the study (**Appendix-B 1-2**) was prepared. The details on coding data sheets are given under (**Appendix-C 1-3**).

Twenty seven schedules/questionnaires (**Appendix-D.2**) have been prepared and used in the field study. For operational convenience the field study was organized at three different levels i.e., level I at villages, level II at clusters (mandals) and districts and level III at state level as shown under **Appendix-D.1**. The photo documentation of the field study viz., crafts, gears, fish diversity are given under **Appendix-E**.

Chapter - III

Review of Fisheries and Aquaculture sector

3.1	Agro climatic zones	3.8	Fishermen Co-operative Societies
3.2	Comparative profile of study districts	3.9	Women in fisheries
3.3	Profile of resources	3.10	Fish trade and marketing
3.4	Fishery activities and practices	3.11	Human resources and Institutions
3.5	Fish seed production and rearing	3.12	Infrastructure and input supply
3.6	Fish and prawn production	3.13	Supportive Schemes, Services and Policies
3.7	Growth trends in fishery sector	3.14	Socio economic aspects

3.1 Agro climatic zones

In the erstwhile State of Andhra Pradesh, the Telangana region had altogether 10 districts and 464 mandals. Later after the bifurcation, the State initiated the process of district reorganization in the middle of 2016 and has now 31 districts with 68 revenue divisions and 584 revenue mandals (Source: Directorate of Economics and Statistics). The State has diverse climatic conditions and based on agro- climatic situation the State is divided into four zones viz.,

- **Northern Telangana Zone (NTZ)** represented by Nizamabad, Adilabad, Karimnagar districts with an annual rainfall of about 900 mm to 1150 mm and the zone is having predominantly red soils. The major crops grown are Rice, maize, soyabean, cotton and red gram.
- **Central Telangana Zone (CTZ)** represented by districts of Medak, Warangal and Khammam with annual rainfall between 800 to 1150 mm, and predominance of Red soils. The major crops grown are cotton, rice, maize, green gram and mango
- **Southern Telangana Zone (STZ)** represented by Rangareddy, Hyderabad, Mahabubnagar and Nalgonda districts with an annual rainfall of 600 to 780 mm and the zone is having predominantly red soils. Cotton, rice, red gram, maize and green gram as the important crops of this region.
- **High altitude and Tribal zone (HA & TZ)** represented by Northern and Eastern borders of Adilabad and Khammam districts. The annual rainfall is high (1400 mm) and the soil types are mainly Red sandy soils and Red loams with clay base. The major crops are Chilly, rice, cotton and horticultural crops.

Table-1 Agro climatic zones-study district

District	NTZ	CTZ	STZ	HA & TZ
▪ A1 - KMR - Kamareddy	✓			
▪ A2 - KRN - Karimnagar	✓			
▪ A3- MAN – Mancherla	✓			
▪ B4 - MDK - Medak		✓		
▪ B5 - RGR - Rangareddy			✓	
▪ B6 - WPY - Wanaparthy			✓	
▪ C7 - BDR -Bhadradri				✓
▪ C8 - MBD - Mahabubabad			✓	
▪ C9 - YDR - Yadadri			✓	

3.2 Comparative profile of study districts

Study districts put together *vis a vis* state as a whole and each study district as it compares to State and inter comparison among the study districts are the aspects brought out in this comparative analysis. The analysis covers the geographical area and the related aspects apart from Agro climatic zones, Average rainfall, Demography, Literacy, Social strata, Workforce, Land holdings and crops.

The study has covered 405 villages (12%) and 81 mandals (45%) in selected 9 districts. The representativeness of the study districts is evident on all the parameters as shown below:

Table-2 Parameters - State vs study districts

	Particulars	Study districts total	State as a whole	% to state total
▪	Geographical area (sq.km)	37374	112077	33
▪	No.of districts	9	31	29
▪	Revenue divisions (No.)	22	68	32
▪	Mandals (No.)	182	584	31
▪	Revenue villages (No.)	3436	10434	33
▪	Gram panchayath (No.)	2607	8684	30

The inter comparison of 9 study districts showing sequential ranking in terms of all the above parameters indicates that in terms of geographical area, Bhadradi (8284 sq.m), Rangareddy (7493 sq.m) and Wanaparthi (4816 sq.m) are bigger in size compared to medium sized Mancherial (3943 sq.m), Kamareddy (3652 sq.m) and Yadadri (3092 sq.m), the smaller districts being Mahabubabad (2877 sq.m), Karimnagar (2178 sq.m) and Medak (1039 sq.m). In number of revenue divisions and mandals, Rangareddy (5) followed by Karimnagar (3) top the list. In revenue villages, it is Bhadradi (502), Kamareddy (478) and Rangareddy (452) are in the top bracket. In Gram panchayats, the list is topped by Wanaparthi (401), Yadadri (334) and Kamareddy (323).

- **Agro climatic zones:** The representation of agro-climatic zones in the study districts is given in the following table

Table-3 Agro climatic zones – State v/s study districts

	Zones	Study districts	State as a whole	% to state total
▪	North Telangana zone (NTZ)	3	10	30
▪	Central Telangana zone (CTZ)	1	3	33
▪	Southern Telangana zone (STZ)	4	15	27
▪	High altitude and Tribal zone (HATZ)	1	3	33
	Total	9	31	29

- **Average rainfall:** The average normal rainfall at 837.45 mm for study districts compares favourably with the State average of 850-900 mm indicating the representation of the study sample in terms of rainfall pattern. The deviations from the State average in the following districts are indicative of relative rainfall deficit having immediate implications on seasonality of water bodies.

	District	Deviation from state average (mm)
▪	Wanaparthi	-300
▪	Rangareddy	-200
▪	Yadadri	-150
▪	Karimnagar	-10

- **Demography:** On the various aspects of demography, the cumulative of the study districts compare favourably with the state data in depicting generally a proper sample representation. However the rural population is higher 70% than the state average of 61%. Similarly the population density in the study districts is much higher than the state average.

Table-4 Demography - State v/s study districts

Particulars	Study districts (total / average)	State as a whole /average	% to state total
Population (lakh no)	126.91	350.04	36
Males (Lakh no)	63.63	176.12	36
Females (Lakh no)	63.85	173.92	37
Population in rural area (%)	69.5	61	-
Households (lakh no)	28.5	83.04	34
Average family size (no.of persons)	4.3	4	-
Population density (persons / sq.m)	340	312	-

- **Literacy:** The overall literacy in study districts is much less than the State average with both male and female literacy also being much less. The women illiteracy in the study districts compared to the State average is very pronounced indicating gender dimension of social inequality.

Table-5 Literacy - State v/s study districts

	Study districts	State as a whole
Overall literacy %	62	66.5
Males literacy- %	71	75
Females literacy - %	52	58
Illiterates-%	38	33.5
Women illiterates-%	48	42

- **Social strata:** The SC and ST population in the state is 54.09 lakhs and 31.78 lakhs respectively which put together forms 25% of the State population which can be compared with study districts as follows:

Study districts									Average	
MBD	BDR	MAN	KRN	MDK	KMR	YDR	WPY	RGR	Study dt	State
51%	50%	32%	31%	26%	24%	23%	23%	16%	31%	25%

It can be seen that SC/ST population in study districts is much higher than state average. Mahabubabad and Bhadrachari are the two districts where SC/ST population is highest followed by 3 districts which are in the medium range, the population being lower in Yadadri, Wanaparthy and Rangareddy.

- **Workforce :** The comparison of total workforce and agricultural workforce for the study districts as a whole and for the State is given here:

Table-6 Agriculture workforce - State v/s study districts

Particulars	Study districts											state
	KMR	KRN	MAN	MDK	RGR	WPY	BDR	MBD	YDR	Total	%	
Total work force (lakh nos)	4.94	4.64	3.47	3.84	21.9	6.53	5.25	4.07	3.57	58.3	36	163.42
% of workers to total populn.	51		43	50	41		48	52	49		48	47
Work force in Agril. (lakh no)	3.46	1.86	1.98	3.07	6.9	3.22	2.84	3.27	0.63	27	30	90.66
% agril.work force to total	70	40	57	80	31	49	54	80	18		46	55

Land holdings and crops: Compared to 55.54 lakh land holdings in the State the study district total of 17.16 lakh accounts for 31%. The gross cropped area of the State is 62.88 lakh ha of which the area for study districts at 14.47 lakh ha would mean a share of 23%. As for crops paddy (23%), maize (11%), pulses (8%), oilseeds (9%), cotton (32%), sugarcane (1%) and horticultural crops (13%) are important in the state in terms of area under these crops. The other crops constitute 4%. This pattern by and large holds good in 4-5 districts while in others there are some deviations. The profile of individual study districts is given under **Annexure-3.1**

3.3 Profile of resources

The activities of fisheries are being pursued in diverse water bodies of different sizes and varied bio-physical characteristics. Considering the resource base, it is the tanks and reservoirs that form the major focus of fisheries and aquaculture development in the State. Hence, the present fish production, sector growth and development are driven by the ongoing activities mainly in these water bodies.

3.3.1 Riverine resources

Salient Features

- Prominent perennial rivers : Godavari and Krishna*
- TWSA : 1808 km
- Major river catchment: Godavari :about 79%; Krishna: 69%
- Important tributaries
 - * River Godavari : Kadam, Kinnersani, Manjra, Pranahita, Wardha, Wainganga
 - * River Krishna : Bhima, Dindi, Manair, Musi, Tungabhadra and Paleru
- All the main rivers and their tributaries have one or more reservoirs constructed across them

Status:

- No regular fish stock enhancement of rivers/canals through ranching activities by Government in practice.
- Fishers' of the catchment areas are mainly fishing local varieties of fishes and also carps on a regular basis for their livelihood.
- Absence of data base & Contribution to state fish production is not known.

3.3.2 Reservoir resources

The resources have an integral role in fisheries and livelihood security of the local community. The State has altogether 103 reservoirs with a TWSA of 210010 ha spread out in 26 districts. The share of reservoirs to total water spread area of the State accounts for nearly 34%.

- State has adopted the national guidelines for classification of reservoirs i.e., (Minor/small (10-1000 ha), medium (between 1000-5000 ha) and large (more than 5000 ha).
- Resources are represented by different size categories viz., small 73 (71%), medium 21 (20%) and large nine (9%) respectively.
- Share of large reservoirs in terms of area is 64% (TWSA 134984 ha) with distribution in nine districts.
- Medium category 22% in (47012 ha) with spread out in 13 districts
- Small category (14%; 28014 ha) located in 20 districts.

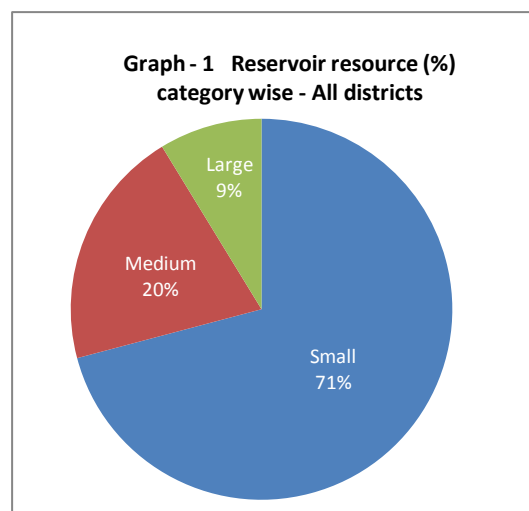


Table-7 Size wise classification of reservoirs

	Reservoir Category	No. of reservoir	%	Seasonality		TWSA		% share	No. of dists.
				Perennial	Long Season	(Ha.)	(av. Area in ha)		
▶	Large	9	8.7%	✓		134984	(14998)	64%	9
▶	Medium	21	20%	✓		47012	(2239)	22%	13
▶	Small	73	71.3%	42	31	28014	(384)	14%	20
	Total	103	100%	42	31	210010	(2039)		

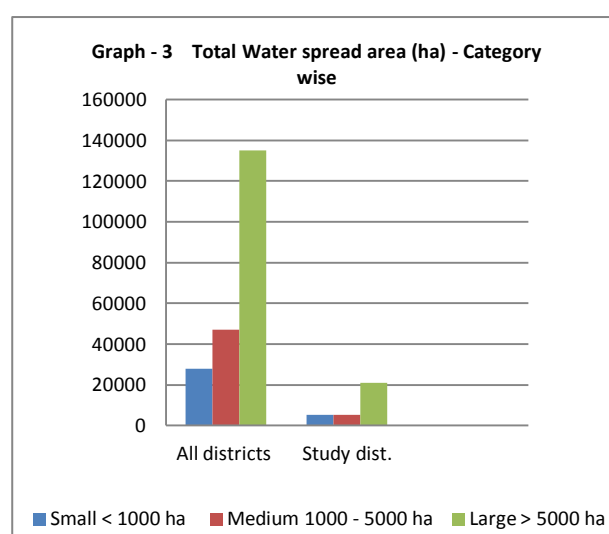
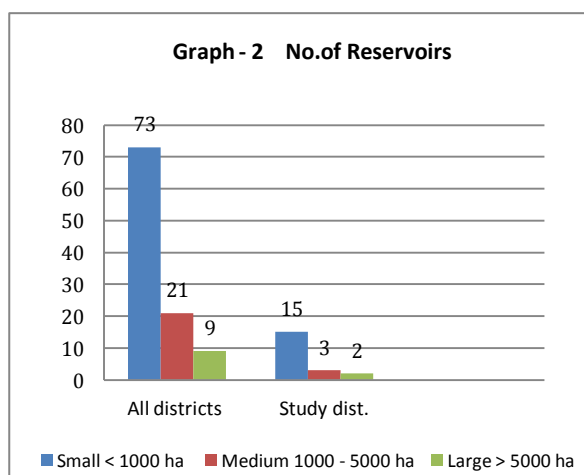
Highlights

- The mean area is 14998 ha for large reservoir followed by 2239 ha for medium and 384 ha for small reservoirs respectively.
- The share of large and small reservoirs under the Godavari river basin is higher. While in medium category, the share of Krishna river basin reservoirs is higher.
- In overall terms also, share of Godavari river basin is higher and accounts for 55.5% in area (1.17 lakh ha) compared to Krishna river basin (44.5 %, and 0.93 lakh ha).
- In area terms, the share of large reservoirs in Krishna river basin is high (59.6%) followed by medium (28.3%) and small reservoirs (12.1%). In Godavari River basin also, the share of large reservoir is higher (68%) similarly small reservoirs (14.4%) compared to Krishna basin and was lesser for medium reservoirs (17.6%).

Table -8 Reservoirs in river basins

Reservoir category	Krishna River basin				Godavari river basin				Total			
	No.	% share	Area (ha)	% share	No.	% share	Area (ha)	% share	No.	% share	Area (ha)	% share
Large	4	8%	55734	59.6%	05	9.4%	79250	68%	9	8.7%	134984	64
Medium	12	24%	26455	28.3%	09	17%	20557	17.6%	21	20.0%	47012	22
Small	34	68%	11297	12.1%	39	73.6%	16717	14.4%	73	71.3%	28014	14
Total	50	100%	93486	100%	53	100%	116524	100%	103	100%	210010	100
% share to overall	48.5		44.5		51.5		55.5					

- Based on TWSA, maximum area is in districts of Nizamabad (four) with 35719 ha followed by Nirmal (four) 34383 ha and Nalgonda district (nine) 24664 ha. The other important districts with better reservoir resources are Sangareddy (16438 ha), Kamareddy (14633 ha) and Gadwal (10737 ha).
- The important large reservoirs in the Godavari basin in the order of TWSA (>10,000 ha) are Sri Ramsagar project, Singoor Reservoir and Nizamsagar project. Similarly in Krishna river basin is Srisailem Project, Nagarjunasagar. The medium reservoirs representing Godavari river basin with area >2000 ha are Suddavagru Gaddanna, Sri Kumurambheem (ADA) Project, Kinnersani reservoir, Kadam, Ramappa Reservoir, Laknavaram Lake, and in Krishna river basin are Rajiv Bhima LIS, Dindi LIS, Jurala Back Water and Musi project.



- In terms of seasonality, the small reservoirs (31 nos, 42%) representing five districts are long seasonal viz., 13 reservoirs representing Adilabad and Jangoan in Godavari river basin (4681 ha) and 18 reservoirs representing Mahabubnagar, Nagarkurnool, Rangareddy and Vikarabad districts in Krishna basin (4894 ha) are long seasonal. On areas basis, long seasonality accounted for 35% of small reservoir resources (10253 ha) in the State.

Status

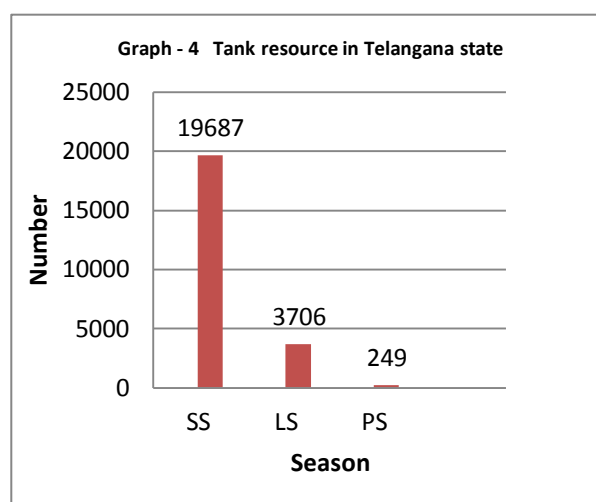
- Being used for multiple activities – mainly irrigation, drinking, Hydro –power, balanced reservoirs for drinking water supply, including fisheries activities.
- Fishers of the catchment are exclusively dependent on reservoir fisheries to eke out their livelihood.
- Reservoirs are regarded as one of the key inland water resources with greater potential for fish production enhancement and growth of fisheries sector. The resource has importance for most communities who are living in the catchment areas and once were affected due to impoundment, losing their valuable agricultural land, assets and all their livelihood options, and also deprived of livelihood assets they had once enjoyed for generations.

The details on reservoir resources in study districts and summary points on rivers and reservoir resources are given under **Annexure-3.2**.

3.3.3 Tank Resources

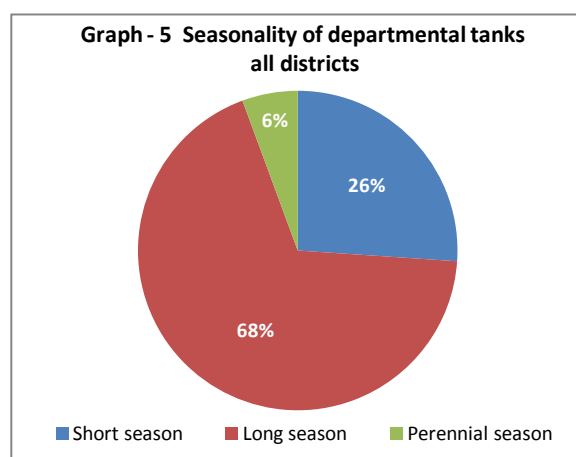
- Mainly irrigation tanks, rainwater-harvesting structures and a significant number of them are mainly functioning as rainwater harvesting structures.
- Considering the geographical terrain of the State, Tanks are regarded as the lifeline of State and core of the rural ecosystem with a significant contribution to both agricultural production and total fish production.
- Resource accounts TWSA of 403896 ha (23642 No.).

Based on ayacut, they are categorized as Department tanks (> 40 ha. Ayacut) and Gram Panchayat tanks (< 40 ha ayacut) and accordingly the fisheries development responsibilities / fishing rights are entrusted to respective Agencies / institutions. Both resource types are also put to multiple uses but mainly for irrigation and drinking water. In exceptional cases, tanks are allowed to be used exclusively for fisheries.



3.3.3.1 Government Tanks

- Account for 4426 with 2.25 lakh ha TWSA.
- Under government ownership as common property resources (CPR) supporting ongoing agricultural activities and public utilities apart from fisheries.
- Represent around 55.8% share in the total water spread area of tanks and 18.7% in number.
- Long seasonal tanks both in numbers (3023) and water spread area was high 152560 ha representing 68% resources.
- Short seasonal tanks 1154 No. (26%) and 52450 ha, 23%).
- Share of perennial tanks both in numbers (249, 6%) and area (20423 ha, 9%) is least.



3.3.3.2 Gram Panchayat Tanks

State has large number of small tanks which are transferred to the Panchayats for management and development of fisheries, generate internal revenue, incremental employment and increased availability of fish in the region addressing rural nutrition.

- Account for 19216 tanks with a TWSA of 178463 ha.
- Short seasonal: Over 96% in No. and 94% in TWSA (18533 nos. and 167457 lakh ha).
- Long seasonal: 683 No. and 11006 ha (4% and 6% respectively).
- The effective water spread area (EWSA) indicates that, of the TWSA only 40% is considered to have reliable/dependable water for short and medium periods of the year. This ratio varies widely in respect of each district and keeps on changing depending on rainfall.

Table-9 Seasonality classification in tanks

	Short Seasonal(ha)			Long Seasonal (ha)			Perennial (ha)			Total		
	No.	TWSA (% share) Av. area	EWSA	No.	TWSA (% share) Av. area	EWSA	No.	TWSA (% share) Av. area	EWSA	No.	TWSA (% share) Av. area	EWSA
DPT	1154 (26%)	52450 (23%) 46	22683	3023 (68%)	152560 (68%) 50	75924	249 (6%)	20423 (9%) 82	14816	4426 (18.7%)	225433 (55.8%) 51	113423
GPT	18533 (96)	167457 (94%) 9	72693	683 (4%)	11006 (6%) 16	5504	0	0	0	19216 (81.3%)	178463 (44.2%) 9.3	78197
Total	19687	219907	95376	3706	163566	81428	249	20423	14816	23642	403896	191620
% share	83	54		16	40		1	5				

Highlights

DOF tanks

- Av. size of perennial tanks is high (82 ha) followed by long seasonal 50 ha and short seasonal (46 ha).
- Six districts, ie Nizamabad, Medak, Mahabubnagar, Mahabubabad and Warrangal collectively account for 40% of total departmental tanks. In contrast, Gadwal, Kumarbheem, Medchal, Bhadradi, and Sirsila have least number of tanks (in ascending order).
- Predominance of short seasonal tanks: Warrangal, Nirmal, Mahabubnagar, Jangaon and Nalgonda districts (651 or 56%).
- Long seasonal tanks : Five districts, namely Medak, Siddipet, Mahabubabad, Khammam and Sangareddy collectively account for 43% of total tanks (1074 of 2481).
- Perennial tanks: Jagtial, Suryapet, Wanaparthi, Nirmal and Karimnagar collectively represent around 67% of the tanks.
- Districts of Jagtial (52 No.) followed by Suryapet (38) lead the state in having more number of perennial tanks.
- Area wise, Suryapet (5230 ha) followed by Medak (1858 ha) are in the forefront.

Panchayat tanks

- Mean tank size of long seasonal tanks is 16 ha and short seasonal tanks 9 ha
- Water bodies of small size ranging between less than 2 ha to around 20 ha are high in number and only a few have larger TWSA.
- Ten districts have 75% share.
- Five districts have tanks >1000 ha are Medak (2160), Nalgonda (1952), Siddipet (1499), Sangareddy (1300) and Suryapet (1097) account over 50% of resource.

The details on tank resources (DPT & GPT) in individual study districts and summary points on tank resources are given under **Annexure-3.3 and 3.4** respectively.

3.4 Fishery activities and practices

3.4.1 Crafts and gears

■ Crafts

- Principal craft used is thermocole raft (locally called TEPPAM).
- In few water-bodies, Tubes, coracle and Boats made of Wooden/galvanized sheets (ex. Galivagu project, Mancherial dist).
- Locally fabricated coracles using bamboo frame and covered with tar / hide/ HDPE sheet wrapped/coal tar covered etc are in use in some selected reservoirs.
- Catamaran, dingy, and other types of country boats are not common practice in the study districts visited.

■ Gears

- Gill nets made of monofilament net material (knotted) without a foot rope, and of varied mesh sizes are generally used in most reservoirs and large water bodies as they are most effective.
- Small set gill nets of smaller mesh size and with reduced net height are being used in shallow marginal areas to catch small fishes.
- Shore seines (pondy) of various dimensions and mesh sizes are employed for harvest of fish in long seasonal and perennial tanks during summer when water level recedes and also in small reservoirs.
- Giant shore seine (Alvi) to remove weed fishes and other commercial fish varieties once a while in small reservoirs and large perennial tanks eg being Sri Rangasamudram reservoir, Wanaparthy district.
- Use of cast nets predominant in tanks and small reservoirs, occasionally in large and medium reservoirs also.
- Use of pole and line is in practice by the fishing hobbyists.
- Fish traps are being used on exclusive basis to catch varieties of fish viz., murrel, eels etc by the specialized nomadic groups on pre agreed conditions of benefits sharing mainly in small reservoirs and large tanks.
- Unconventional methods such as electrical fishing, use of light as fish lure etc is also in practice mainly by the fish poachers (ex. Haldiwagu project, Medak).
- Selection and operation of different nets depends on the water depth in the tanks. Shore seine is generally used when the water level in tanks recedes to lower levels mainly during summer months both in seasonal and perennial tanks.

■ Fishing efforts:

- Nets are operated from dusk to dawn in reservoirs and fish is harvested once a day in early hours of the day (usually before 9.00 am).
- In tanks, fishing is done between dawn & dusk and harvesting is done twice (9.00 am and 3.00 pm) during this period where ever gill nets are used, other multiple times in case of cast net.

■ Fish harvesting

Depending on type of water body and arrangement, fish harvesting is done by different means and methods.

- In case of reservoir fisheries where it has been leased out to FCS, fishing operations are managed and monitored by the Society.
- They may select some among their members and provide extra incentives on the quantity of fish captured or may engage expert fishing labour on wage basis and pay them the wages.
- In case of tanks allotted to societies, they follow any of the above methods or enter into an agreement with the financing merchants. Under such conditions entire responsibilities of harvesting is left to merchants or his agent. He may bring his own labour with him or engage local fishers for harvesting of fish.

The summary points on crafts and gears and fish harvesting is given in **Annexure – 3.5**.

3.4.2 Aquaculture

The existence of more seasonal tanks, and rain dependence, has limited the anticipated fish production to meet domestic fish demand of the state and hence has now no alternative other than promoting aquaculture. Further, this needs to be emphasized to offset lower acreages under perennial water bodies for fish farming in the state.

Aquaculture development in the state is at low key. About 474 aquaculture ponds covering 784 ha is under this production system and the activities are limited to only a few districts viz., Gadwal, Wanaparthy, Mahabubnagar, Khammam, Sangareddy, Warangal Urban, Yadadri and Mancherial.

Fish production through aquaculture in the State is still traditional and is restricted to low level of input usage in the ongoing aquaculture practices. Farming is limited to only a few fish species; integrated farming is being pursued in sporadic cases.

Of late, farming of pangasius and tilapia, native catfishes, murrel and freshwater prawn is picking up under culture based production system in the State. Cage culture of pangasius and tilapia are being pursued in reservoirs (open waters) of some selected districts.

Aquaculture activities in study districts

- In the study districts, aquaculture activities were observed in districts of Wanaparthy, Yadadri and Mancherial with canal fed system.
- Similarly, cage farming of pangasius is being carried out by the fisher group at LMD reservoir, Karimnagar.
- Efforts are also going on in identifying new reservoirs for further expanding of the activity and similarly for promoting fish seed rearing and fish farming in pens and coves in selected reservoirs on a trial basis.

The fish production from aquaculture system is mainly targeted to domestic markets, and is destined for local consumption and local fish markets. Varieties like vannamei are farmed in negligible areas in locations like Pebbair mandal of Wanaparthy district and also in Mahabubnagar and Gadwal districts mainly destined for export. The produce is being sold to wholesalers of AP (Nellore). The farmed fishes viz., pangasius, pacu etc. are supplied to wholesalers/merchants and are also being sent to outside state viz., Maharashtra, Karnataka, Kerala etc. as the demand in local domestic markets is limited.

The contribution of freshwater aquaculture to total fish production of the State is very insignificant. The State has proposed to bring an additional area of 200 ha under semi-intensive aquaculture during the year 2017-18 under Fisheries development project with NCDC assistance.

Ornamental fish farming, although a non-food activity also has a promising future and is likely to contribute to the overall growth of fisheries sector in the coming years in terms of foreign exchange earnings and additional livelihood opportunities both in the urban and rural areas. However, this activity has not taken priority in the State.

Re-circulatory Aquaculture System (RAS) is a high tech fish production system and is regarded as one of the upcoming technology for enhancing fish production. The activity is still to gain commercial importance both in the State and also in the country. One entrepreneur is already into the activity on a trial basis and is yet to receive commercial attention for wider adoption. Lack of commercially viable technologies (developed for the fishes of demand) within the State, absence of viable units in operation for demonstrating the technology and its economic viability, with many business components unanswered have limited its wider adoption.

Table – 10 Fish Culture Ponds (FCPs)

Sl. No	Fish Culture Ponds (FCP)	District	Location	Extent	Capacity (tons)	Remarks
1	Raja fisheries & orchids	Khammam	Nachepally	3 Ponds – 33ha	500	Pangasius
2	Vijana Fisheries & orchids	Khammam	Nachepally	2 ponds 10 ha	120	Catla, rohu
3	Pond at sangareddy	Sangareddy		10 ha		Newly reg.
4	Pond at Bheemaram	Warangal Urban	Bheemaram			
5	Pond at Hanamkonda	Warangal Urban	Bheemaram			
					620	

Note: Fish culture ponds in the study district: Yadadri-nearly 40 ha; Wanaparthy - 5-20 ha, Mancherial: 5 ha.

The summary points on Aquaculture are given in **Annexure – 3.6.**

3.5 Fish seed production and rearing

Quality fish seed is basic input in any biological production processes and so is in the fish production activity. Ensuring availability in right quantity, at right time and at reasonable cost for any sustained program in support of sector growth is hence regarded as one of the essential services to be provided by the Government. If not 100%, the Government ought to meet crucial and credible level of demand for seed since by experience it is found that the private sector would always follow the State. Hence, the State has to lead from front in ensuring seed supply for sustained fisheries growth.

3.5.1 Status of fish seed production in the State

Hatchery and spawn production

Scenario: Highlights

Infra structure

- Infrastructure available for the required seed production and rearing is very meagre.
- **State: Govt. Fish hatcheries** /spawn production centers): 8; only 6 are functional viz., one in each of the districts of Karimnagar, Khammam, Medak, Nirmal, Nizamabad and Warangal urban.
- Farm area: About 45.5 ha (both spawn production and seed rearing).
- **Private hatcheries** cum seed rearing farms: 5; one each in districts of Jagtial, Karimnagar, Khammam and Warrangal urban and Rural (2).
- Farm area: About 18.7 ha (both spawn production and seed rearing).

Study districts: Only 2 **govt. hatcheries** cum seed rearing farms one at Karimnagar and other at Medak;
One pvt. KVK hatchery

Designed capacity

State : Govt. hatchery : Range 2 to 6 crores

- Cumulative designed capacity : about 27 crores
- Designed capacity share: 12%
- Private hatcheries : one to 175 crores
- Cumulative designed capacity : about 196crores
- Designed capacity share: 88%
- **Private hatchery** functioning in Jagtial district alone has designed capacity of 175 crores/year (nearly 90%) and of the other 4 hatcheries cum fish seed rearing farms is estimated at 21 crores.
- Major bulk of spawn production is met from the private sector seed production and rearing farms.

Study districts: annually 5 crores capacity each; **KVK hatchery:** 3 crores /year

Spawn production performance

Govt. hatcheries: Fish species : Major carps and common carp

- 2015-16: Target: 26.06 crores; Achievement: 9.45 crores (9.16 crores major carp and 0.25 crore common carp spawn); share of common carp spawn production to total was only 2.6 % during 2015-16 **Performance against target: 36%.**
- 2016-17: Target : 12.69 crores ; Achievement : 4.92 crores (4.67 crores major carp and 0.25 crore common carp spawn); share of common carp spawn production to total was over 5%;
- **Performance against target: 39%.**

Private hatcheries: Major carps, common carp, grass carp (details not available).

Study districts: Functioning only at 40- 50% of their full designed capacity.

- Mean farm area/hatchery is high (7.5 ha) compared to 3.75 ha for private farm.
- Estimated designed capacity per ha farm size is 0.59 crore spawn as against 10.48 crores in private farm indicating the existing scope for both horizontal and vertical expansion of activity in Govt. farms.

■ **Brood stock out sourcing**

- **Govt. hatcheries:** although have brood stock maintenance ponds, outsourcing is up to 80% every year from the nearby tanks two-three months prior to the onset of breeding season and reared under pond conditions (source of hatchery of this stock not known).
- **Private hatcheries:** outsourcing is up to 20-30% every year from the nearby tanks (source of hatchery of this stock not known).

■ **General observations**

- Hatching is done in either cement Chinese hatchery/jar hatcheries.
- Production of spawn is mainly demand driven in both private and government hatcheries.
- Built up facilities are not being effectively utilized to harness potentials.
- Due to absence of data for private hatcheries, the spawn output between Govt. and private hatchery production systems could not be compared.

Fish seed rearing

■ **Fry and fingerlings production**

Infra structure

State	Private management
▪ 32 fish seed rearing farms	▪ 8 farms
▪ Farm area: over 200 ha	▪ Farm area: nearly about 40 ha
▪ Production capacity as fry: 11.38 crores	▪ Production capacity as fingerlings: 11.3 crores

Overall : 40 farms; 240 ha of farm area

■ **Performance of spawn rearing**

State:

- 2015-16: Target for spawn rearing: 34.09 crores; Achievements: 10.28 crores (9.16 crores IMC and 1.12 crores CC) **30%.**
- 2016-17: Target for spawn rearing: 28.74 crores; Achievements: 9.07 crores (8.07 crore IMC (89%) and 0.95 crore common carp) **11%.**

Study districts :

2015-16: except in Mancherial, Mahabubabad and Yadadri study districts, contribution of other study districts to the total spawn rearing was 30% in total area terms and **21% in total spawn rearing.**

2016-17: 30% area wise and **28% in total spawn rearing.**

2015-16: Share of study districts to IMC and common carp rearing was 22% and 18% 2016-17 : .Share has increased to 25% and 53%.

Performance of fry rearing

State: Fish species -Major carps, common carp, grass carp.

- 2016-17: 3.26 crores (share of IMC 2.93 crores and CC 0.34 crore).
- Contribution of study districts was 0.7 crore (21%) comprising IMC (0.55 crore) and common carp (15 crores).
- 2017-18: Target: 11.01 crores comprising 8.26 crores for IMC and 2.75 crores for Common carp.

Study districts: 3.21 crores (29%) comprising 2.46 crores IMC and 0.75 crore CC.

Key highlights**Spawn production**

- State has only two Government hatcheries with a designed capacity of producing 800 lakh spawn/year and fingerling production of 200 lakh (25-30% survival from spawn to fingerlings).
- Farms are functioning to only 40- 50% of their full designed capacity for various reasons.
- In both the govt. hatcheries visited by the study team (Karimnagar and Medak) the utilization is only up to 40-50% of the designed capacity because of varied limitations and constraints.
- The common problems flagged were leaking conditions of the tanks/water scarcity/ lack of man power / lack of rearing space or untimely rains etc.
- Visit to private seed production farm (Jalapushpa farm, Jagtial) indicate that the farmer has high designed capacity (195 crores spawn) but is not producing spawn to the designed capacity for reasons of less demand.
- The share of Govt. hatcheries to the designed capacity is only around 10-15% indicating the major role played by the private sector in fish seed production (85-90%).

3.5.2 Fry and fingerling production

State has altogether 32 fish seed rearing farms under DOF management with farm area of over 200 ha and 9 farms under private ownership with nearly about 40 ha. In all, during the base year, about 240 ha of farm area are dedicated for seed production and rearing.

Av. area availability/farm for seed rearing is highest 6.25 ha in case of govt. farms as against 5 ha for private farm.

Performance of seed rearing farms

Performance wise, the seed output of Govt. farms is 11.38 crores fry in 200 ha farm area (@5.7 lakh fry/ha or 2.3 lakh fingerlings considering survival from fry to fingerling as 40%) and in private sector 11.3 crores fingerlings in 40 ha farm (@28.25 lakh fingerlings/ha) indicating over 10 folds higher output in private farms over Govt. farms.

The average survival rate of spawn to fry (12-15 mm) and fry to fingerlings (35-40mm) in most of the State farms is around 40-50% and 50-60% respectively and the survival from spawn to fingerlings (35-40mm size) is around 25 % while in private sector farms survival from spawn to fingerlings (35-40mm size) is better (30-40%).

3.5.3 Fish seed demand

The DOF estimated fish seed requirement of 46 crores to stock reservoirs and department tanks (about 19 crores and 27.13 crores respectively) as fingerlings of 80-100 mm size and 10.11 crores fingerlings of 35-40 mm size to stock gram panchayat tanks @ 3000/ha for 2016-17. Thus the overall fish seed requirement as fingerlings was estimated at 56.11 crores. The share of study districts in seed requirement accounted for 11.40 crores comprising requirement of 1.26 crores for reservoirs, 7.45 crores for department tanks and 2.69 crores for GP tanks respectively.

Considering the previous year, the DOF has made estimation of fish seed requirement of state for the current year (2017-18) as 40.27 crores for stocking of reservoirs and department tanks, accommodating requirement of 6.83 crores fingerlings (80-100 mm size) for stocking reservoirs, 24.50 crores requirement for Department tanks and 8.94 crores fingerlings (35-40 mm size) for stocking GP tanks. The share in fish seed requirement of study district is estimated at 11.14 crores (28%) for stocking different water bodies. The variation in seed requirement between the years was mainly associated to difference in the area assumption for stocking different resource types.

The details of demand supply gap, fish seed procurement, DOF Initiatives and progress made for establishment of brood bank and summary points on fish seed production and rearing are given **Annexure 3.7**.

3.6 Fish and prawn production

3.6.1 Fish production

The overall Fish production of the State during 2011-12 was estimated at 1.97 lakh tons and of study districts 0.66 lakh tons (33.7% of State production) which surged to 2.15 lakh tons (study districts 0.72 lakh tons with 37% share to state production) during 2012-13; later the production increased to 2.43 lakh tons (study district share of 0.81 lakh with 33.15% share in 2013-14. The total fish production of the State was all time high during 2014-15 registering a production of 2.6 lakh tons and the share of study districts during the period was 0.88 lakh tons (33.63%). In the subsequent years due to continuous deficit of rainfall and related aberrations, the total fish production of the State witnessed decline in production to 2.28 lakh tons during 2015-16 (share of study districts came down to 0.78 lakh tons, 34.10%) and also in 2016-17 registering production of 1.94 lakh tons (study district 0.72 lakh ton). The trend in fish production observed was akin to the State fish production trend. Inter district variations are observed on a year to year basis.

Table-11 Fish production trends

							production in tons
Fish Production	2016-17	2015-16	2014-15	2013-14	2012-13	2011-12	Total
➤ All Districts	193732.2	228185	260010	243037	214591	196708	1142531
➤ Selected Districts	71988	78106	87490	80584	72220	66323	384723
Selected district as a %	37%	34%	34%	33%	34%	34%	34%

3.6.2 Freshwater prawn production

This is a high value and sunrise segment of fisheries and needs to be sustained further. Beginning with a small quantity, the State has made a impressive strides in prawn production during the same period of four years starting from 2011-12 registering production 3774 tons and later increased production of 5037 tons in 2012-13, 6596 tons in 2013-14, 8352 tons in 2014-15, 8567 tons during 2015-16 and decreased to 5189 during 2016-17. The production was on increasing trend and the growth in production from the initial year of 2011-12 was (i.e. 226% growth). (The Economic review has estimated prawn production at the order of 9200 tons during 2016-17). The share of study districts was 1347 tons, 1697 tons, 2103 tons, 2838 tons and 2566 tons during 2011-16 respectively and the contributions to the total prawn production of State varied from 29% to 36% during different years.

Table -12 - Freshwater prawn production

Prawn Production	2016-17	2015-16	2014-15	2013-14	2012-13	2011-12	Total
➤ All Districts	5189.22	8567	8352.3	6596	5037	3774	32326
➤ Selected Districts	1524	2566	2838	2103	1697	1347	10551
selected district as a %	29%	30%	34%	32%	34%	36%	33%

3.7 Growth trends in fishery sector

In absolute terms, production estimates for the four period i.e. 2011-12 and 2014-15 indicate sustained growth. From 1.97 lakh tons in 2011-12, production went up to 2.6 tons in 2014-15 and scaled down to 2.28 lakh tons in the following year (2015-16) and to 1.94 lakh tons in 2016-17. The cumulative growth between periods 2011-12 and 2014-15 is estimated at 16%. The subsequent decline compared to base year 2014-15 when the state bifurcated was 12.3% during 2015-16 and 24.8% during 2016-17.

The trends in fish production of the nine selected districts during the five year period i.e., 2011-12 to 2015-16 shows sustained increase on an year to year basis during the first four years. While during the year 2015-16 and also during 2016-17 there is decline in output.

As against the target of 353563 tons of fish and prawn production for the year 2016-17, the production during the year was 1.94 lakh tons of fish and 5189 tons of prawn (total of near 2 lakh tons) resulting in a gap of over 1.5 lakh tons during the year (deficit of nearly 44%).

3.7.1 Growth rates

Between 2011-12 and 2016-17, due to annual fluctuations in production, growth rates had kept changing on a year to year basis. Between 2011-12 and 2016-17, following growth rates were recorded

Table –13 Fish production growth rate

Year	Production	% increase/decrease From base year	% Change from Preceding year	Remarks
2011-12	196,708	-		Base year
2012-13	214,591	+9.00%	+9.00%	positive growth
2013-14	243,037	+23.5%	+13.00%	Do
2014-15	260,017	+32%	+%7.00%	Do
2015-16	228,186	+16%	(-)12.00%	Positive from base year but negative In relation to preceding year
2016-17	193,732	(-)15.00%	(-)01.50%	Negative growth both In comparison with base year and preceding year

The details on district wise trends and summary points on sector growth trends are given in **Annexure 3.8**.

3.8 Fishermen Co-operative Societies

3.8.1 Overview of FCS

Fisheries activities in the State are mainly carried out through community based institutional system. As Government cannot have an all-pervasive role and responsibility of achieving economic advancement without active and positive support from the community at large. The DOF prioritized promotion of Fishermen Cooperative Societies (FCS) as one of the important grass-root level institutions for the development of sector activities, identifying and organizing fishers under the local institutional framework of Fishermen Cooperative Societies and three-tier-cooperative system (PFCS,DFCS and Federation). Present PFCS are categorized under non-credit societies with active role in fisheries activities along with marketing, supporting generation of rural employment and inclusive finance. They are being supported by the DOF for sustainable development of resources and harnessing the potential of resources in support of their socio-economic welfare. Hence PFCS are institutional face for development programs and serve as channel for development and implementation of resource management decisions and regulations.

Cooperative network for fisheries sector at a glance			
Particulars	Soc.	No. of mem.	Av.mem./ soc.
PFCS	3595 (90%)	258946 (90%)	72
FWCS*	400 (10%)	22702 (8%)	57
FMCS	06 (0.15 %)	3529 (1.23%)	588
Total	4001	286677	72
*WMMs group: 666 nos.			

The DOF targeted development of both fisher community and resources under the Co operative movement, involving other stakeholders also who are functioning at different levels as partners in sector growth process and progress. Over the years, DOF has been focusing on optimal use of available vast water bodies with the objective of effectively organizing the activities at different resource level through community involvement and participation, nurturing Fishermen cooperatives through channelizing set of schemes and targeting enhancement of both productivity and associated benefits.

In pursuance of DOF policy of growth of fisheries sector, fishers/societies are extended with a number of benefits like licensing of selected developed reservoirs to fishers for fishing to meet their livelihood, leasing of reservoirs to FCS, exclusive allotment of government tanks on lease, free supply of fish seed, subsidized

supply of fishing nets, Boats, mopeds, pick up vans, of late support for cage fish farming etc. The training and capacity building, marketing support etc. are also receiving attention of the DOF in recent years to further strengthen and empower the PFCS in the State.

▪ All Districts

There are as many as 4001 cooperative societies, with enrolled member strength of nearly 2.87 lakh. They comprise 3595 Men Primary Fishermen cooperative societies with nearly 2.59 lakh members. Collectively the share of men PFCS account for nearly 90% in number and 90% in member strength. The State has 400 Fisher women cooperative societies with 22702 members and also 666 women groups identified as Matsya Mitra's involving actively in fish marketing and six Fishermen Marketing Societies with 3529 members.

Both FWCS and FMCS deal with marketing of fish and work in close connection with the main PFCS. The cooperative set up has a three-tier system under which the primary FCS are Federated into 10 District Fishermen Cooperative Societies, which in turn are federated into the State FCS Federation, an Apex Body. The FCS function under the guidance and advice of the Department of Fisheries. The Panchayats administer and manage the tanks under their jurisdiction and control and also provide support to the FCS/DOF in resource use and production of fish.

Among the 31 districts, the FCS membership was more than 10000 in about 13 districts and in the order of higher membership, the districts are Nalgonda, Warangal (Rural), Nagarkurnool, Siddipet, Khammam, Nizamabad, Suryapet, Medak, Kamareddy, Karimnagar, Mahabubabad, Janagaon and Mahabubnagar. The exclusive WFCS are formed in almost all the districts except in Kumarmbheem whereas women MM's are formed only in about 50% of the districts in the State. The fish marketing cooperative societies are formed only in three districts and the number of such societies was maximum (4 Nos.) in Hyderabad district.

▪ Study districts

In the study districts as many as 1046 PFCS are registered with a membership of around 69535. The per cent share to total PFCS of state is 29%. Under gender empowerment program, 82 Fisher Women Cooperatives also are promoted and has member strength of 4662 and one FMCS located in Karimnagar district. Collectively all these societies account for 1129 in numbers with 75624 members with a share of 28% & 26% respectively to the state total FCS and members. In addition to the registered membership, almost all the societies are admitting their community households into their societies under the term "Non Members" who do not have any locus standi in the management and no voting rights are allowed to such non-members.

Table-14 Type of Cooperative Societies

Districts	PFCS		FWCS		FMCS		No. FCS	No of Mem.
In study dist	1046	69535	82	4662	1	1427	1129	75624
Overall dist	3595	258946	400	22702	6	3529	4001	286677
% Share to overall total	29	26.85	20.5	20.5	16.67	40.43	28.22	26.38

FWCS and FMCS are exclusively engaged in fish marketing since women are barred to be members of PFCS which are mainly in fish production business while women take up marketing. In addition, good number of Women Matsya Mitras are also engaged mainly in marketing of fish and they are either members of the FWCS / FMCS or Self Help Groups.

The FCS are managing all the fisheries activities under different arrangements i.e., (i) Direct involvement in stocking, watch and ward (ii) direct harvesting and marketing. This arrangement is working with mutual understanding barring few weaknesses. The PFCS resource development operations and handling of issues constraining development of allocated resources is highly unregulated.

3.8.2 District Fishermen Cooperative Federation (DFCS)

The DFCS are District unions of primary cooperative societies and their mandate is to provide necessary help and support FCS which are their constituents and represent them at Federation level. Under a Three-tier Cooperative Structure, the DFCSs were established by the erstwhile Andhra Pradesh. Post-bifurcation, these were later transferred to Telangana. Thus in each old District, there is one DFCS. The newly created districts do not have such District level institution but are attached to older districts. The PFCS are members in their jurisdictional DFCS. These institutions are required to work as a District Apex Society. There are two DFCS in the nine selected districts.

3.8.3 Telangana State Fishermen's Cooperative Societies Federation Ltd.

Organizational structure

This Apex body of fishermen cooperatives and DFCS is federated at State level by promoting Federation by the Govt. of Telangana. It is headed by a Managing Director, who is ex-officio member on the Board, supported by General Manager and some skeletal staff. The Commissioner of Fisheries is the Chairman of the Federation. The Federation has a mandate to promote fisheries development and growth and protect the interests of the fishermen. The 10 DFCSs are its members and are on the Board of Directors. The Federation Board comprises 10 Directors with one nominee from NCDC. At present the Federation is operating at Hyderabad and mainly concentrating on marketing of fish.

As per the Demerger Proposal, 18 posts are allotted to Telangana State. After registration of the society during 2015 service bye-laws were prepared along with staffing pattern. At the time of registration there were 10 DFCS members in the Federation. There are four post of officer cadre i.e. General Manager, Dy. General Manager and Asst. General Manager, Technical Assistant which are to be filled up by deputation. On the ministerial staff, Superintendent, Jr. Accountant which are to be filled up by promotion or by direct recruitment and other posts at lower cadre are to be taken on outsourcing / contract / daily wages. At present one officer in the cadre of Joint Director of Fisheries is on deputation to Federation to work as General Manager and about six borne employees are working in Federation.

Managing Committee:

The Management of the Federation shall vest in Board of Directors consisting of 5 members and their tenure is for five years.

- i) Directors representing 'A' Class share holders i.e Representatives of "A" Class Share holders shall elect the Directors from among "A" Class members.
- ii) One Director to be nominated by N.C.D.C.
- iii) Joint Secretary / Deputy Secretary to Government, Fisheries Department.
- iv) The Commissioner of Fisheries or his /her nominee.
- v) The Managing Director of the Federation shall be Ex-officio member on the Board and will be by appointment.
 - The elected Directors elect president and Vice-President from among themselves.
 - Any elected member of the Board may at any time resign from the office by sending a letter of resignation addressed to the Managing Director of the Federation.
 - The resignation comes into effect only after acceptance by the Committee.
 - The vacancy caused on this account is filled up by cooption, by selecting a candidate from among similar category.

Table-15 Membership and Share capital of Federation

Sl.No	Nature of Cooperatives	No. of FCS	Membership	Share capital
i	District level societies	10	2736	20000
ii	Primary Fishermen Cooperative Societies	3522	257981	136500
iii	Fisher women Cooperative Societies	416	25053	
iv	Other share capital TFCCS Hyderabad (Merged from TFCCS)			494250

Table-16 Financial status of Federation (Rs. in lakhs)

Sl. No	Particulars	2013-14*	2014-15	2015-16
1.	Paid up share capital	763.70	6.51	6.53
2.	Deposits from govt.	2402.07	261.12	217.68
3.	Other sources	8690.33	1481.28	1781.30
4.	Total Liabilities	11856.10	1703.91	2005.51

*Combined AP

It has set up of 5 retail markets, 4 mobile vending units and a Fish canteen. It has plans to expand its operations to districts but due to lack of staff, it has not been able to stretch out as envisaged. The Federation which was incurring financial loss has turned table and has made around Rs. 6.00 crores profit during the previous year (2016-17). The NCDC project of the DOF is proposed to be implemented through the Federation with active participation of DFCS in routing the benefits to the members of PFCS.

While the PFCS provide overall support for fisheries sector activities, more particularly the backward linkages like procurement of seed and stocking, the WFCS and FMCS provide marketing support for the fish produced in their area. The key activities of federation include

- Supplying fresh fish in hygienic condition to consumers of Hyderabad city through its own distribution net work.
- Organizing trainings on hygienic handling of fish and fish dressing to fishermen and fisherwomen through Dist. Fisheries Coop. Societies with funding support of NFDB and so far trained 400 fishermen/women.
- Facilitating Dist. Fisheries Society to pursue fish seed rearing in support of increased supply and access to better quality seed. The Government Fish Seed Farm located adjacent to DOF fish seed production farm in Karimnagar Dist has been given on lease basis to DFCS. The fingerlings produced in the seed farm are being supplied to the Government on cost basis to stock LMD reservoir.
- A Modern Fish Marketing Complex (**Matsya Darshini**) in support of fresh fish sale, Ornamental Fish Display cum sale unit, Fish Food Court is also in position with the Federation for an integrated commercial activity and supply of quality fish to the consumer in a hygienic condition. The federation is also operating fish canteen on the premises of Matsya bhavan for internal income generation and financial sustainability.
- The Federation in coordination with the Fisheries Department is also extending supportive service in supplying of Murrel fingerlings to the Asthma patients on Mrigasirakarathi day to administer the fish prasadam by Bathini Brothers.

Table-17 Federation-Sources of income and expenditure**Income (Rs.in lakhs)**

Sl. No	Particulars	2013-14*	2014-15	2015-16
1.	Grants from Govt.			1.56
2.	Interest on deposits	77.13	-	12.94
3.	Other income	0.74	0.04	1.23
	Total	77.87	0.04	15.73

*Combined AP

Expenditure: (Rs. In lakh)

Sl. No	Particulars	2013-14*	2014-15	2015-16
1.	Rents, rates, taxes		1.95	2.58
2.	Salaries and wages	116.72	52.50	56.56
3.	Office Expenses	2.83	0.45	7.66
4.	Others	27.05	30.23	66.64
	Total	147.06	85.13	133.45

*Combined AP

3.9 Women in fisheries

The Women folk in Telangana state play an important role in the fisheries growth through their participation in many sector related activities. Their major role in fish marketing is very conspicuous and in serving as additional labour force in routine fishing operations of men fishers apart from playing key role in post harvest operations

if the harvested fish is not marketed. The contribution of Women to sector activities is significant in generation of additional employment within sector.

Women Self Help group movement in the state is very strong. The Government has organized fisherwomen into Matsya Mitra Groups (MMGs) within the Fisher Women Cooperative Societies. So far, 666 MMGs covering 8700 fisherwomen are organized in the State and a financial assistance of Rs. 138.65 lakh is released to 550 MMGs. In the study districts there are 185 groups involved in various activities of fisheries and mainly pursuing fish marketing. These grassroots level institutions designed and implemented for the fisher women play very important role in reducing the tension and burden of producers/fishermen. The MMGs are localized in their operations, prepare their micro business plan and take up income generating schemes for improving their economic condition. Each group of 10 to 15 women is supported with a revolving fund of Rs. 25,000 under the CM Package and RKVY. Each Group is handling substantial volume of fish and thus facilitating channelization of fish from producer to consumer.

Women FCS and Fishermen Marketing societies are important links between producers and consumers in the State. Many of them act as sub- Aggregators and procure fish directly from fishermen. By and large, they purchase fish from Aggregators and whole sale markets when their area of business is far off from Tanks and Reservoirs. Otherwise, they source from tank/reservoirs and directly deal with producers.

On an average, a fish marketing woman sells anywhere between 25 to 40 kg of fish in a day if it is a semi-urban market while this quantity goes up in metros where average sale may go up to 50 kg/day. In semi urban retail markets eg. Mandal level and Small towns and District headquarters (converted as Dist Headquarters after carving of new districts from bigger and older districts). She keeps busy throughout the year selling fish and earns comfortable income. Summary points on Fishermen Cooperative Societies, DFCS, Federation and women in fisheries are given in **Annexure 3.9**.

3.10 Fish Trade and marketing

3.10.1 Market infrastructure

Status of Market Infrastructure

- In all, the State has over 83 fish market outlets located in different districts providing access to consumers and linking produce of fishers with wider market network chain.
- State has altogether three wholesale cum retail markets, two in Hyderabad of bigger magnitude both in terms of volume and value trade (Begum bazaar and Musheerabad) and one in Karimnagar town (Ramnagar market).
- Rest of the markets are of different magnitude and function with wider diversity and arrangements.
- Nearly 55% of the markets are retail and comparatively better organized with a market spread across the State located mainly in tier 2 and tier 3 cities and major towns.
- About 45% of the markets are unorganized, and majority of them have no shelters.
- Fish trade is being carried out in unhygienic conditions.
- These markets (some of them constructed by the traders themselves and some leased by the Panchayats/local bodies) handle any quantity between 1 to 10 tons every day.

Table–18 Details of market infrastructure in the State

Sl No	Market Size Avg. Sale (kg/day)	No. of market	Study Districts	Retail	Wholesale	unorganized
1	> 10000 Kg/Day	1			2	
2	> 5000 Kg/Day	1		1	1	
3	> 1000 kg/day	18	8	11		4
4	> 500 Kg/Day	11	4	9		2
5	> 100Kg/Day	18	10	9		9
6	< 100 Kg/Day	11	2	9		2
7	No data	24	11	6		18
		83	35	45	3	35

Among the districts, highest fish market spread is in Mancherial (12) followed by Khammam (11), and Kamareddy (11). These three districts have higher number of rural/ retail markets collectively accounting for about 41% of all markets, followed by Siddipet (5), Nizamabad (4), Nirmal (4), Medak and Rajanna Sircilla (3 each) and Warangal (2). Thus 45 retail markets out of 83 total numbers of markets are located in 9 Districts (77%). Rest of the districts does not have such network but account for one or two rural markets.

- All these markets are working in “make shift” marketing conditions.
- Practically with no amenities and facilities like water supply, electricity, fish display plat forms, waste disposal arrangements, drainages and shelters.

■ Marketing channels

The harvested fish is marketed in different ways. The fish is marketed domestically through Network of wholesale, major, minor retail, roadside markets, etc.

First point of sale (where farmers offer produce after the harvest) is on site (tank/reservoir) or in local village/ GP/Mandal, at best the district place.

■ Retail and unorganized markets

These are key platforms for the daily transaction of fish trade and are important transaction points between consumers and traders.

- Rural markets are dominated by local small-time retailers who bring fish from water bodies (reservoirs/tanks) and do their business in make-shift shops/stalls.
- Their daily sale during week days is around 30 kg and keep a margin @ Rs. 20 /kg of fish sale thus earning around Rs. 500/600 per day. They make business of up to 100 kgs during Sundays and special holidays/festival days.
- Large number of unorganized markets function at each cluster of villages and in villages adjacent to reservoirs and large tanks from where the retail traders bring fish to these Mandis (road side markets).
- Keeping a tag on road side / temporary markets is very difficult since they keep on changing the location within the villages/clusters.
- Majority of mandal towns have markets run by local traders and Women FCS (Matsya Mitras).
- Average daily trade in fish ranges between 100 kg to 1000 kg on week days and double this quantity on festival days/holidays.
- These Markets are characterized by unhygienic conditions with
 - Lack of adequate facilities for fish handling.
 - Inadequate availability of potable water, good quality ice, electricity, storage and disposal of waste generated due to fish dressing and disposal of spoiled / non marketed fishes.
 - Fish markets though unhygienic are still patronized by the fish eating population, perhaps because they get fresh fish at reasonable costs.
- Both fish selling/supplying agents, intermediaries and retailers dominate the transaction activities.
- Fish packing and repacking to transport for distant markets also takes place on a continuous phase.

■ Whole sale markets

- In the two wholesale cum retail markets functioning at Hyderabad the daily volume of fish traded (bought and sold) vary on a season to season basis.
- Overall average is 10 tons on week days and around 20 tons/day on holidays and festival/marriage season in each market.
- Wholesale fish markets are generally located at strategic points and are active very early in the morning hours.
- Retail marketing also takes place to a limited extent.

Constraints in marketing system

- Present marketing system is widely scattered, segregated into several players who make their own livelihood by earning respectable income.
- Fragmentation of markets, high intermediation costs and wastage, and high prices for the final consumer is commonly seen in this segment.

Marketing system of fish is different for reservoir and tank fisheries**■ Marketing of reservoir fishes**

- In case of reservoir fisheries, barring two months (June-August) when fishing is minimal due to conservation, facilitating breeding of indigenous and endemic fish species, fresh stocking of seeds and such other reasons the FCS/Licensees organize fishing for about 8-9 months on either daily basis or twice/thrice a week depending on the reservoir category.
- In most of the reservoirs, a part of the fish is sold at the reservoir site (ranging from 20-80% depending on the category of reservoir, fish harvest, season, and water level of reservoirs, prior marketing arrangement with merchants and other hidden arrangements) and only the rest is sold to merchants (wholesalers and retailers).
- Per capita catch being small during lean season, they sell almost 75-80% of their catch on the site itself and take the balance mainly to local markets.
- In several reservoirs, some of the fishers do marketing directly apart from involving in main fishing activities, also function as retail traders/aggregators working for the main merchants.
- Fishermen's households / spouses are invariably engaged in carrying out the second task. Large number of aggregators (estimated to range from 20-40 per reservoir depending on the size of reservoir) also buys fish regularly from fishers of reservoirs in addition to tanks.

■ Marketing of tank fishes

- As for tank fisheries, the system is different. The fishermen/societies do not organize fishing on daily/weekly basis except in case of large perennial tanks where in their operations are limited to 2-3 months and in some cases may stretch to 4 months i.e. January / February to May (depends on availability of water in tanks).
- Volume of sale on tank site during the non peak harvest season is quite small and limited to the local demand in addition to the demand of local small time aggregators.
- Harvest is mainly during summer months when maximum water recedes in seasonal tanks and calls for a systematic approach to sales.
- Bulk of it has to find place in far-off markets for which they are required to find such an intermediary.
- Test harvesting of fish and negotiating the selling price by the FCS executives on behalf of society with the merchants prior to commencement of harvest in some of the large perennial tanks and perennial small reservoirs that are developed directly by the FCS is also in practice.

■ Value Added products

As a traditional practice, both in the country and in State, fish is preferred in fresh form and that too, in live condition. The consumers do not seem to have much preference for processed fish/fish products. The women marketing organizations sell both fresh and dried fish in a limited scale and the volume is moderate. Dry fish is procured from outside (Andhra Pradesh) in limited quantity.

The DOF in order to increase domestic fish consumption through better marketing network and under hygienic conditions, provides access of fish to consumers in fresh, hygienic and sanitary conditions at reasonable rates, reduced wastage and spoilage of fish and prawn leading to distress sale and increase income to fishermen community has proposed several initiatives viz., construction of retail fish markets by societies (250 units) each unit with a cost of Rs. 10 lakhs, construction of wholesale fish market etc under various external funding (NFDB, RKVY etc) and also from state plan and NCDC project.

Incentive schemes/ programs to facilitate market players and institutions are being roped in to address the gap areas related to Hygienic marketing. Markets by District unions (30 nos.) with at a cost of Rs. 2 crores; Marketing assistance to Fisherwomen Coop. Societies (2 lakhs as Revolving fund) for 400 units, Mobile Fish

Outlets by the societies/individuals (100 units) each unit at a cost of Rs.15.10 lakhs, Vending unit with Moped to society members (50,000 nos.) each with unit cost of Rs. 50,000, Vending unit with Luggage Auto to society members (1000 nos.) each unit at a cost of Rs. 5 lakh and Portable fish vending Kiosks for members (4000 nos.) with a unit of Rs. 20,000 are proposed under NCDC project and also to various sponsoring institutions. Summary points on fish trade and marketing is given **Annexure 3.10**.

3.11 Human resources and institutions

3.11.1 Department of Fisheries

All Fisheries related activities are being promoted, planned, monitored and regulated by the Department of Fisheries. Fisheries sector activities and programs are being implemented through the District offices.

■ The DFO has mandated role of

- Appropriate disposal of water bodies to fisher societies (lease/ license/auction).
- Overall responsibility of implementing the programmes.
- Supervision of the performance of the support staff.
- Keeping constant link with FCS and other institutions.
- Administering subsidy schemes.
- Providing technical help and support to the fishermen.
- Seed production and distribution (wherever Govt. hatcheries are operating).
- Supervision of working of seed farms.
- Keeping close contact with all the concerned Departments and agencies.
- Representing the DOF in District level meetings and discussion, executing other tasks.
- Responsible to submit periodical progress / status reports on various programs and schemes under implementation.

■ DOF set up – at district level

Each District is provided with some minimum staff and is managed by a District Fisheries Officer. The staff pattern at District level comprises: 1) District Fisheries Officer, 2) Asst. Directors of Fisheries, 3) Fisheries Development Officers, 4) Assistant Inspector of Fisheries, 5) Superintendent, 6) Senior Assistant, 6) Junior Assistant, 7) Fishermen, 8) Field men and 9) Watchmen. The present staff strength of the DOF is 230 with the following distribution.

Table–19 Staff strength of DOF

	Particulars	Nos.	Remarks
■	District Fisheries Officers	33	
■	Asst. Directors of Fisheries	2	Medak and Adilabad
■	Fisheries Development officers	32	
■	Superintendents	1	post vacant
■	Asst. Inspector of Fisheries	17	No AIF posted in 14 Districts
■	Senior Assistant	3	
■	Junior Assistant	5	
■	Coordinators	3	
■	Fishermen	58	
■	Field men	65	
■	Night Watchmen	04	
■	Driver	1	
■	Others	6	
		230	

All the nine selected / study districts have the following staff contingent:

	Particulars	No.	Remarks
■	Dist. Fisheries Officers	9	one in each dist.
■	Asst. Director of Fisheries	1	one in Medak
■	Fisheries Development officers	8	Two in Karimnagar and one each in all districts except in Medak and Wanaparthy
■	Asst. Inspector of Fisheries	3	Karimnagar, Kamareddy and Mahabubabad
■	Junior Assistant	1	Mancherial
■	Fishermen	12	Karimnagar eight ; Mancherial, Yadadri, Medak and Rangareddy one each
■	Field men	18	All Districts
		52	

3.11.2 Fishery Training centers

The Department of Fisheries has inherited one Training Centre at Warangal where young and aspiring educated boys and girls are imparted training in various aspects of Fisheries science/management. This Inland Fisheries Training Centre (IFTC), Hanumkonda, has developed a comprehensive three-month course for fishermen and others which is stipendiary and provides training to 120 beneficiaries annually. The trainees take up jobs either in private or Government Department after they complete the course. However, their general tendency and expectation is joining Government service. The National Fisheries Development Board and Department of Fisheries provide financial assistance for organizing programs on a regular basis.

The National institutes (MANAGE, NIRD, NAARM) located in Hyderabad and State Agricultural Universities conduct need based training programs for the Departmental personnel with external funding sources on a periodic basis. Among the Central Agencies, the location of National Fisheries Development Board with its Central office at Hyderabad has helped the State in many ways. The Board implements wide ranging schemes and programs to promote fisheries across the country. Among the schemes (i) support for fingerlings stocking (ii) farmers Training (iii) development of hygienic markets are also being implemented in Telangana. The Fisheries Research Station, Divisional Training Centre (DTC) provides technical support to the Department.

Table-A20 Training centres

Sl.No	District	Mandal		NGO	KVK	
1.	Bhadradi	Kothagudem	Kothagudem	Arrow	-	-
2.	Kamareddy	Kamareddy	Kamareddy	-	-	-
3.	Karimanagar	-	-	-	-	-
4.	Khammam	Wyra	Wyra	-	KVK	-
		khammam	Khammam	-	DAATTC	-
		Kusumanchi	palair	-	FRS	Govt.
		khammam	Khammam	-	DTC	-
5.	Medak	Narsapur	Narsapur	NRDS	-	-
		Medak	Medak	Navajyothy	-	-
		Kowdipally	Kowdipally	Seva Sangam	-	-
6.	Medchal	-	-	-	-	-
7.	Nagarurnool	Bijinapally	Palem	-	KVK	-
8.	Nalgonda	Thripuraram	KampaSagar	-	KVK	Govt.
9.	Suryapet	Garidepally	Gaddipally	-	KVK	Govt.
10.	Vikarabad	-	-	-	-	-
11.	Wanarpathy	-	-	-	KVK	NGO
12.	Warangal Urban	Khila Warangal	Mamnoor	-	KVK	Govt.

3.11.3 Krishi Vigyan Kendras

The state has altogether 13 KVK centers to meet the field extension needs of farmers and technical knowledge support in agricultural sector. Among them, four are NGO KVKs, 8 KVKs are under the umbrella of State Agricultural Universities network, one under State Veterinary University. The four KVKs in the state viz., two NGO KVK's (Gram Nava Nirmal Samithi, Jammikunta, Karimnagar district, and KVK, Gaddipalli, Nalgonda district) are extending institutional support for the fisheries development through exclusive Fisheries Subject matter specialists. Similarly the State PJT Agriculture University KVK in Wyr, Khammam and of University of Veterinary, Animal & Fisheries Sciences KVK in Warangal Urban district is also supporting the fisheries activities through its contractual Fisheries SMS. In the study districts, all the three KVKs are sponsored and managed by NGOs and are functioning at Karimnagar (Gram Nava Nirmal Samithi, Jammikunta), Medak (Decan Development Society) and Wanaparthi (Youth for Action, Madanapuram, Kothakota mandal).

These institutions in addition to agricultural activities also have the mandate to support fisheries sector growth in general and raise the skill levels / knowledge levels of the fishermen. Additionally, they are also expected to carry out on farm testing (OFT) of technologies, conduct Front Line Demonstrations (FLDs) apart from extending training support, advisory and other type of extension activities to the field functionaries and the fishers. Field Demonstrations on new and innovative technologies related to fisheries and aquaculture are being taken up in few of the KVKs in support of wider dissemination and better adoption of improved practices. Some of the KVKs have necessary infrastructure to carry out the mandated tasks and facilities for imparting training in fisheries and aquaculture. Further, they have fisheries experts on their roll or outsource fisheries experts' services wherever required. However, the KVKs do not have separate financial allocation for fisheries related programs and depend on the sponsors. They have been imparting short term training to farmers under sponsorship of NFDB, DOF and others. These institutions are complementing the efforts of the DOF in Technology Transfer and Skill up-gradation. However, financial constraint has limited their involvement in promoting fisheries and providing effective backward linkage support on a larger scale.

3.11.4 NGOs

Excepting the NGO run KVKs with mandated activities on fisheries, the study districts though have four NGOs viz., Arrow NGO in Kothagudem district, NRDS, Navajyothy and Sevasangam in Medak district, no specific activities related to fisheries development are being pursued by these institutions.

3.12 Infrastructure and input supply

3.12.1 Hatchery and seed rearing farms

Seed supply is crucial to fisheries activities. The essential **5 R's** are (i) Required quality (ii) Required quantities (iii) Reasonable cost (iv) Right time and (v) Right place decides both development and economics of fisheries activities. To fulfill most (if not all) of the conditions, there is need to have locally accessible seed supply units with facilities to produce required qualities and quantities and ensure timely supply at reasonable costs. Since seed requirement is huge in quantity, it is necessary that at least a part of this requirement is supported by the Government hatcheries since leaving this field entirely to the private sources is not desirable from the point of sector growth and sustainability.

In general, the infrastructure facilities for production of fish seed viz., spawn, fry and fingerlings in the state both under government and private segments is limited. Quality seed production and rearing in the department fish seed farms is mainly limited due to inadequate facilities related to land and water.

The only infrastructure support available to the fisheries sector activities is network of hatcheries and seed farms that churn out fish seed and fish culture tanks/ponds. But their number and volume of seed production are quite insignificant in the context of huge demand. Hatcheries and farms established years ago (under the undivided Andhra Pradesh) also suffer from inadequate facilities and man power thus limiting their production capacities. Some of the hatcheries and farms are defunct and those that are functional, their

designed capacities are not fully utilized. This has led the fish production segment to heavily depend on neighboring state Andhra Pradesh.

The State is at present '**Seed Deficit**' and hence on priority, efforts are being made by the DOF to restructure / improve the conditions in these units, the outcome remains to be seen. The private seed producers (barring one at Jagtial) have smaller capacities. It was seen that private participation in seed production is emerging mainly among young and enthusiastic fishermen/entrepreneurs and this is expected to meet the demand for seed and facilitate to move forward for inclusive growth in the fish seed segment in years to come.

In order to strengthen the segment, the DOF has proposed to support farmers/entrepreneurs in private sector and cooperative sector for strengthening existing farms to produce quality fish seed and fish (280 units). The DOF has proposed for strengthening of 10 Fish Seed Farms (0.5 ha unit) maintained by District unions at a cost of Rs. 5 crores/unit, construction of 20 new fish seed farms each of 0.2 ha size by district union at a cost of Rs. 2 crore/unit, establishment of about 50 freshwater fish seed hatcheries (each of 2 ha area) by the members / societies (Rs.25 lakh/unit) and establishment of new fish seed rearing units (200 units) by the beneficiaries (each unit at a cost of Rs. 7.5 lakh/ha).

▪ **Private tanks for Fish / prawn culture/ farming**

In support of enhancing fish and prawn production by way of promoting aquaculture activities in the state, supportive benefits to entrepreneurs/ farmers for setting up of fish production farms and related units has also been proposed. Beneficiaries oriented supportive programs for captive rearing of fish in tanks (1150 units/ ponds) each with a unit cost of Rs. 7.5 lakh/ha, construction of new fish ponds/ tanks and rearing units (400 units) each unit with support of Rs. 8.5 lakh /ha; Pen culture units(4000 nos.) each of Rs.0.5 lakh /unit and establishment of Re-circulatory Aquaculture System (10 units) with financial support of Rs. 0.5 lakh/unit are also positioned by the DOF in support of promoting diversified aquaculture activities on pilot scale mode.

3.12.2 Fish Feed Mills

Except under aquaculture activities, input based fisheries/ fish culture in tanks and other water bodies is very minimal or totally absent in the State. Use of feed is restricted to activities of cage farming of pangasius or tilapia, murrel and carp fish farming in private farms and vannamei shrimp farming in freshwater. Allottees of tanks (both Government and Panchayat) are not practicing use of any production enhancing inputs including feeds, there is no existing demand/requirement for feed of any kind in the state (both on-farm feed and company formulated supplementary feeds). Presently, in very few cases some locally available natural feed like rice bran, cooked broken rice, ground nut cake and dung as organic manure to fertilize the water is used only in limited quantity in tanks / water bodies which are not used for either human drinking, livestock drinking or bathing or washing clothes etc. The multiple uses of water and the prevailing traditional fisheries activities in most tank resources of the State have also restricted use of production enhancing inputs.

As such no feed mill has been established in any part of the State. With aquaculture and input based fisheries enterprises coming up in some parts of the State, feed supply will assume importance in the years ahead. At present whatever quantities are required by the aquaculturists, are being outsourced from neighbouring state as also from other suppliers. As such demand is not visible on a large scale.

Establishment of about 20 mini fish feed mills (small) each of one ton capacity/ hr by the members of societies (unit cost of Rs. 15 lakh) and five large formulated pellet feed plant (6-10 ton/hr) by the unions (unit cost of Rs. 2 crores) are proposed under Fisheries Development with NCDC assistance in the state on concept of 20% subsidy, 60% loan and 20% margin money. Further it is expected that the fishermen may be motivated to use fish feed in such water bodies wherever feasible in future.

3.12.3 Fish landing centers/points

The harvested fish is brought to the shore of water body for onward transmission / disposal by the fishermen. For this purpose, certain strategic locations/ points are designated by the fishermen themselves and over the years, they serve the purpose of "landing Centers" or landing points. Unlike in marine sector, the

landing centre concept is strictly not definable in inland water bodies as the magnitude of operation both in quantity terms, size and no. of fishing units, intensity and daily harvest is generally very limited. The conventional landing points both at reservoirs and tanks are mostly open type with no shelter of their own, do not have any defined facilities /infrastructure for safe landing, constructed space for fish holding, grading, weighing, packing and other utilities including facilities for on- site sale, fish cleaning, disposal of waste and dead fishes, protection to the craft used (boat, theppam) etc. Considering the ongoing focus of the State for the fisheries development and anticipated future expansion, necessity of such “full-fledged Landing points/Centers” is felt only in case of large and medium reservoirs and some Govt. large perennial tanks where fish in bulk is brought and handled by the fishermen.

As per the available secondary data as many as 22 Landing Points are identified as Landing centers in reservoirs across the districts Kamareddy Nizamsagar reservoir (8), Rajanna Sircilla UMD (3), Nalgonda (3), Suryapet (3), Karimnagar (2), Nirmal (2) and Nizamabad (1). These spots have make-shift arrangements for landing of fish where spot sale also is carried out and trading takes place between the buyers and sellers.

The DOF has proposed development of these centers in selected larger reservoirs and provide minimum basic amenities/facilities for the benefit of fishermen community. Under Fisheries Development with NCDC assistance, State has proposed for development of about 100 landing centers each with a unit cost of Rs. 10 lakh.

3.12.4 Accessories & equipment

Realizing the poor economic status of the fishers and the PFCS, the recurring cost in the fishing operations and to improve better handling of fish from the time of harvesting to marketing, the DOF is also extending support for craft, gear and other accessories though at a minimal level. Under the ongoing NCDC supported program the DOF has proposed supporting members / societies with nets & boats (20000 units) each unit cost of Rs. 20,000; similarly support for drag nets to society/ group members (2100 units) with unit of Rs. 2 lakh. The DOF has also proposed to extend support for net mending and Putti (coracle) fabrication units (10 nos.) each with a unit cost of Rs. 10 lakhs. Support for supplying about 25,000 units of plastic crates (each unit of 5 crates) to facilitate better handling of harvested fish has been proposed under the NCDC program.

3.12.5 Ice plants /cold storage

Availability of quality ice for post harvest handling of fish both in landing centers and also in marketing places is inadequate and a limitation in the State. As per the secondary data provided by the DOF, the state has 43 ice plants with capacity ranging between 1-20 tons/day. The existing total capacity of ice production from these private infrastructures is estimated at 272 tons/day.

In the study districts, ice plants/cold storage facilities are available only in five Districts i.e. Kamareddy, Karimnagar, Mancherla, Mahabubabad and Medak. All of them are in private sector. Out of 18 such units, 10 are located in Mancherla and four in Kamareddy, two in Mahabubabad and one each in Karimnagar and Medak.

The ice plant in Karimnagar has an installed capacity to produce 20 tons of ice while one of the four in Kamareddy has 10 ton capacity and three with eight ton capacity. Most of the other units have only one ton capacity while the two in Mahabubabad have 1.5 tons capacity. The cumulative ice production capacity in the selected districts is around 60 tons. Some of the Ice factories established in earlier period require renovation and restructuring.

▪ Cold storage

At present the demand for fish outpaces /outstrips supply, which leads to a fast turnover and hence there is absence of cold storage facilities in most of the districts. The present handling and transportation of fish limits to only use ice where ever available. In most ice plants, block ice is being produced and supplied. The inadequate storage facilities for the fresh fish after catch/harvest have limited the producers/fishers to have better access to consumer market. Considering the importance of promoting use of ice in post harvest handling

of fish to minimize post-harvest losses and the quality loss due to bad handling, the State has proposal for establishment of 50 Ice Plants (each of 10 Tons capacity/day) with societies linkages spread out in different districts under the program on Fisheries Development with NCDC assistance and the unit cost of each ice plant is Rs. 25 lakh.

3.12.6 Fish transportation, processing and value addition

As a traditional practice, both in the country and in State, fish is preferred in fresh form and that too, in live condition. The consumers do not seem to have much preference for processed fish/fish products. There is clear absence of hygienic transport vehicles (Refrigerated vehicles) usage for transporting fish from the major fish landing centers to the distant markets. Similarly, limited insulated trucks in support of fish transport constrain the supply of quality fish to the consumers located in far off from the production units/landing centers.

In support of improvement in this segment, the DOF has proposed for support of 200 Hygienic Transport Vehicle (four wheeler) each with a unit cost of Rs. 10 lakhs, insulated trucks (60 nos.) each of 6 tons capacity with a unit of Rs.15 lakhs and four processing units with a unit cost of Rs. 76 lakhs. Summary points on infrastructure and input supply are given in **Annexure 3.11**.

3.13 Supportive Schemes, Services and Policies

3.13.1 Promotional schemes

The Department of Fisheries is supporting fishermen and their societies in their livelihood and welfare activities and promoting fisheries development through number of interventions. Some of the schemes have been adopted and continued from pre-bifurcation period and some are newly introduced. There are specific schemes related to resource use, productivity enhancement, market development, institutional and market related aspects apart from the backward linkages required. There is also a special focus on innovative schemes. Fishermen welfare is yet another aspect of promotional schemes that is given due importance.

The State is receiving budgetary support both from the state and central government to implement various development schemes. During the period 2014-15 to 2016-17, the DOF had implemented several schemes under Normal State Plan, State Sector schemes, Tribal Sub Plan (TSP) and Scheduled Caste sub Plan (SCSP) by GoTS, Blue Revolution program and Integrated Fisheries Development Scheme (IFDS) implemented through loans. Some of them are Centrally Assisted State Plan schemes (about 6 nos.) and the others are under Normal State Plan schemes. The Department has been implementing schemes/ programs supported by NFDB and Rashtriya Krishi Vikas Yojana scheme (RKVY) funds.

■ Central Sector Schemes

Under this category, six schemes (including part of Blue Revolution schemes) were implemented with an allocation of Rs.3335.34 lakhs for 4 years and the financial utilization was nearly 91% (Rs. 3029.30 lakhs). Major share of Rs.2338 lakhs (66%) had been accounted for by Blue Revolution schemes followed by Fishermen Housing scheme (Rs.275 lakhs), and insurance schemes accounted for at Rs. 260 lakhs. However, inland fisheries / aquaculture had good provision but achievement side was not encouraging. The following are the six important schemes implemented from 2014-15 to 2017-18.

Schemes implemented	2014-15	2015-16	2016-17	2017-18
▪ Development of Inland Fisheries and Aquaculture	✓			
▪ Housing scheme for fishermen	✓			
▪ Training & Extension	✓			
▪ Group Accident Insurance Scheme (50:50)	✓	✓	✓	✓
▪ Savings-cum-Relief		✓		
▪ Blue Revolution: Integrated Development & Management of Fisheries			✓	✓

■ State Plan Schemes

Under this scheme Rs.15974 lakhs were planned to be spent against which the actual expenditure were just Rs. 4413 lakhs. Of the 20 schemes, major allocation (more than 70%) was made for three schemes namely Construction of community halls, strengthening of seed farms and stocking of seed in reservoirs and tanks. Followed by Vending units (Rs.1305.14 lakhs) about 8% and Assistance to 672 FCS in seed procurement (Rs.674 lakhs).

■ Scheme focus and cost sharing

The average budget share in the total allocation made for fisheries state plan budget was 75% (Rs.24520 lakhs) for the four year period starting from 2014-15. The overall allocation had highest share for infrastructure development at 39% (Rs.9592 lakhs) to support construction of hatcheries, seed rearing farms, cage structures, fish landing centers, markets (ice box, whole/ retail, vending units, solar panels etc.), followed by fish seed supply to societies for stocking different water bodies 32% (Rs.7931 lakhs), Welfare schemes, 24% (Rs.5870 lakhs) comprising construction of community hall, support for relief cum savings to fishers, etc. Collectively these three schemes accounted for over 95% (Rs.23393 lakhs). The budget share for the input supply (nets, boats to SC and ST fishers) was 3% and for administrative support 1% to Apex Fisheries Federation, and maintenance of Relief Boats. The State share for implementation of NFDB schemes was <1%. The share of budget allocation for Fishermen Training was very meager and insignificant looking to the need for training of fishermen and other stakeholders of the sector. However, it is compensated to a certain extent by covering under Central schemes where in the State share for training and extension activities is about 50%.

The Centrally Sponsored programs mainly cover Housing scheme and had over 74% share followed by Development of Inland fisheries & Aquaculture (over 15%). The rest is accounted for Group Accident Insurance Scheme, Relief cum Savings Scheme, Training & Extension. All these schemes are implemented on 50:50 shares between Central and State govt. Strengthening of Fisheries database and Networking is implemented with 100% support of central govt.

Considering the total allocation for schemes (both State and central sponsored), the share of State accounts for over 85%. The budget allocation under State plan witnessed an all time high during 2016-17 with an allocation of Rs.10015 lakhs and with more emphasis on Development of Fisheries (70%) followed by development of Government Fish Seed Farms (nearly 29%). During the year, the focus of fisheries development in the state was more on supply of fish seed with 100% grant as per requirement based on Water Spread Area. This component of development had a budget allocation of Rs.4836 lakhs and in the current year the allocation is Rs.3073 lakhs. In all, the budgetary allocation under state sector schemes for the year 2017-18 is Rs. 4047 lakhs and of CSS program Rs. 2004 lakhs for the current year. The details on promotional schemes are given under **Annexure-3.12** supported by **Appendix-F**

3.13.2 Credit support and insurance

■ Credit support

As at present, fisheries activities are carried out on traditional lines and aquaculture is yet to take off though efforts are underway by some young and aspiring entrepreneurs. Since the tanks and reservoirs are leased to the FCS by the Government, the FCS cannot obtain any loan from banks. Such loans need to be supported with adequate collateral security (mortgage of the property). Since FCS/individuals are eligible only to use the water bodies for fishing, they have no ownership rights which makes them ineligible for loan. In case of marketing, there could be some short term accommodation by banks, purely on personal credibility/contacts of Wholesalers with banks etc. But such cases are far and few. By and large, this sector has not benefitted with institutional credit.

■ Insurance

A Central Scheme of personal insurance for fishermen is in operation under which an amount of Rs. 6 lakhs is paid by way of compensation to the family members/next of kin in the event of fatal accident or death due

to drowning or any other reason. Apart from this no crop insurance scheme is in operation in respect of loss of fish crop (on the lines of Agriculture).

■ **Group Accident Insurance Scheme for Fishermen (CSS-50: 50)**

The program is targeted to support fishers in case of any eventuality while carrying out fishing. The premium under Group Accident Insurance Scheme for fishermen is Rs.20.27/head which is shared equally by Central and State Government. The Government of India releases its share directly to the National Federation of Fishermen Cooperatives, New Delhi for payment of premium to the Insurance Company. The Ex-gratia amount payable is Rs. 2 lakh in case of death / permanent disability and Rs. one lakh in case of partial disability and also covers Rs. 10000 towards hospitalization expenses in the event of accident. The Govt. of Telangana also pays Rs.4.00 lakh as ex-gratia to the dependents of the deceased fishermen in addition to the amount payable under GAIS. During 2014-15 and 2017-18, total amount of Rs. 250 lakh has been allocated.

3.13.3 Sector related policies

■ **Overview on policies**

The fisheries sector in the State over the period has witnessed several changes both in resource use pattern, diversification in activities and practices, investment and participation of user groups. The activities are predominantly community oriented, small scale in nature, and supporting livelihoods of many in the entire supply chain that are exclusively dependent on this sector. The profitability of aquaculture and related activities in recent years has enhanced the interest of progressive farmers and entrepreneurs especially in some of the potential districts where the resource base is more suitable.

The sustained growth of this sector reflects in the development initiatives/interventions in State policies and programs that have direct bearing on the activities. The policy on natural resources calls for better management regimes. Further with 98% of the population of the State being meat consumers, it becomes all the more important for the state to ensure demand and supply conditions to go in a coordinated manner. These are symbiotic conditions in the supply chain mainly between fish producers/suppliers and ultimate consumers which needs to be ensured. Further there is need to incentivize the private entrepreneurs to engage in various production, distribution, processing, value addition and marketing activities.

Experience has shown that the Government cannot by itself directly get involved into any business or economic activities but can only create/facilitate an enabling environment for the private sector and others. At the same time, the State cannot be a mute spectator of any monopoly and exploitation of poor people. It has to frame suitable format for sustained growth with equity. In the absence of comprehensive state Inland Fisheries Policy, the GOTS has put in place several policy guidelines and Govt. orders in place to address many issues that are constraining sector growth. Aligning with national policies and programs the State govt. has initiated interventions on the following lines:

- Access rights and property regimes.
- Livelihood safeguards of communities and others exclusively dependent on the activities.
- Food and nutritional security.
- Protection to ecological diversity of resources - observation of closed seasons, restrictions on use of destructive craft and gears, regulations on mesh size, biodiversity conservation.
- Enhancement of production and productivity.
- Diversification of production systems and species.
- Registration of farms and compliance to set guidelines.
- Effective monitoring, control and surveillance mechanism.
- Environmental sustainability, etc.

The above will ensure optimum and judicious utilization of available natural resources with technologies, management led development approaches and sustainability for the benefit of human kind and with equity.

Accordingly, the GOT has come out with over 56 GO's at different points of time and on wide range of issues related to inland fisheries sector. There are 22 GO's pertaining to resource access and leasing rights starting from 1964 under non-bifurcated Andhra Pradesh addressing the following aspects:

- Issue of license to fish in reservoirs.
- Introduction of Licensing System in reservoir projects.
- Permissions related to licensing of reservoir projects.
- Leasing of tanks to FCS.
- Handing over of tank resources to Gram panchayat.
- Lease rent fixing/ payment/waving off and such others.
- Leasing of water bodies for a period of 5 years.
- Conduct of public auction where no co-operative societies exist etc.

About 4 GOs deal on introduction of Licensing System in Godavari River - Declaration of Non Fishing Zone in Godavari River, Devolution of powers and functions to Panchayat Raj Institutions.

On **Technical and regulation issues** there are 13 GO's relating to registration of new aquaculture units in fresh water lands; regularization of existing freshwater aquaculture units in operation; promotion of cage culture in Telangana Reservoirs; Guidelines for cage culture in inland open water bodies; Guidelines for Tilapia Fish Hatchery and farming; Restriction and Regulation of exotic fish culture – Tilapia (*Oreochromis mossabicus*) to conserve the indigenous aquatic diversity; Ban on African Catfish and regulation of Freshwater Aquaculture.

Related to **Administrative issues**, there are about 17 GO's on devolution of powers; tenders for input procurement- seed, nets and others; implementation of schemes/programs; notification of *Channa striatus* (murrel Fish) as State Fish; operational guidelines for skill test; seed stocking; establishment of PMU at Hq.; staff service related matter etc.

The policy guidelines on resource access, initiatives for input support, aquaculture, cage fish farming, exotic fish culture, conservation of fishery resources and governance, convergence and conflict resolution are given under **Annexure 3.13 and Appendix G**.

3.14 Socio - economic aspects

3.14.1 Socio-economic profile of fishers

Historically, fisheries activities were mainly carried out by specific communities known as Bestas, Ganga Putras and Bedas. Traditional fishers dominate the sector activities and in recent years, Mudiras who constitute a significant per cent of rural communities are also seen to be actively engaged in fishing. Due to traditional practices, fishers are socially deprived; educationally weak with very high occupational rigidity face high risks of life and means of livelihood. Generally fishers are unorganized with least social security benefits.

The fisher communities use public / community water resources available within their inhabitations and nearby that are owned by Government/ Panchayats. Formation of Fishermen cooperatives was encouraged by Govt. and these water bodies were leased out to FCS since it represented the community members and expected equitable sharing of the usufructs/fish. With growing demand for fish, systematic and organized activity was ushered into the sector which gave a commercial touch in recent years.

The sector is marked by institutionalized system in that water bodies are allotted to the Fishermen Cooperative Societies with practically no scope for individuals. The tanks and reservoirs are virtually owned by the FCS since a water body once allotted, cannot be taken back or allotted to any other FCS/party due to social issues and strong resistance. This has given practically a monopolistic power to the FCS. This also has given rise to local inter-community disputes, frictions and has assumed serious proportion wherever there is heterogeneity of communities within the villages. Villagers inhabiting in the vicinity of water bodies have composite community cultures who include other than traditional fishermen and want rights for fishing in the common water resources. Frequent incidences of violence and civil disputes, court case etc. have increased due to inter-community rivalry for access to water resources from across the state. Some of the FCS is riddled with internal rivalry since stakes are high. Only where there is homogenous groups form societies such as Mudiras, Gangaputras they are free from such problems since there is social and community affinity among them in respect of sharing the output.

3.14.1 Community and livelihood protection

Of the 1.90 million fishermen of whom 0.32 million are actively engaged in fisheries, large majority them (especially fishers of large and medium reservoirs) depend on fishing as their family and traditional livelihood activity and own very little or no land. Their main source of income and employment is fisheries and agriculture labour is second source. Mudiras and Gangaputras dependent on small reservoirs and tanks generally have alternative resource base, and have diversified activities towards other income generating sources such as small trade, business, weaving, marketing and sundry menial jobs in addition to agriculture labour. Many among them also have acquired small pieces of agriculture land. Thus, multiple channels of income and employment are used by the fishermen though fishing is their main occupation. The informal social security system in the form of sharing of earnings for the community and social organizations is prevailing.

The land productivity and return to labour are significantly high in fisheries compared to other land based activities. The socio-economic profile of fishers involved either as a secondary source or primary source presents increasing participation young or educated persons (belonging to fishermen communities) into various fisheries activities. This is regarded as most visible impact of the economic advantages of fisheries sector *vis a vis* other activities like agriculture, dairy etc.

Summary points on socio economic aspects are given in **Annexure 3.14**. The secondary data tables on Resources (Reservoirs and Tanks), Activities, Production and Markets and Institutions are given under **Annexure-3.15**.

Chapter – IV

Field survey, FGDs, CSDs and stakeholder analysis

4.1 Field survey findings

4.2 Focused group discussions (FGDs) & case studies

4.3 Stakeholders' analysis

4.1 Field survey findings

Field survey of selected water bodies, GP villages, FCS and other institutions including markets and infrastructure are completed in all respects and primary data generated through this exercise in the nine selected districts, 81 Mandals and 405 villages is tabulated and preparation of summary tables in respect of each of the 13 questionnaires used for primary data collection by both enumerators and team leaders have been completed. The output tables are used for drafting this exclusive chapter on the Field surveys. The final status of the field coverage of enumerators and Team leaders are given in **Annexure 4.1**.

4.1.1 Feedback from respondents

The response from reservoir fishermen relates to 15 reservoirs in seven study districts across 11 mandals, with the exception of Mahabubabad and Yadadri where there are no reservoirs. The feedback covers 111 respondents which would mean an overall average of about nine per reservoir with the exception of three reservoirs in Wanaparthy. Further the field survey response is available from 4500 fishermen for 708 tanks (both DPT and GPT) across nine study districts representing 78 mandals and 368 villages. This would mean coverage of about six respondents per tank. The socio - economic profile of fishermen representing the reservoir resource and tanks is as follows:

■ **Fishermen Families:** The survey shows that the gender composition of fishermen families is 50% males and 50% females in case of reservoir fishermen and the same is 52% and 48% respectively in case of tank fishermen with an average family size of 4 members in both the cases and generally with one child per family. On an average there is one person per family actively involved in fisheries which means 25 to 30% of the family members as a whole are actively involved in fishing.

■ **Social category:** In both reservoirs and tanks category 90% of the respondents reported to come under BPL category with the balance in APL group. As for the further social categorization the details are as follows:

		General	OBC	SC/ST	Tribal	Others	Total
➤	Reservoir fishermen	-	72%	1%	27%	-	100%
➤	Tank fishermen	10%	65%	22%	0%	3%	100%

From the above it can be seen that the OBC category of fishermen is more pronounced in case of reservoirs and the same is the case as for tribals. In case of tank fishermen coverage of SC/ST category is substantial.

■ **Education level:** Among the fishermen both in case of reservoirs and tanks a substantial number of them are illiterates and the level of schooling and education is as follows:

		Illiterates	Primary	Secondary	Graduate	PGs	Others	Total
➤	Reservoir fishermen	53%	25%	13%	8%	1%	-	100%
➤	Tank fishermen	50%	29%	17%	2%	1%	1%	100%

It is noticeable from the above data that though generally the illiteracy is lower in tank fishermen, education profile at primary and secondary levels is better in that category. However, the presence of more qualified people among reservoir fishermen is to be observed which can be attributed to perennial nature of activity in reservoirs attracting educated men to involve in post catch activities with possibly better prospects.

■ **Occupation and livelihood:** An attempt has been made to know the implication of occupation and livelihood options among fishermen in terms of their extent of reliance on agriculture and other business apart from fishery activities. In fishery *per-se* their involvement in reservoir fishery, tank fishery and aquaculture has been elicited. In the context of both the resources i.e. reservoirs and tanks majority of respondents (about 70%) reported that fishery is their main livelihood option. However among reservoir fishermen about 35% and among tank fishermen 46% reported agriculture also being supplemental to their livelihood. The higher reliance on agriculture among tank fishermen may be attributed to seasonality limitations of water availability as compared to reservoirs. The absence of aquaculture activities among both the categories of fishermen is evident with the exception of some sporadic incidences seen in tanks situation. The reliance on business to a small extent among tank fishermen and its lack of it among reservoir fishermen is also explainable on constraints of seasonality.

■ **Experience in fishing/fishery related activities:** Depending on the age group the span of experience varies among the fishermen of both the categories. The experience in five different categories is given in the following table:

		< 3 years	3-5 years	5-10 years	10 to 15 yrs	> 15 yrs	Total
➤	Reservoir fishermen	3%	18%	28%	15%	36%	100%
➤	Tank fishermen	9%	3%	7%	18%	64%	100%

It can be seen that the fishermen in the longer experience category in case of tanks is evident as compared to reservoir fishermen. In reservoirs where the risk profile is higher, nearly 50% of fishermen being in the younger age group may account for the depiction of lesser no. of years of experience seen there in.

■ **Basis of choice for fisheries/ aquaculture activities:** Among the reservoir fishermen, availability of water bodies followed by family occupation is the deciding factor while it is the other way round in case of tank fishermen where family occupation takes the precedence in choice of activity. It can be seen that anticipation of better income is not a determinant factor in the choice under both the situations indicating the need for much desired changes for making fishery an attractive sector for better livelihood options.

■ **Asset ownership:** The asset ownership comparison among the two categories of fishermen is given here:

		Agri. Land	Fish pond	Thermocol Theppam	Nets	House	Vehicles	Others
➤	Reservoir fishermen	25%	0%	68%	69%	38%	9%	11%
➤	Tank fishermen	44%	2%	32%	77%	75%	23%	3%

The higher incidence of agriculture land as an asset among tank fishermen relates well to the earlier finding under the head '**Occupation and livelihood**'. There are some cases among tank fishermen where the fish pond as an investment is reported. The predominance of thermocol theppam use among reservoir fishermen is evident and is in accordance with the dire necessity of the situation and nature of activity. The popular usage of nets in both the situations is reflected in the reporting of nets as an item of asset among both the categories of fishermen. House as an item of asset being more pronounced in tank fishermen and may relate to the supplemental income from agriculture lands. The same could be the reason for vehicle ownership being more among tank fishermen. The other assets reported in both the cases include household and durable utility items.

■ **Income sources:** Income sources of fishermen were listed in the study to find out the sources of income from different sources viz., fisheries, agriculture and agriculture labour apart from business and other activities. It is seen that fishermen have multiple sources of income. The feedback from tank fishermen shows that in about 49% of the cases they derive income from agriculture and in about 15% of the cases they supplement

their income from agriculture labour. Only in about 27% of cases fishery alone forms the exclusive source of income. In about 23% of the cases income is reported from business and other activities as well.

■ **Involvement in the institutional activities:** The institutional membership among the respondents which mostly relates to being members in the local FCS is as high as 98% in case of reservoir fishermen while it is about 80% for tank fishermen. As for the reasons for not taking the membership the major one reported seems to be the costs and commitments involved in the participatory process which are not affordable by some of them. Highlights on Respondent's Feedback are given in **Annexure – 4.2**

4.1.2 Field survey of resources

4.1.2.1 Reservoir resources

The 11 reservoirs out of 15 in the study districts (with the exclusion of Mahabubabad and Yadadri where there are no reservoirs) are under Godavari river basin while four are in Krishna basin. The details of reservoirs covered in the field study across the seven study districts and highlights are given in **Annexure 4.3**. As for the size category majority are small reservoirs with most of them being perennial in nature. Bhadrachalam district has five reservoirs of which four are covered here and the one left out i.e. Kinnersani reservoir which has been set apart for crocodile Conservation Park. Similarly in Wanaparthy three reservoirs have been covered out of the five in the district. In Mancherial there are three reservoirs and all are covered in the study. In Medak out of three reservoirs two have been covered with the inclusion of Pocharam reservoir which extends into neighbouring Kamareddy district as well. In Karimnagar out of the two reservoirs one has been studied. As for Kamareddy and Rangareddy which have one reservoir each and the same are duly included in the field study.

■ **Resource utilization:** One of the important aspects of resource utilization in reservoirs relates to the mode of fishing access rights. In the reservoirs studied allotment to FCS on lease is the predominant feature to the extent of 70% as seen in the reported cases with the balance 30% being under the license system. To the question on amenability of reservoir for fishing in terms of seasonality majority (> 70%) of reservoir fishermen indicated that it is throughout the year with the balance 30% stating it to be for one or two seasons. As for the role played in the fish seed stocking process both DOF and FCS are depicted on an equal footing by the respondents.

■ **Species composition & stocking:** In stocking, the share of catla, rohu, mrigal along with common carp form the major species with 80% share, the balance 20% being other species with clear predominance of rohu and mrigal visible in a large number of reported cases. It is also observed that the species composition relates to the size of the reservoir. In case of large and medium reservoirs catla, rohu, mrigal are predominant while in small reservoirs the common carp is part of the species mix. Size at stocking is an important seed quality parameter and as per the respondents in >80% of the cases the stocking size is in the range of 70 to 100mm with some exceptions of 20 to 50mm reported sporadically. The stocking done both by DOF and FCS being common double stocking have been reported in most of the cases studied. The reported stocking density on a per ha basis when compared with the standard stocking density as applicable to size category of reservoirs shows that there are wide variations and on the whole the stocking efficacy is just around 100% despite double stocking being there in many cases is indicative of a better understanding to be derived on the field reality concerning this important issue.

■ **Operational aspects:** The field study has delved on important posers to respondents on operational aspects of reservoirs which include the **resource management, crafts and gears** and **fishing effort** including season wise **fishing days**.

The study shows that FCS have been taking a major role in the **resource management** with the support of DOF along with individual fishers as members of FCS also taking part in the processes through group efforts. Watch and ward (nearly 70%) is one major area where the FCS have been playing a key role while the department's role has the stocking as its centrality. It is in this context institutional linkage of DOF with FCS stands apart in its advantages as compared to the resource licensing system where the spirit of stake holder concept seems to be getting diluted.

As for **the crafts and gears** reporting on boats is limited to the widely used thermocole theppam which is ubiquitous in the study districts. The usage of gill nets and drag nets is predominant with sporadic cases of cast nets and traps being used.

As for the active members in the FCS, the study shows that about 70% are involved in active fishing while the balance are passive or their involvement is only sporadic. The issue of non members (about 36%) involved in **fishing effort** is reported. The reporting on number of **fishing days** spread across three distinct seasons viz., Summer (Feb-May), Rainy days (June-Sept.) and Winter (Oct- Jan.) has been enumerated. Though on an average the duration of fishing per day ranges from 6 to 7 hours with about 140 to 150 days of fishing in an year it varies with size of the reservoir for extended periods up to 230 to 250 days in case of larger reservoirs. The seasonal share in the fishing days reported as above is 50% in summer followed by 35% in winter with a minimal of 15% in rainy days coinciding with the mandatory fishing holiday.

The field study shows that the labour mobilization for various activities is more by group efforts both in terms of FCS members organizing themselves for the tasks and individual fishermen collaborating in their efforts. This is very evident especially in providing the watch and ward. Thus, the use of family labour is reported to a larger extent as compared to hired labour taken on commercial terms. The wage rates reported vary from Rs. 150 to 300 per day. While the data is not conclusive either on cost of fishing or the annual income, there is information on sale price which could lead to possible income levels of the reservoir fishermen. It is seen that the price realized by the fishermen widely varies from the range of Rs. 70 to 80/kg and Rs. 90 to 100/kg in most of the cases with instances of Rs. 120 to 150/kg also reported for specific varieties in specific locations. As for murrel which is a much sought after priced variety in Telangana the reported prices are in the range of Rs. 300 to 400/kg.

■ **Landing centres and marketing aspects:** The landing centres are the nodal points where the fish catch from the reservoirs are brought ashore from where it is disposed off in a number of ways. Depending on the size of reservoirs there are a number of landing centres around the water body which is the point of linkage to markets, be it local or otherwise. As per the study it is seen that the landing centres on a reservoir, especially the larger ones are all major landing centres. Regarding the disposal of fish, the feedback indicates that nearly 40% happens as on 'site sale' at the landing centres followed by local/rural market in the near vicinity (20%). The off take by merchants who visit the landing centre for procurement and retailing constitutes about 24%. The balance relates to off take for whole sale and distant markets by the aggregators. As for the channelization it is seen that nearly 90% of it happens between group members to FCS pool from where the disposal takes place to other market intermediaries. It is a notable aspect that fisheries federation is far removed from this entry point operations in marketing in which they are supposed to play a key role and initiate ameliorative measures to protect the interest of fishermen.

The feedback on consumer preference as obtained at landing centers shows that there is a much higher rating for commercial carps as compared to catfish and other exotic species.

■ **Feedback, perceptions and suggestions**

■ **Respondent's feedback**

The respondent's feedback on fish **seed stocking** and related issues is one of the major items of relevance in reservoir fishing. The feedback on this item covers the aspects of the agencies involved in stocking, source of fish seed, its cost and the issues related to outsourcing of seed. Going further, it delves on involvement, participation and awareness aspects apart from role clarity and finally culminating in seed quality aspects as well as impact of stocking program on increased fish consumption among the fishermen families.

The feedback has brought out the following specific points:

- In annual fish seed stocking the role of FCS and DOF is on equal footing with both sharing the task of stocking.
- It is seen that at least 50% of the seed is outsourced in most of the cases with the share being much higher in some cases.

- For the question 'were you involved in fish seed stocking program', 58% say 'yes' and 42% say 'no' and specific reasons are not given for non participation. However, those who are involved have commented on need for better seed quality and appropriate species composition.
- On the seed stocking being participatory or otherwise 55% say 'yes' and 45% say 'no'. Further on the awareness about the scheme under which stocking is being done the respondents have no clarity, the reasons being stated as not involved in the process.
- On the expected role play and the responsibilities in seed stocking the respondents have a mixed feedback with substantial number of them expecting DOF to take more responsibility.
- On the aspect related to check on the seed quality more than 80% of the respondents state that they are not trained and thus are unable to participate in the process. Those who have been trained state that the check for quality is in terms of size, activity or mobility.
- As for fish consumption trend 70% of the respondents attribute increased consumption seen to increased production due to seed stocking apart from good size at harvest and better catch (20-30%) in their fishing efforts.

Feedback on participatory management and other related issues shows that nearly 80% of the respondents confirm their participation and those who do not report the reason as 'not involved in the group' and in some cases stating that they are not interested. When it comes to training a large majority state that they have not undergone any training so far which could have really helped them to do better. The awareness about the government programs meant for fishermen is also low among the respondents with only 40% of them answering in affirmative. As for the support received from DOF apart from seed stocking nearly 50% of them say that they have been provided nets and boat in most of the cases. More than 90% report having seen no support forth coming from DOF on marketing of fish. As for infrastructure facilities excepting landing centers the respondents feel there are no other specific facilities like Ice plants or transportation vehicles forth coming to help them.

Regarding the diversifying fishery activities in reservoirs the respondents report that apart from pilot intervention of pen/cage culture there are no other activities like fish seed rearing, fish fattening for which they feel there exists potential.

For support under welfare schemes 86% of the respondents have replied in negative and state that apart from some insurance schemes and community hall and houses to a limited extent not much has come through for welfare of fishermen in any larger measure. The respondent's feedback shows that over the years the number of members involved in fishing has more than doubled which has implications on levels of income and dependability of fisheries income for their livelihood.

With the regular stocking program going on in recent years it is of interest to know from the fishermen if it has lead to progressive increase in fish catch. The survey shows that >60% of them report that a 25 to 50% increase has been witnessed over the period. This increase, as per the feedback is attributed mainly to regular seed stocking and improved management apart from increased fishing effort. On the question whether this has lead to more asset creation among fishers, only 40% of them concur while the majority say 'no'. On increased fish availability and per capita fish consumption nearly 50% of them put the figure at 30 to 40% increase. There is similar feedback in their response on increase in fish consumption in their own families. The fishers feel that these interventions have given them a better sense of economic security (80%). More than 50% of them state that better catch and higher sale price are the contributing factors.

■ **Perceptions and suggestions**

The respondents have ranked the constraints related to resources access, equity in allotment of water bodies, availability of quality fish seed for timely stocking, Inadequate institutional support including marketing and governance- mesh size regulation etc.

As per the feedback on resource access, equity in allotment of water bodies, availability of quality fish seed for the timely stocking are of much greater concern to the reservoir fishermen as evident from their ranking with the other issues coming much later in there prioritization. On the likely causes for the concerns rated as above the following are the ones that assume much importance in the perceptions of fishermen:

1. Seed deficit and dependence on outsourced seed.
2. Poor literacy and socio economics of fishers.
3. Exclusive dependence on the resource for livelihood.
4. Lack of knowledge on resource management.

The others which follow the priority concerns as above include, inadequacy in code of conduct for leasing of water bodies, inequality in benefit accruals to the community and weak PFCS and lack of participatory management. The suggested solutions in the feedback are listed as follows in the order of priority

1. Strengthening seed production in local vicinity.
2. Improvement of landing centers and marketing channels.
3. Improving functioning of PFCS and other local institutions.
4. Positioning better code of conduct for leasing of water bodies.
5. Strengthening institutional arrangement and net work.
6. Effective governance, participatory collective action.

On the question 'who has to attend to bring the above solutions in action' the respondents state that the onus has to be on DOF first who should take the FCS along in the process through a well designed participatory mechanism. This has to be through an approach taken by DOF that consciously involves:

1. Participation and support in development process of Integrated Reservoir Development.
2. Play active role in community participation and overall governance.
3. Involvement in sector related activities and institutional collective action.

The reservoir fishermen have given their **suggestions** on a number of aspects that includes prospects for improvement and changes required as it relates to access right system livelihoods and community participation. On the issue of scope to increase reservoir productivity the following are the points that have emerged:

- With timely and adequate quality seed supply productivity can be greatly enhanced.
- With better quality seed there is larger scope for increased production.
- Productivity can be further enhanced by stocking bigger size fingerlings.
- Quality seed from reliable source is important and it should receive highest priority.
- More stocking of quality seed well in time hold the key for greater success.
- Supply seed of different varieties for better production.
- Increase seed supply and ensure optimum stocking.
- Retain more water for fisheries as it is vital for livelihood of fishermen.
- Government involvement is a must but the processes are to be made more participatory.

Regarding the changes suggested the respondents strongly opine that long term lease is good and there has to be rationalization of resource access with due concern for the livelihood options of fishermen population dependent on resources.

4.1.2.2 Tank resources

In the field survey altogether 341 DP tanks (48%) and 367 GP tanks (52%) totaling to 708 tank resources have been enumerated. The details of tanks covered in the field study across the study districts and highlights are given in **Annexure 4.4**. The highest coverage of tanks is in Medak followed by Mahabubabad with the share of other districts mostly being on par.

■ **Resource utilization:** The data shows that the share of short **seasonal tanks** is highest at 61% followed by long seasonal tanks at 32% and the number of perennial tanks being only 7%. In 65% of the tanks, **water availability** is for <6 months and in about 30% of the cases it is 6 to 9 months. Availability of water for >9 months is limited to the extent of perennial tanks. In nearly 60% of cases, respondents say that they have been carrying on fishing operations in these tanks for **30 to 40 years** or even more. As for the **pre stocking management** practices weed removal is widely practiced followed by screening of spill way, canals, inlet / outlets. The feedback shows that in more than 80% of the cases **traditional fish culture** is practiced with only a limited extent that could be categorised as extensive fish culture.

■ **Fish seed stocking:** In case of seed stocking, catla seems to be the choice species (30%) followed by rohu (27%), mrigal (15%), common carp (13%) and others (14%). In nearly 35% of the cases the stocking density/ha varies from 3000 to 5000 or even higher depending on availability of seed, size, varieties etc. on the perception that higher stocking will result in better fish production which is much in deviance with the recommended standard of 2000 to 2500/ha as applicable to long season tanks. In the field study data as the short seasonal tanks are predominant the actual stocking densities must have been much lower. For better interpretation on this, one need to consider the field reality on size at stocking as well as stocking densities and periodicity in stocking that are in practice. The respondent's feedback shows that nearly in 60% of the cases the stocking size is less than 50 mm. Further in nearly 50% of the cases the reported stocking is twice or even more. The stocking density deviance in the field data is thus to be reckoned giving due allowance to the factors discussed as above.

■ **Production inputs:** Of the 708 tanks studied the low input usage is reported in about 240 tanks which would mean that input based management is there in about 34% of the cases. It is significant to note that in this small segment nearly 60% of the practice relates only to application of lime and manure with the feed as an input being abysmally low.

■ **Operational aspects:** The operational aspects cover management, labour requirement, and level of involvement, crafts and gears, fishing effort and species composition. The respondent's feedback on operational aspects is summarised as follows:

- FCS takes a clear lead (90%) in the management with fishermen groups and individual fishermen's role being limited.
- Profit sharing among members seems to be a popular practice with sporadic incidences of produce sharing in some cases (2%).
- Much of the labour requirement is on watch and ward with the requirement on other maintenance being limited. Of the total labour requirement the share of family labour is substantial (>75%) as compared to hired labour.
- Nearly 90% of the members report to be active fishermen with a small number of them being passive or sporadic fishers. To a small extent there are also non members in the fishers group.
- In nearly 80% of the cases the usage of thermocole theppam is prevalent and as for nets, gill nets are common (50%) followed by drag nets (20%) and cast nets (30%).
- The reported average fishing hours per day is mostly 3 to 5 hours (>70%) with the total no. fishing days per annum being 50 to 100 days depending on tank category. In case of small GP tanks of <5 ha it is even less than 20 days.
- On the aspect related to fish size (in kg) at harvest, in case of commercial carps nearly 60% response relates to the size being <1 kg followed by 40% in the category of 1 to 2 kg.
- On the sale price realised, the majority (nearly 70%) of respondents are in the group of > Rs. 75 per kg.

■ **Landing centres and marketing aspects:** As in the case of reservoirs in tanks also the landing centres/points serve as the nodal points where the fish catch is brought ashore and from where it is disposed off in a number of ways. Depending on the size of the tanks there are landing centres around the water body which is the point of linkage to markets. In the field survey 647 landing centres/points have been covered of which a large number of them are considered small to medium ones based on the fact that the arrival of catches at these points would be much lesser as compared to reservoirs. Regarding the disposal, the feedback shows that nearly 70% of catch is sold 'on site sale' at the landing centres / points followed by local/rural market in the near vicinity (5%) during initial harvesting from January to March in long seasonal and perennial tanks and near total harvest in case of seasonal tanks. The balance relates to off take for retailing/own marketing by the fishermen/ spouse/ women member of the fishers family. Bulk of harvest (60-70%) goes to retail marketing channels and 10-20% to direct wholesale during summer harvest in long seasonal and perennial tanks. The feedback on consumer preference as obtained at landing centres shows that there is a much higher rating for commercial carps as compared to catfish and other exotic species.

■ Feedback, perceptions and suggestions

■ Respondent's feedback

The respondent's feedback on fish **seed stocking** and related issues is one of the major items of relevance in tank fishing. The feedback on this item covers the aspects of the agencies involved in stocking, source of fish seed, its cost and the issues related to outsourcing of seed. Going further, it delves on involvement, participation and awareness aspects apart from role clarity and finally culminating in seed quality aspects as well as impact of stocking program on increased fish consumption among the fishermen families. The summary points on feedback are as follows:

- In annual fish seed stocking the role of FCS and DOF is in terms of 70% and 30% respectively.
- It is seen that at least 60% of the seed is outsourced in most of the cases with the share being much higher in some cases.
- The cost of fish seed is reported as Rs. 500 to 1000 per 1000 fingerlings.
- For the question 'were you involved in fish seed stocking program' 68% say 'yes' and 32% say 'no' and specific reasons are not given for non participation. However, those who are involved have commented on need for better seed quality and appropriate species composition.
- On the seed stocking being participatory or otherwise 72% say 'yes' and 28% say 'no'. Further on the awareness about the scheme under which stocking is being done most of the respondents have no clarity, the reasons being stated as not involved in the process.
- Regarding the awareness on the process adopted/ in practice for seed procurement, supply and stocking 50% say 'yes' especially with regard to direct purchase from seed supplier and tender process/quality check on set guidelines.
- On the expected role play and the responsibilities of members in seed stocking, the respondents have a mixed feedback with substantial number of them expecting DOF to take more responsibility.
- On the aspect related to check on the seed quality nearly 50% of the respondents state that they are not trained and thus are unable to participate in the process. Those who have been trained state that the check for quality is in terms of size and activity or mobility.
- As for increase in fish availability due to stocking, respondents agree on the point of more fish being available locally.

Feedback on participatory management and other related issues shows that nearly 50% of the respondents confirm their participation and those who do not report the reason as not involved in the group and in some cases stating that they are not interested.

When it comes to training, a large majority state that they have not undergone any training so far which could have really helped them to do better. The awareness about the government programs meant for fishermen is also low among the respondents with only 35% of them answering in affirmative.

As for the support received from DOF apart from seed stocking nearly 50% of them say that they have been provided nets and boat in most of the cases. More than 85% report having seen no support forth coming from DOF on marketing of fish. As for infrastructure facilities excepting landing centres the respondents feel there are no other specific facilities like Ice plants or transportation vehicles forth coming to help them.

Regarding the diversifying fishery activities in tanks, the respondents report that activities like fish seed rearing for which they feel there exists potential.

For support under welfare schemes most of the respondents have replied in negative and state that apart from some insurance schemes and community hall and houses to a limited extent not much has come through for welfare of fishermen in any larger measure.

The respondent's feedback shows that over the years the number of members involved in fishing has increased by about 25% which has implications on levels of income and dependability of fisheries income for their livelihood.

With the regular stocking program going on in recent years it is of interest to know from the fishermen if it has lead to progressive increase in fish catch. The survey shows that >70% of them report that a 25 to 50% increase has been witnessed over the period. This increase, as per the feedback is attributed to mainly to regular seed stocking and improved management apart from increased fishing effort. On the question whether this has lead to more asset creation among fishers >60% of them concur while the balance say 'no'. On increased fish availability and per capita fish consumption nearly 60% of them put the figure at 20 to 40% increase. There is similar feedback in their response on increase in fish consumption in their own families. The fishers feel that these interventions have given them a better sense of economic security (75%). More than 50% of them state that better catch and higher sale price are the contributing factors.

■ Respondent's perceptions

The respondents have ranked the constraints related to resources access, equity in allotment of water bodies, availability of quality fish seed for timely stocking, inadequate institutional support including marketing and governance- mesh size regulation etc.

As per the feedback availability of quality fish seed for the timely stocking, equity in allotment of water bodies and resource access, are of much greater concern to the tank fishermen as evident from their ranking with the other issues coming much later in their prioritization. On the likely causes for the concerns rated as above the following are the ones that assume much importance in the perceptions of fishermen:

1. Seed deficit and dependence on outsourced seed.
2. Inadequacy in code of conduct for leasing of water bodies.
3. Exclusive dependence on the resource for livelihood.
4. Lack of knowledge on resource management.
5. Poor literacy and socio economics of fishers.
6. Weak PFCS and lack of participatory management.

The suggested solutions in the feedback are listed as follows in the order of priority

1. Positioning code of conduct for leasing of water bodies.
2. Secured access over water bodies by the fisher communities for longer period.
3. Improvement of marketing channels.
4. Improving functioning of PFCS and other local institutions.
5. Strengthening seed production in local vicinity.
6. Promotion of participatory collective action.
7. Strengthening institutional net works.

On the question of who has to attend to bring the above solutions in action, the respondents state that the onus has to be on DOF first who should take the FCS along in the process through a well designed participatory mechanism. A good number of them desire Fisheries Federation and DFCS to involve closely in fish marketing in a way that can help FCS in general and fishermen in particular. This has to be through an approach taken by DOF that consciously involves:

1. Play active role in community participation and overall governance.
2. Participation and support in development process of Integrated Tank Development.
3. Involvement in sector related activities and institutional collective action.

■ Expectation mapping

The fishermen as the main stakeholders in tank fisheries have well set expectations from line departments and developmental agencies. Their feedback on each agency's role in the order of priority has been presented in the following expectation mapping

■ DOF	■ Federation	■ PFCS
Timely supply of quality seed	Post harvest handling facilities	Preference for member in resource access
Providing suitable boats	Transportation facilities	Profitable management of resources
Providing good quality nets	Good market access and remunerative prices	Facilitate Conflict resolution and participatory decision making
Training & Capacity building	IGA for women members	
Exposure visits	Arrange diagnostic & technical support	
New development schemes related to seed rearing & other fisheries related activities.		

■ R & E Institutions	■ Seed suppliers	■ Input dealers
Providing need based trainings, technology consultations	Ensuring seed quality- varieties, size, health	Quality Accessories
Services, extension related activities- participatory demos, field visits, interactions, discussion meetings etc.	Timely and planned supply	Quality Net / Gears
Lab facilities for diagnosis	Required quantity as per stocking needs	Quality Craft

■ Financial institutions:	■ Insurance companies	■ Community welfare Depts.:
Loan for purchase of nets, production related inputs, accessories; credit support to pursue fisheries related new business activities-seed rearing, cage/pen culture, net making/ fabrication, processing and value addition, new investments on fish marketing etc...	Coverage of fishery risk and disasters	Cluster Housing Water and sanitation
Loans for consumption & family needs	Coverage of personal / family risks	Children education
		Community hall and amenities

■ Suggestions from Respondents

The suggestions from the respondents relate to a number of issues related to tank fisheries and their prioritized list along with a pie chart is given here:

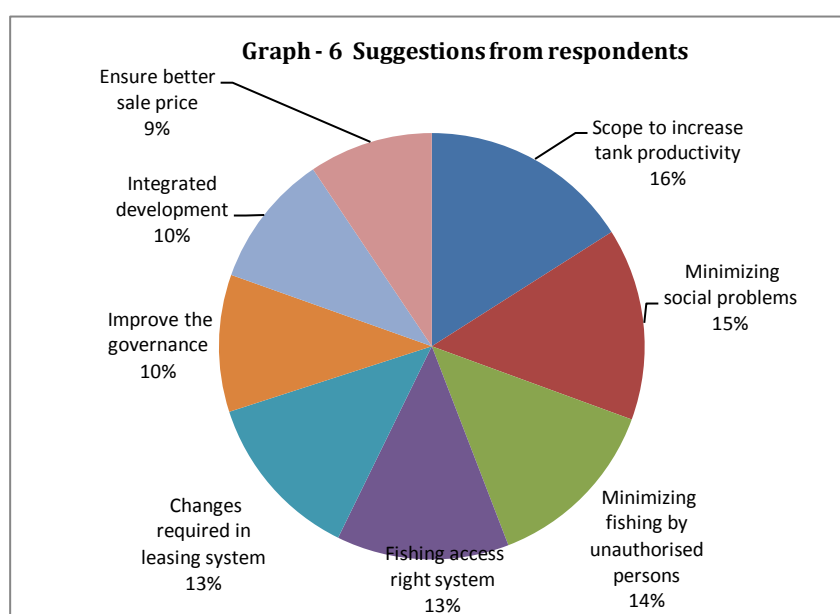


Table -21 Respondents priorities on issues related to tanks

	Prioritized issues	Responses	
		No.	%
➤	Scope to increase tank productivity	712	16%
➤	Minimizing social problems	650	15%
➤	Minimizing fishing by unauthorised persons	604	14%
➤	Fishing access right system	583	13%
➤	Changes required in leasing system	569	13%
➤	Improve the governance	464	10%
➤	Integrated development	452	10%
➤	Ensure better sale price	419	9%
		4453	

The Suggestions that have emerged in the field study on the prioritized list as above are summarized in the following table:

	Prioritized issues	Suggestions
1	Scope to increase tank productivity	Promote limited use of manure and feed – wherever there is no objection by the public. Ensure proper stocking size (80-100 mm) and also use stunted fingerlings and yearlings Maintain minimum water level (3-5 feet)
2	Minimizing social problems	DOF & PFCS should initiate some safety measures like resolving conflicts and influencing through peer groups.
3	Minimizing fishing by unauthorized persons	DOF and society should initiate suitable collective measures like offering membership if eligible, awareness building including legal implications, initiating compromising measures through reduced sale price, preferential sale, goodwill sharing etc., Provide support to strengthen watch and ward/security system
4	Fishing access right system	Rationalize the system through an effective consultative process.
5	Changes required in leasing system	Long term leasing is good - at least for minimum of 10 years There are problems in the existing leasing system more so in disposal of GP tanks which needs to be deliberated and addressed.
6	Improve the governance	FCS should hold regular consultation with community DOF and GP along with FCS should deliberate on this to ensure active participation of members in all developmental processes.
7	Integrated development	Creating awareness on resource tagging (GP tanks with long seasonal and perennial tanks in support of fish seed rearing, fish seed holding, fish fattening etc.), multiple use of water, farming waste recycling as input for manure application, feed etc. about use and value addition for by-catch. Promote utilization of identified ornamental fish species. Resource integration – use of seasonal tanks for seed rearing. Fish culture/fattening in encircled areas (Pens/coves). Institutional Integration / Convergence. Linking the existing schemes/programs and policies for above.
8	Ensure better sale price	DOF should initiate steps for price fixing and explore if market futures could be helpful to get better prices for fishermen/FCS.

4.1.3 Marketing aspects

In the field study, the various aspects of marketing have been covered in detail. The coverage includes 659 local/rural markets, 63 aggregators and 3 wholesale markets. Survey of consumers as an important dimension in marketing and feedback has been obtained from 718 rural consumers and 322 consumers in urban areas.

The details of markets studied, market aggregators, response of rural and urban consumers and highlights of marketing aspects across the study districts are given in **Annexure 4.5**.

4.1.3.1 Local/Rural market (MLR)

The survey aimed at understanding the **business profile** of local/rural markets in terms of whether the operators in the market are fishermen cum sellers, their main **procurement sources**, along with quantities and **species mix**. Further the **transaction** particulars in the market have also been enumerated. It also delves on understanding the sale price, margins, demand and the business period in the markets. The aspects related to **procurement arrangement, infrastructure and fish disposal** have been enquired into. **Business risks and problems, support system and expectations** are the other points on which feedback was envisaged. The findings on business profile of the markets are as follows:

- Majority of the market operators (>90%) are fishermen cum sellers and they are in the business for >10 years.
- The major source of procurement (>70%) is from tanks followed by reservoirs as a source (20%) with balance being from other sources (rivers and canals, neighbouring village resources, also outsource from bigger retail/whole sale markets to maintain continuity in business).
- **Market transactions:** The species wise **average sale price** varies from market to market depending on nearness of resources and local preferences. The broad indicative prices are in the range of catla Rs. 85 to 100/kg, rohu Rs. 100 to 120/kg, mrigal Rs. 150 to 200/kg and murrel Rs. 350 to 400/kg.

The prioritized **species preference** in the market has catla in the first place (32%) followed by rohu (23%), murels (15%), common carp and grass carp put together (12%) with the balance of 18% constituting the other species.

As for the number of days of trading in a year there is variation across rural markets with an overall average of 230 days as depicted in the following table:

Days of market trading	180 days	240 days	270 days	300 days
Response percentage	30%	43%	20%	7%

■ **Procurement arrangements:** The market feedback shows that most of the operators (60%) have continuing/ongoing informal arrangement with contracts/agreement with fishermen or co operatives regarding procurement of fish. The terms of understanding is guaranteed price (60%), guaranteed purchase (30%), the other aspects include financial assistance in the form of advance (7%) and long duration acquaintance and loyalty.

■ **Infrastructure facilities:** The feedback indicates that in >70% of the cases the market operators face infrastructure constraints in procurement, handling and storage etc. For the question on 'how these constraints are handled' the operators say they resort to procurement in smaller quantities, outsourcing the facilities or avail the facilities from wholesalers. Where facilities are stated to be available 70% of them confirm having own transport while about 20% have their own godown/storage facility.

■ **Arrangements for fish disposal:** Generally the operators do not face much problem in disposal (70%) and they say for off take of unsold fish if any they resort to wholesalers or clearance by discount sale. There are also options in the feedback when they say that direct supply to hotels and bulk consumers in the local areas is a possibility in such situations.

The buyers in the local market are mostly local households (60%) followed by urban consumers from nearby places (30%) and aggregators and others constituting the balance (10%).

■ **Business risks and problems:** Lack of infrastructure and non availability of ice are stated as the major problems in the market operations. On the average margin available per kg of fish sold the majority (90%) state that it is Rs. 10 to 25/kg. On whether the business is remunerative enough the majority opinion (80%) is negative for which the stated reasons are:

1. Inability to maintain steady supply.
2. Uncertainty in fish availability.
3. Undercutting of price.
4. Shortage of working capital.
5. Dependence on natural fishery or low profile aquaculture.
6. Competition among fellow businessmen.
7. Inability to comply with statutory regulations.

Support system and expectations: Request for financial support from institutional agencies tops the list of expectations followed by subsidizing cost of infrastructure facilities without which operators face several risks in their business. They also want regulatory measures to be introduced to curb unscrupulous and nefarious activities in the market.

4.1.3.2 Wholesale Market

As a part of the field study, feedback has been obtained from three wholesalers operating in the wholesale markets one each in Karimnagar, Mancherial and Medak districts. These agencies are all partnership firms who are in the fish wholesale business for 15 to 20 years. Their profile shows that two of them operate integrated fish sale along with livestock produce like meat and poultry while one of them is exclusively in fish sales.

■ **Fish procurement:** They procure fish from aggregator, reservoir societies as well as tank FCS, the weekly procurement being 2 to 5 tons. The demand pattern as per wholesalers feedback is sequentially catla, murrels, rohu, common carps and others. The species wise procurement price is summarised in the following table:

*Price range (Rs./kg)	Fish species					
	Catla	Rohu	Mrigal	Murrels	Common carp	Others
80 to 90	✓	✓			✓	
100 to 150	✓✓	✓✓	✓			✓
150 to 200						
200 to 350				✓		✓
>350				✓		✓

*note: includes transportation cost met by the wholesalers.

** note: more no. of ticks (✓) indicate higher incidence of the particular price range reported.

African catfish and pacu are the exotic fish species which do not form the part of regular market arrivals for which the price range is much lower at Rs. 40 to 60 per kg having low consumer preference/acceptability.

Operational aspects: Two of the wholesalers report that they operate in the wholesale market for 270 to 300 days per year while the third one says that it is about 150 to 180 days (private market). All the three wholesalers adopt **fish procurement** methods like traditional contacts, open market buying and advanced paid for procurements from societies, fisher groups and aggregators.

Their **operational expenses** apart from procurement include grading, loading and unloading, transportation and storage, marketing charges (cess paid to the municipal council/GP/commission paid), rent, electricity, water and others charges. The **fixed overheads** such as rent for market premises, salaries and wages and watch & ward, Taxes and other statutory charges are also met as a part of their wholesale business. Their average **daily turnover** is around Rs. 1.00 lakh in two cases and slightly less in the third case.

■ **Consumers' expectations:** Wholesalers opine that in recent years the consumers' expectations are progressively changing in the sense that, the demand for freshness of the produce, quality parameters, smaller size (about 750 gm.) and local varieties are on the increase. It is in this context they state that murrel command best price as it is the most preferred fish in the state. Consumer's expectations on cleanliness of market surroundings and hygienic way of handling have also increased.

With their long experience in the market the wholesalers find that the consumers are gradually moving from cost-based consumption to quality based consumption, the driving factors being awareness that fish is good for health and increase in disposable incomes in towns and cities.

■ **Infrastructure and communication facilities:** The wholesalers are equivocal on mobiles being extensively used in their business to keep in touch with client's retailers, vendors and super markets and vouch for its usefulness in ease of their business. In their perception the outcome of mobile technology in their business can be ranked as shown here:

Table – 22 Ranking by wholesalers on use of mobile technology

Impact/Advantages	Ranking by wholesalers		
	I	II	III
Better/competitive price to fishermen	2	2	3
Reduced the cost of marketing services	3	3	2
Reduction in retail price	5	4	4
Quick payment in sale transactions	1	1	1
Regular supply of fish to the consumer	4	5	5

From the above it is clear that the most important impact has been on quick payment in sale transactions followed by better/competitive price to fishermen and reduced cost of marketing services.

■ **Facilities for fish trading:** The two wholesalers state that they operate in market premises of the local municipal council while the third one runs his business in own premises all of them have the facilities of a storage/godown but no cold storage. They buy the ice from outside for the purpose of safe keeping of fish. Two of them have own vehicle and one relies on rented vehicle. All of them have equipments like weighing scales, boxes/buckets, ice box and wooden boxes required for their business.

■ **Constraints and suggestions:** The following are the summary points on constraints faced by wholesalers and their suggestions for betterment.

- Wholesalers agree that they experience during certain months glut and shortage which adversely affects their business. They feel construction of ice plants and cold storage can help the situation.
- On whether government can provide price support they feel that in a commodity like fish such regulatory mechanisms may not work.
- They want guidelines to be developed for the management of fish markets by the wholesalers/retailers along with construction of modern fish markets to be managed by the operators in a participatory mode. However they are not clear if fish has to be part of regulated market legislation.

4.1.3.3 Market Aggregators

■ **Profile of aggregators:** Majority of the aggregators >40% are in the age group of 40 to 50 years followed by 30 to 40 year age group (30%) with more than >50 years represented by 17% . The involvement of youth (<30 years) is limited to 10%. Education wise, most of them are beyond secondary school and up to matriculate (37%) while about 20% of them are up to primary stage. There is considerable number >40% who are illiterate.

Most of the aggregators surveyed are in the business for >10 years (75%) with the rest having 5 to 10 years of experience. Their main procurement source is tanks (63%) followed by reservoir (21%) and other sources being (16%). The average procurement of aggregators varies from 0.50 to 1.25 tons weekly.

The weightage of species transacted in the market shows that >60% comprises catla, rohu and mrigal put together followed by 24% of common carps and grass carps, 8% by murrel and the balance other species. The species wise procurement price is summarised in the following table:

*Price range (Rs./kg)	Fish species					
	Catla	Rohu	Mrigal	Murrels	Common carp	Others
80 to 90	✓✓✓	✓✓	✓✓✓		✓✓✓✓✓	✓✓✓✓✓
100 to 150	✓✓✓	✓✓✓	✓✓			✓
150 to 200	✓	✓✓		✓		
200 to 350				✓✓✓✓		
>350						

*note: includes transportation cost met by the aggregators.

** Note: more no. of ticks (✓) indicate higher incidence of the particular price range reported.

On the question whether there is increased demand trend for any particular species nearly 90% of aggregators confirm that there is exceptional demand for murrel in all places. African catfish, tilapia and pacu are the exotic fish species which do not form the part of regular market arrivals for which the price range is much lower at Rs. 40 to 50 per kg having low consumer preference/acceptability.

■ **Operational aspects:** As for the number of days of trading in a year there is variation across rural markets with an overall average of 240 days as depicted in the following table:

➤ Days of market trading	180 days	240 days	270 days	300 days
➤ Response percentage	24%	34%	32%	10%

■ **Procurement arrangements:** The market feedback shows that most of the operators (50%) have continuing/ongoing informal arrangement with contracts/agreement with fishermen or co operatives regarding procurement of fish. The terms of understanding is guaranteed price (44%), guaranteed purchase (41%), the other aspects include financial assistance in the form of advance (15%) and long duration acquaintance and loyalty.

■ **Infrastructure facilities:** The feedback indicates that in >60% of the cases the market operators face infrastructure constraints in procurement, handling and storage etc. For the question on 'how these constraints are handled' the operators say they resort to procurement in smaller quantities (60%), outsourcing the facilities or avail the facilities from wholesalers. Where facilities are stated to be available >70% of them confirm having own transport while about 30% have their own godown/storage facility.

■ **Arrangements for fish disposal:** Generally the operators do not face much problem in disposal (70%) and they say for off take of unsold fish if any they resort to clearance by discount sale or wholesalers in addition some of them say that they also resort to credit sales. There are also options in the feedback when they say that direct supply to hotels and bulk consumers in the local areas is a possibility in such situations.

The buyers in the local market are mostly local households (>50%) followed by urban consumers from nearby places (40%) and other aggregators constituting the balance (10%).

■ **Business risks and problems:** Lack of infrastructure and non availability of ice are stated as the major problems in the market operations. On the average margin available per kg of fish sold the majority (80%) state that it is Rs. 10 to 25/kg. On whether the business is remunerative enough the majority opinion (>80%) is negative for which the stated reasons are:

1. Shortage of working capital.
2. Uncertainty in fish availability.
3. Undercutting of price.
4. Competition among fellow businessmen.
5. Inability to maintain steady supply.
6. Dependence on natural fishery or low profile aquaculture.
7. Inability to comply with statutory regulations.

In the problems faced by aggregator's lack of infrastructure is the major item reported with some of them making a specific mention of inadequate storage and non – availability of ice plants in the vicinity.

■ **Support system and expectations:** Request for financial support from institutional agencies tops the list of expectations followed by subsidizing cost of infrastructure facilities without which operators face several risks in their business. They also want regulatory measures to be introduced to curb unscrupulous and nefarious activities in the market.

4.1.4 Consumers Response

Socio demography: The socio demographic characteristics of rural and semi/urban consumers covered in the survey include head of the household, gender, age; marital status and house hold details. Further, it covers education and employment status, occupation, working members apart from household income and family expenditure on food. In case of non vegetarians, the survey elucidates if there is preference for fish over meat in their diet. The findings are as follows:

- More than 90% of respondents both in rural and urban categories report that they are the head of the household and they are the male members of the family.

The comparative age profile of the respondents is as follows:

Age category (yrs)	20 - 30	30 - 40	40 - 50	>50	Total
Rural	13%	57%	25%	5%	100%
Urban	17%	48%	25%	10%	100%

- Nearly 90% of the respondents in both the categories are married

The comparative education profile of both the categories is as follows:

Education level	Illiterate	Primary and secondary	Practical Education	Bachelor's degree	Master's degree	Others	Total
Rural	36%	42%	2%	14%	2%	3%	100%
Urban	31%	35%	6%	20%	4%	5%	100%

From the above it is seen that in the consumer's profile there is a difference in terms of higher illiteracy in rural areas and better educational level in all categories (except primary and secondary level) in urban areas which is likely to be relevant in understanding the consumer behavior and preferences as it relates to fish markets.

The comparative employment status in the two categories is shown here:

Employment status	Un employed	Employed	Self -employed	Retired	Others	Total
Rural	43%	13%	40%	0%	5%	100%
Urban	22%	16%	52%	8%	2%	100%

The higher employment level including its converse 'lower unemployed' and more self employed and retired population brings in its distinctive features to urban markets and gets reflected in the behavior and preferences of urban consumers.

- In terms of the occupation while among rural consumers more than 60% state their occupation as agriculture while among urban consumers salaried group and business as an avocation is predominant (>75%).
- In the number of working members per family it is one in urban area and slightly higher in rural area (1.12). As for the monthly house hold income >90% are in less than Rs.50000 category in rural areas where as substantial number of them (20%) are in >Rs.50000 category.
- The monthly expenditure on food is in the range of Rs.3000 to 5000 per family with the data for rural and urban consumers tending towards either ends of the range respectively with 5-10% of it being for non vegetarian items that include fish.

■ **Consumption pattern:** The consumption pattern in terms of species preference and frequency of consumption has been enumerated in the field study. It is seen that both in urban and rural consumers the group wise preference and consumption frequency is as follows:

Fish groups	Consumer preference percentage
Catla, Rohu, Mrigal	74%
Common carp, Grass carp, silver carp	22%
Others	4%

Table –23 Fish consumption frequency

Consumption frequency	Group I species		Group II species		Group III species	
	Rural	Urban	Rural	Urban	Rural	Urban
Daily	<20%	-	<10%	-	<5%	-
2-3 times a week	>25%	-	>15%	-	>10%	-
Once a week	>30%	20%	>20%	10%	>20%	5%
Once a month	>50%	>25%	>40%	>10%	20%	<10%
Once in several months	-	>50%	-	>30%	-	>20%

The changing trends in consumption pattern given in the following table gives a comparison of a situation 5 yrs before with the present status:

	Consumption in Kg											
	5 years ago						now					
	< 10	20	30	40	>40	Total	< 10	20	30	40	>40	Total
Rural	0%	86%	9%	4%		100%	0%	26%	49%	2%	23%	100%
Urban	45%	37%	18%	0%	0%	100%	35%	17%	29%	12%	8%	100%

From the table it is seen that over the period the consumption among rural consumers has increased 4 times and the enhancement in the highest consumption bracket (>40 kg) has been 23%. Similarly in urban consumers the increase is > 2 times and addition in the higher consumption category as above is 8%.

■ **Consumers' perceptions:** The points covered include the perceptions / beliefs on nutritional importance of fish, how consumers prefer to source the fish, trends in consumption, reasons for increase / decrease, barriers for fish consumption, expectations from market players / DOF/ institutions and suggestions. The summary points are as follows:

The rating by rural and urban consumers on their preference for fish based on their conviction is given in the following table:

Table –24 Fish consumption preferences

Strongly agree	Rural	Urban
■ Fish is nutritious	25%	34%
■ Fish is healthy	26%	31%
■ Fish is tasty	25%	21%
■ Fish available at lower price	9%	8%
■ Other reasons	15%	6%
Total	100%	100%

It can be seen that the weightage given by urban consumers is more on nutrition and health aspects where as the other factors are also figuring among the rural consumers. The other reasons relate to awareness of specific health benefits expected from enlightened consumers both in rural and urban areas.

Regarding the source of purchase local market is prominent (>70% and >60%) for rural and urban consumers followed by wholesale market at 25% and 32% respectively. More than 70% of the respondents in both the categories opine that fish consumption has increased from 25 to 50% in the last 5 yrs. The reasons include improved income and higher propensity for consumption along with the awareness of fish being good for children in the formative years.

Among the urban consumers higher prices, problem of smell and non availability of fresh fish are quoted as important barriers for consumption of fish. A good number of them also state the problem of preparation of cooking as an important reason.

Their suggestions include the need for good infrastructure, better storage and hygienic markets. They want good species choice and availability throughout the year apart from a mechanism of consumer friendly pricing system and efforts to promote fish consumption on a larger scale.

4.1.4 Institutional feedback

The field survey covers 256 Gram panchayats, 66 FCS, 18 WMMGs and 3 NGOs across the nine study districts.

4.1.4.1 Gram panchayats (GPs)

The various aspects of GPs covered in the survey are **water bodies, access rights** and **suggestions** from them. The category of water bodies in the GPs studied indicates that 44% are short seasonal, 39% are long seasonal, and 17% are perennial. Of the total water bodies in the GPs 52% are allotted to FCS and the balance 48% involves use by individual fishermen. By and large the lease renewal procedure is as per normal procedure followed by government in allotment of water tanks. For the question whether all water bodies are being used for fish culture, about 95% responded 'yes' and the balance being 'No'. The reasons for yes/no in the order of priority in each category are as follows:

Sl.no	Yes - reasons	No - reasons
1	Mostly for Fisheries	Disputed water body
2	Mainly for Irrigation	weed infested
3	Composite use practiced	Poor water holding capacity
4	Livestock drinking and other uses	Silted water bodies
5	-	Not accessible

Regarding allotment of tanks to third parties on expiry of lease >80% of them say 'no', the reasons being that priority is given to local FCS or local fishermen. The reasons given under response category 'yes' for the above question mainly relate to local factors and other issues. Awarding the lease by open auction system is not prevalent in most GPs. However, to the question whether existing procedure of leasing ensures equity among fishermen in resource access, >80% of them say 'it does'. Going further, a majority of them (80%) state that neither there is need for any change in the present system nor any amendments. The suggestions by GPs are:

- Stocking of big fingerlings and on the right time.
- Marketing support.
- Providing training and technical support.

4.1.4.2 FCS

In the study districts, the survey has covered 66 FCS with a total membership of 7606 with an average membership of 115. The details of FCS studies and highlights of institutional feedback are given in **Annexure 4.6**. In the societies covered about 57 are PFCS (86%) and 9 are DFCS. In nearly 60% of the cases feedback has been obtained from managing committee members while the balance relates to responses obtained from President (20%) and Secretary (20%) of the societies. It is seen that nearly 50% of the respondents said above are in office for 2-5 yrs while a good number of them (>20%) have reported to be holding the post for >5 yrs and even up to 10 yrs indicating that the democratic processes in the societies have not been effective.

■ **FCS governance:** Going by their registration most of these are older societies with nearly 60% of them in the range of 20-50 yrs since registration. They have been mostly registered under cooperative societies act with some of them being under the category of mutually aided societies. A comparison of the number of members at registration and as of now shows that there is a nearly 60% increase over the period with per society average on the whole increasing from 72 to 115 members.

As for the departments / authorities facilitating the societies sequentially in the order of importance, the respondents list the same as Fisheries Dept, Cooperative Dept, Grampanchayat and Federation. The listed facilitations include seed stocking, auditing, leasing and so on with nothing specifically mentioned for Federation's role in any facilitation.

■ **Membership issues:** on the conditions stipulated to become a member, the feedback shows that fishing profession (42%), fisher by birth (39%) are the most important criteria. As for termination of membership not involved in fishing (36%), violating society norms (18%), non payment of society dues (14%) are enlisted with the balance being case to case miscellaneous reasons. To the question on succession rights in membership, the majority say that it is the legal heir of the member. Measures taken to increase the membership is mostly through awareness programs (50%) and membership campaigns conducted in the villages with substantial fisher population (30%).

About 50% of the members opine that there has been increase in membership and the majority says that the increase is in the range of 25 to 50%. The reasons stated for not witnessing substantial membership increase include all fishermen households having been already included or some of the uncovered ones not evincing interest in taking the membership.

■ **FCS performance:** The FCS is involved in managing of different water bodies and the feedback shows that 40% of the resources managed by them relate to DP tanks with about 37% relating to GP tanks. In the feedback, societies involved in reservoir resources are only 16%. It is interesting to note that the other water bodies are very limited being only to the extent of <10%. The indicative data on performance of societies for the year 2016-17 is shown in the following table

Table –25 Performance of Societies in terms of fish catch and value

	KMR	KRN	MAN	MDK	RGR	WPY	BDR	MBD	YDR	Total
Qty (tons)	5	8	8	8	0	95	13	8	40	185
Value (Rs.in lakhs)	4.9	8.0	5.8	6.2	0	90	12.6	4.5	52.8	184.8
Price (Rs.per kg)	97.11	100	72.5	76.90		94.74	96.92	56.25	131.88	100

On the question whether FCS earned money from their operations in the preceding 3 yrs >70% of the response is 'yes'. When asked how is the surplus appropriated, the feedback is that it is by way of distribution among members (50%) followed by building assets/ taking more water bodies on lease. There are some cases wherein they say that it is ploughed back into FCS operations including creating a reserve fund.

Adherence to procedures to be followed is yet another dimension in the performance of FCS. On this aspect 70% of the response is affirmative. Following are the procedures listed under non adherence:

- Convening meetings and recording minutes (>50%)
- Holding elections as per schedule and submission of periodical reports (20%)
- Audit and other statutory compliances (25%)

■ **Resource linkage and activities:** The resources operated by the FCS are either govt. owned reservoirs, DP tanks or GP tanks leased from panchayats. In the following feedback that relates to mainly tanks, perennial long seasonal and short seasonal aspects are covered both for govt owned and leased resources.

Table –26 Resource linkage and activities

All districts	Government owned				Leased from Panchayat				Over all			
	Tank/ponds (Nos.)				Tank/ponds (Nos.)							
	PS	LS	SS	Total	PS	LS	SS	Total	PS	LS	SS	Total
Total	45	46	72	163	0	36	139	175	45	82	211	338
Percentage	28%	28%	44%	100%	0%	21%	79%	100%	13%	24%	62%	100%
Avg. no. of tanks/FCS	0.68	0.70	1.09	2.47	0.00	0.55	2.11	2.65	0.68	1.24	3.20	5.12
Avg. TWSA	82.02	50.47	45.45		16.11		9.04					
Avg. FCS per capita	55.92	35.17	49.58	140.68	8.79		19.03	27.82				168.50

On the main activities of FCS and whether they are involved in retail trade of fish, the feedback shows the main activities are providing / facilitating issue of fishing licenses to intending fishermen, stocking and harvesting of water bodies. Their involvement in other activities that relate to input supply, providing crafts and gears, facilitation for trainings are all on a limited scale. As for their involvement in the retailing of fish, it is reported only in about 10% of the cases.

Operational aspects and management: Feedback has been obtained on the roles / responsibilities, modalities and financing options as practiced in FCS. The feedback on the options in each of the issues under the above aspects is as follows:

Issues	Feedback (%)
Responsibility for planning and stocking of fish seeds	
➤ President	66
➤ Secretary	33
➤ others	1
Procurement of fish seeds	
➤ Hatcheries	10
➤ Rearing units	33
➤ fisheries dept	57
Finance for procurement	
➤ Own funds	61
➤ Traders	7
➤ Dept	31
➤ From banks	1
➤ From Federation	-
Source for repayment of the loans	
➤ Sales earnings	30
➤ contracting with buyers and traders	14
➤ others	3
➤ Not applicable	53

From the above it is clear that the office bearers of FCS take a key role in aspects related to stocking of fish seed, the procurement responsibility mainly being the DOF. The finance source in FCS is mostly own funds, followed by departmental support and funding by traders. It is notable that institutional finance is almost nonexistent. Further, the federation is also not involved in financial support which is contrary to its expected role. Repayment is mostly from sales earnings and contracting. Lack of institutional finance is further evidenced here when the majority response on source of repayment shown as 'not applicable'.

■ **Harvesting, revenue sharing and marketing:** Monitoring of stocked fish and prevention of poaching is an issue that concerns the societies and the feedback shows that whenever such problems occur it is often discussed in the member groups of FCS and suitable action is initiated in consensus with the management committee members. For harvesting the FCS members joining together for completion of the task is widely prevalent.

In the last 3 to 5 yrs, it is reported that at least for 2-3 yrs the desired water level did not exist in the water bodies and this as per the feedback adversely affected the fish yield. In fact it is stated by >40% of the respondents that there was acute shortage of water for 2-3 yrs which impacted their livelihoods. As for revenue sharing practices equal distribution of pooled income is the most popular practice among FCS members.

Whenever there are conflicts that need to be resolved, the members adopt mutual discussion approach for finding a solution while soliciting intervention from DOF and line departments as and when required. In the listed collective and promotional activities, the FCS members feel that they are to be carried out by the DOF and other departments and they are not presently involved in any significant way for

- Weed monitoring and control.
- Water quality and pollution control.
- Maintenance of sluice gate and flood management.
- Maintenance of minimum water level.
- Skill development of members/fishing / harvesting practices.
- Developing alternative employment through skill development/ value addition.

■ **Member relations and FCS net working:** The feedback shows that the relation of majority of members with the office bearers is mostly cordial while in limited number of cases it is reported as excellent. Regarding support from govt that relates to number of aspects, FCS members list the items as good, satisfactory and unsatisfactory in the following sequence:

Good	Satisfactory	Unsatisfactory
Subsidized seed supply	Subsidized feed supply	Technical assistance
Grant under different schemes	Training of members and office bearers	Exposure visits of farmers/office bearers
Insurance coverage	Concessions / facilities in regulated markets	Market / transport subsidy
Share capital		Subsidized transport vehicles

Inter FCS contacts and communications are there in some of the societies where they report finding a common ground on issues like seeking solutions to common problems, supply of seed and other inputs and sale and transportation of fish. Similarly net working to a limited extent is reported with WFCS, SHGs and SC/ST FCS. As for the contact with other line departments it is mostly with cooperative department, agriculture and irrigation departments.

In the view of FCS members the following are the requirements that figure conspicuously in their short and long term plans:

Short term plans	Long term plans
<ul style="list-style-type: none"> ▪ Good seed and feed ▪ Nets and boats ▪ Ice plant 	<ul style="list-style-type: none"> ▪ Cold storage ▪ Market yard ▪ Community hall

When asked about the activities that they would like to take up on priority for betterment of their income the feedback shows that pen culture and cage farming figure prominently followed by seed rearing and aqua culture.

SWOT analysis of FCS:

The perception of respondents on the SWOT of FCS as evident from the field survey is as follows:

Strengths	Weaknesses
Potential for collective action through well organized efforts	Predominance of illiteracy among fishers
Scope for good work allocation and effective work sharing	Lack of awareness of govt scheme / programs
Involvement of fishermen families and networking	Limited outreach of technology & knowledge dissemination
Scope for women fishers involvement	
Opportunities	Threats
Scope for promoting seed rearing	Pollution in water bodies
Scope for promoting aquaculture	Problems of encroachment
Scope for dry fish production and marketing	Adverse effects of climate change and drought
Scope for value addition	

■ **Suggestions:** Collective action among members to be promoted. For Federation, the suggested course of action is to develop an integrated approach in bringing FCS together in effective resource utilisation, better post harvest handling, transportation, storage and marketing net work. They want government focus to be on timely, qualitative and adequate seed stocking taking into account field realities and nature of water bodies.

Desirably the stocking should be based on effective water spread area of water bodies. Need to promote input based fishery and aquaculture are the other suggestions from FCS respondents.

4.1.4.3 Women Matsya Mitra Groups (WMMG)

Eighteen WMMGs have been covered in the survey obtaining feedback from group representatives. Some of these groups are older while there are recently formed groups as well:

	Year of formation of the group		
	1990-1995	2004-2010	After 2010
No. of WMMGs	5	10	3
Percentage (%)	27	56	17

The membership in these groups at start was 675 (38 per group) which has now increased to 869 (48 per group) showing an increase of 30% in membership.

Activities and track record: The activities that are being carried out include dry fish production and marketing, door to door vending and value addition like fish cleaning etc. The WMMGs being basically SHGs, their main role stated in the feedback relates to helping members in obtaining loans. They are also involved in arranging exposure visits and to some extent in market intermediation. Some groups have involved themselves in arranging fishing equipment.

As for specific **activities** nearly 70% of them are into retailing of fish. For the question whether they meet and interact with govt./ private agencies in connection with fisheries activity, majority of them (>80%) indicate that there is no such direct interaction. However, about 60% of them confirm that they are getting some kind of support from the government in activities related to fish retailing.

The groups report an overall **annual turnover** of about 30.8 tons which would mean per group average of 1.7 tons. In value terms this amounts to Rs. 47.35 lakhs translating to about Rs.2.63 lakhs per group. As for the source of procurement of the fish, it is mainly from tank fishermen (50%) followed by reservoirs (30%), the balance being from others like aggregators.

The **procurement price** per kg varies with the type of fish, with catla, rohu, mrigal ranging from Rs.80 to 150/kg, the procurement price for murrel being higher ranging from Rs. 250 to 450/kg. The cost of prawn is also generally higher at about Rs.170- 200/kg. The procurement cost of dry fish is reported at Rs. 280 to 350/kg. The data shows that they incur additional cost on transportation to the extent of Rs.5-10/kg with the same being much higher @ Rs.20-30/kg in some cases.

On the number of **days of trading** in a year, 50% of them state that it is about 300 days while the rest indicate a range of 180-270 days. Nearly 60% of them operate in the market run by local municipal council while the others operate from the GP run market facilities. Regarding procurement arrangement by and large it is the open market purchase that is practiced by the groups.

Group performance: In nearly 70% of the cases the respondents say that they share the profits among the group members depending on their contribution. On bank linkage only about 50% of the groups confirm having a bank account through which they route all the transactions. Most of them have their account in DCC banks or Grameena banks. As for bank loans and revolving funds, it is seen to a limited extent only in one district (Medak).

Members are willing to take training in fishery related activities (86%). This is being stated in the context of much needed IGAs, >60% state that no such group activity has been taken up. In about 30% of the cases they confirm having been trained in an Income Generating Program (IGP).

Meeting once a month is widely prevalent among the groups and they hold attendance sacrosanct. In proof of this up to 75% attendance have been adhered to in nearly 80% of the cases.

Perceptions and feedback: WMMGs report that there have been changes in consumer preference in recent years with increased demand for freshness, cleanliness and hygienic conditions. They opine that there has been increased awareness on fish consumption and increased income has contributed for insistence on quality. Going further, they report there is increased demand for specific varieties like murrel and other location specific fish species.

On the issue of shortage or glut in the market, the opinion is divided among the WMMGs. However, it is the shortage of fish on which they are emphatic rather than the problem of glut in the market. More than 80% of them are unhappy when they say that the desired support from government is not adequate. About 70% of the respondents are suggestive of some kind of a regulation of fish trade without any specifics on the issue.

Suggestions from WMMGs: In 90% of the cases surveyed the groups are vehement that fish markets are to be improved keeping in view the requirements of producers, market intermediaries as well as consumers based on the changing trends. They want trainings which can help them to commercialize their ventures and require hand holding in IGPs to be taken up on a larger scale. They want to increase their involvement so as to better their income from retailing apart from fish cleaning, dressing and value addition activities.

4.1.4.4 Feedback from other institutions

An NGO in Medak, a KVK in Mehabubabad and activities under ATMA in Yadadri have been covered in the field survey and the feedback has been obtained from the Director of NGO, Subject Matter Specialist representing the KVK and Block Technology Manager in case of ATMA program.

The NGO is involved in tank fisheries since 1980 and they are actively involved in FCS membership. The KVK since 2009 is organizing general awareness programs and also involved in distribution of fish seed under Integrated Telangana Development Scheme. They are also conducting training programs for fish farmers. Under the ATMA Programs the promotional activities carried out include poly culture with prawn, popularizing Best Management practices (BMPs) in fisheries and value addition in fishery products. The activity matrix of these 3 institutions is as follows:

Activities	NGO	KVK	ATMA
Supply of seed/ feed/ other inputs	✓	✓	✓
Arranging for fishing equipment	✓	-	-
Training of fishermen in different skills	✓	✓	✓
Organizing exposure visits to fishermen/women	✓	✓	✓
Collection, transport and marketing intermediation	✓	-	-
Arranging finance for fishermen/women	✓	-	-
Other support services for promotion of fisheries	-	✓	-

■ **Fishery focus:** While the NGO does not have a qualified fishery person, both the KVK and ATMA have experts in the line. There have been demonstrations including method demonstration, awareness trainings and promotion of ice packing of fish by both KVK and ATMA initiatives. It is reported that in the last 3 yrs, 500- 1000 fishermen have been benefited through these initiatives.

These institutions report that they regularly interact with DOF Officers, FCS representatives and fishermen. The KVK reportedly has been interacting with fish wholesalers and retailers and transport operators in the context of providing market linkage.

GPS linked primary data summaries for Resources, markets and institutions are given under **Annexure 4.7**

- Matsya Mitra programs for tank fisheries.
- Promoting Good Management practices (GMPs) in fish culture.
- Disease management in fish culture.
- Value addition in fish and fish products including by product utilisation.
- Sending timely messages through SMS on fish culture and topics of interest to fishers.

4.2 Focused Group Discussions (FGDs) & Case Studies (CS)

The fisheries sector baseline study aims at understanding various dimensions of fisheries and related economic activities and roles of number of stakeholders i.e. fishermen and their groups/associations/societies, women groups, individuals and groups of intermediaries in the supply chain and the institutions directly and indirectly connected with fisheries sector growth. This source of information also helps support the inputs contained in secondary data accessed from different sources.

Participatory approach to growth of any economic sector has assumed prime importance in the process of planning since it involves understanding the ground realities/ community experiences and expectations. The major techniques / tools being used in recent decades are i) Focused Group Discussions with stakeholders, ii) case study methods and iii) stakeholders analysis. These tools have come to be reliable source of factual information/ data and serve very useful purpose in process of planning.

The Experts team itinerary thus included conducting Focused Group Discussions with the stake holders in the selected districts and case studies. These related to activities/individuals/ institutions, agencies and groups pursuing wide ranging activities such as seed rearing, fishing, aquaculture, fish aggregation, intermediation, extension and training etc.

4.2.1 Focused group discussions (FGDs)

Focused Group Discussions were held in all the study districts with fishermen, FCS members, and other stake holders on resource use and management (in each of the reservoirs, Govt. and Panchayat tanks visited by the core team) seed rearing, stocking, fish marketing, training and extension. Details on focused group discussions for reservoirs and tank resources is given in **Annexure 4.8**

Reservoir resources: As many as 13 FGDs were held in respect of reservoirs. The district wise coverage of 12 reservoirs is given in the following table:

Table -27 FGDs related to reservoir resources

Name of Reservoir	Date	Category			Access sys.		Stratum I			Stratum II			Stratum III		
		S	M	L	LIC	LES	A1	A2	A3	B4	B5	B6	B7	B8	B9
FGD 1- KMR –RSV 1 Nijamsagar Dam	10.08.17 & 25.09.17			✓	✓		✓								
FGD 2– KMR– RSV 2 UMD Reservoir	16.06.17			✓	✓		✓								
FGD 3 – KRN – RSV 3 LMD Reservoir	19.06.17 & 19.07.17			✓	✓			✓							
FGD 4 – KRN – RSV 4 LMD Reservoir – Fishers	10.08.17 6.09.17 & 12.10.17			✓	✓			✓							
FGD 5 – MAN – RSV 5 Mulkula Ralivagu Reservoir	20.06.17 & 14.10.17	✓				✓			✓						
FGD 6 – MDK – RSV 6 Haladi project	9.08.17	✓			✓					✓					
FGD 7 – MDK – RSV 7 Pocaharam Reservoir	15.06.17		✓		✓					✓					
FGD 8 - RGR - RSV 8 Indiramma Sagar reservoir	17.07.17 & 11.10.17	✓				✓					✓				

Name of Reservoir	Date	Category			Access sys.		Stratum I			Stratum II			Stratum III		
		S	M	L	LIC	LES	A1	A2	A3	B4	B5	B6	B7	B8	B9
FGD 9 – WPY – RSV 9 Ukachettuvagu Ramanpad balancing Reservoir	08.08.17	✓				✓						✓			
FGD 10 – WPY – RSV 10 Sri Rangasamudram Reservoir	07.08.17	✓				✓						✓			
FGD 11 – WPY – RSV 11 Gopal Dinne Balancing Reservoir	08.08.17	✓				✓						✓			
FGD 12 – WPY – RSV 12 Saralasagar Balancing Reservoir	08.08.17		✓			✓						✓			
FGD 13 – WPY – RSV 13 Yenkunta Balancing Reservoir	09.08.17	✓				✓						✓			
Total		7	2	4	6	7	2	2	1	2	1	5			
		13			13		13								

The FGDs include large, medium and small categories along with some of the reservoirs being designated as balancing reservoirs. The resource description includes the river across which the dam is constructed its TWSA at FRL and aspects related to static factors viz., annual rainfall deficit, multiplicity of water use in terms of irrigation, power etc. and dynamic factors viz., catchment activities, weed infestation, siltation, encroachment, pollution etc. Number of villages and dependency of fishermen families for livelihood are also mentioned.

In the **activity focus**, the prevailing system of resource access is it leasing system or licensing system is indicated. In the reservoirs covered under FGDs there are five cases of licensing while the balance seven is the leasing system.

Under the head '**practices and processes**', number of members are the fishermen who carryout fishing on a regular basis and is indicated along with number of days of fishing carried out. The type of craft and gears used, seasonality's, catch particulars are the other details.

In the **techno-economics** part of the FGD, details on fish catch, fish growth, productivity, production, fishing effort, prices obtained and the earnings/income have been discussed. The catch composition, species diversity and the emphasis on fish and prawn production in different locations have been covered. The support systems in terms of **departmental schemes** which have benefitted the FCS in terms of various interventions have also been discussed in the FGDs.

In each FGD, a number of **observations** relate to resource, resource constraints, resource access, fishing activity, intensification efforts, interventions, pilot projects and so on apart from issues related to landing centers, aggregators, middlemen and marketing aspects are mentioned. The **feedback** from the primary stakeholders on all these aspects along with problems/conflicts faced by them and the insights into prospects has been duly captured. The outcome of the interface and the suggestions that emerged from the FGDs has been summed up for drawing inferences.

The FGDs highlight some important issues that relate to **stocking practices** and in a number of situations multiple / overstocking is reported. Involvement of merchants in stocking operations more particularly in freshwater prawn is a notable feature. Agreements entered with merchants for **sale / marketing** in some cases and direct marketing of fish are the other aspects noted in the discussions. **Cage culture** trials, Pangasius farming have provided some leads for intensification efforts made by the DOF. There are also instances of **seed**

4.2.1.2 Feedback summary on Tank resources

Table-28 FGDs related to tank resources (DPTs)

Table – 29 FGDs related to tank resources (GPTs)

Note : SS-Short season; LS – long season; PS- Perennial season; LIS – Licensing system; LES – Lease system

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aquaculture (3), aggregators (2), markets (4), institutions (4) and infrastructure (1). Among CSDs 21 are from the eight study districts and 7 CSDs are from other districts. Details on case studies are given in **Annexure – 4.9**.

4.3 Stakeholders' Analysis

An economic activity involves multiplicity of stakeholder's i.e. individuals, groups, Associations, Administrators, Planners, Intermediaries, Service providers, facilitators and others who may or may not be directly connected with the activity. As an outward/outreach Plan, efforts were made in the study to map various key stakeholders of fisheries sector in the state whose roles and interplay (levels of stake, engagement, responsibility and awareness) are multi-dimensional. Stakes could be (i) collective, (ii) collaborative, (iii) supportive, (iv) facilitative and (v) regulative. Yet some of the stakes could divergent and conflicting interests that influence the growth and sustainability of the sector. Some of the prominent stakes and stake holders are identified here but there could many other dimensions of stakes and stake holders. The purpose of this is to design strategies for integrating the various roles and responsibilities of different stakeholders functioning at different levels of fish production supply and value chain in the state to achieve the desired sector growth in a sustainable manner.

The status of stakeholders in the fisheries sector of the state, FCS-influence over /interests in resource, local institutions to meet the interest of fishers (fulltime/part time/subsistence welfare) and the detailed analysis on primary stakeholders, input suppliers, fish traders, non fisher aggregators, retail/wholesale traders, Women MMs, fish consumers, local money lenders, fisheries workforce, DOF, FCS, NGOs, KVKs, and financial institutions are given under **Annexure 4.10**.

Chapter – V

Study findings and observations

5.1	Assessment of resources	5.7	Fishermen Co-operative Societies (FCS)
5.2	Resource productivity and potential	5.8	Marketing
5.3	Economic aspects	5.9	Human Resource Development
5.4	Resource projections	5.10	Infrastructure and input supply
5.5	Aquaculture	5.11	Centrally sponsored and state plan schemes
5.6	Fish seed production and rearing	5.12	Policy frame work

5.1 Assessment of Resources

5.1.1 Scenario analysis - Resources and Activities

Tanks and reservoirs are the major resources around which the sector will drive growth. The present fish production is driven by the ongoing activities mainly in these resources. Activities under both the systems is mainly traditional, pro-poor practices, restricted to mere stocking of selected cultivable fish species, sporadically prawn species in a few of the reservoirs and have different levels of involvement of traditional fishermen. The resources are focus for new technology adoption, management, fish production, income and employment for rural fishers. The activities in the state are not trade-driven commercial fish farming.

The study findings have clearly shown major contribution of these resources to food and nutritional security. The reservoirs in the command area of the Godavari and Krishna Basins and those coming under different agro – climatic zones have different characteristics in terms of water holding capacities, seasonality, inflows from catchment areas etc.

The water sharing in reservoirs is for multiple purposes, mainly for irrigation and agriculture operations, while drinking water occupies second place of importance in some cases and is mainly associated with balancing reservoirs. Fisheries come next to these two uses and are being encouraged by the state with certain conditionality's.

For better understanding of both resource usage and also in terms of prevailing constraints in productivity and fish production, small reservoirs are sub categorized based on TWSA between 500-1000ha, 100-500ha and <100 ha. The latter two categories share commonality with perennial and long seasonal tanks. The seasonality of the reservoirs and Effective Water Spread area is governed by the monsoon on a year to year basis while reservoirs located in the two river basins enjoy better source of water. There are some reservoirs (eg. Musi) which are highly polluted due to industrial activities and also discharge of sewage from the agglomerations / towns.

5.1.2 Morpho-metric and hydrological features

All the reservoirs studied are shallow with high proportion of euphotic zone. The av. water depth at the time of visit by study team for the major reservoir was 20.5 m, medium reservoirs 18.25 m and small 9.4 m indicating a lower depth in the latter category.

■ Highlights on Morpho-metric characteristics

- Reservoirs such as LMD, Nizamsagar, Pocharam, Saralasagar, Sri Rangasamudram, Ramanpad, Ralivagu, Gollavagu, Thummalacheruvu, Singetham located in plain region are not surrounded by hills and are subjected to heavy wind action; turbulence is high due to seiche.
- In these reservoirs, regeneration of nutrients to euphotic zone from bottom layers is relatively more effective.
- On the contrary, water bodies such as Indiramma sagar reservoir, Vemala kunta are located in sheltered region and are subject to low wind action.
- Nutrients may be trapped for short or long periods in the bottom layers reducing the photosynthetic rate.

■ Characteristics of balancing reservoirs

Reservoirs under-lift irrigation (e.g. From Jurala reservoir, water is let into Ramanpad and from Ramanpad to Yenakunta), similarly Sarala sagar, Srirangasamudram are balancing water bodies and are characterized by

- high water level fluctuation within a short duration
- high inflow and outflow resulting in high flushing ratio
- loss of nutrients and flushing of plankton out of the reservoir
- relatively low primary productivity

Fisher's feedback: complaints of slow fish growth, low fish productivity and production - catla registers a growth of 500 g and rohu & mrigal 300 g in one year. Details of morpho-metric and hydrological features, *abiotic parameters* of reservoirs are given in **Annexure 5.1 & 5.2**.

■ Tank Studies

As for tanks in general, most of these water bodies are irrigation tanks, seasonal and rain-fed, mainly functioning as rain water harvesting structures the notable aspects of tanks are:

■ DOF Tanks

- Excepting a few, Most of the perennial tanks are canal fed and are contributing significantly to the present fish production of the state.
- Major share of the fish production is coming from long seasonal tanks as they have major share in the resource base of department tanks.
- Most of them rain-dependent; hold water for duration of 6-9 months, but are most suitable for the prevailing fish culture practices.

■ Panchayat Tanks

- Over 94% of these tanks are rain-dependent and hold water for shorter duration of 3 to 6 months (1.67 lakh ha) making it difficult to carry out any sustainable fishing operations. Hence, fisheries operations are not going on in a large scale.
- Use of these resources for fish culture activities depends mainly on rain fall in any given monsoon months, but in most instances is uncertain in dry belts.
- In effect, large number of short seasonal tanks are not stocked for more than 2 to 3 rainy seasons.
- Long seasonal tanks are the major hope for the fisheries development with some reliability for fish production.
- These resources are impacting community pursuing the activity, serving only as part of meeting their fish requirement for family consumption rather than as economic activity.

■ Overall

- **Short seasonal tanks:** Account maximum both in numbers and water spread area (83% and 54%).
- **Long seasonal:** 16% and 40%.
- **Perennial:** 1% and 5% respectively.
- Combining both short and long seasonal tanks, the share is 99% in number and 94% in area.
- Depending on monsoons, intrinsic characteristics of these resources, more importantly, the smaller water bodies (Panchayat Tanks) limits the sector growth in the state.

Highlights on abiotic parameters of tanks are given in terms of three different situations as follows:

■ **Domestic sewage fed water bodies**

- Musi river fed water bodies registered significantly high ionic concentration (Mean: 1025 μ S/cm) than the Sewage fed water bodies (Mean: 548 μ S/cm).
- Alkalinity, a correlate of specific conductivity, showed similar trend (Musi fed: 344 mg/l; Sewage fed: 298 mg/l).
- Water transparency is marginally higher in Sewage fed (Mean: 58.2 cm) *vis-a-vis* Musi fed (Mean: 49.4 cm).
- Over all, the mean ionic concentration for water bodies receiving high organic load is 774 μ S/cm and the alkalinity value is 319.6 mg/l.

■ **Rain-fed perennial and long seasonal water bodies**

- Ionic concentration did not vary significantly between rain fed perennial and long seasonal tanks (Mean: 388 to 409 μ S/cm)
- Alkalinity was marginally higher in the case of long seasonal (Mean: 191.2 mg/l) as compared to perennial tanks (Mean: 114.7 mg/l).
- Over all, the mean ionic concentration and alkalinity values for rain fed water bodies was 388 μ S/cm and 156.5 mg/l.

■ **Domestic sewage fed water bodies via-a-vis rain fed water bodies**

- As expected, the mean ionic concentration for water bodies receiving high organic load was significantly higher (Mean: 774 μ S/cm) as compared to water bodies that receive only rain water runoff (Mean: 388 μ S/cm).

The trend was mirrored in the case of alkalinity value also (Mean - Musi river and domestic sewage fed water bodies: 319.6 mg/l;

- Rain fed water bodies: 156.5 mg/l).

Details of fish production potential of tanks based on Morpho-Edaphic Index are furnished under **Annexure 5.3**. Data tables on abstract of biological studies are given in **Annexure 5.4.1** and of abiotic parameters of Musi River fed DP Tanks, Domestic Sewage Linked DP Tanks, Rain-fed DP Tanks in **Annexure 5.4.2, 5.4.3 and 5.4.4**.

5.2 Resource productivity and potential

5.2.1 Productivity potential

Knowledge of fish production potential is essential for taking measures for management of reservoirs in order to realize optimum fish yields. Estimating fish production potential of water bodies by collecting data by physically visiting landing centers is time consuming, expensive and difficult given the location of reservoirs in remote areas, scattered landing centers and availability of limited trained man power. However, fish production potential can be predicted using simple empirically derived estimators such as Morpho-Edaphic index and tropho -dynamic models using Gross Primary Production (GPP). However, the present study being short duration, estimate obtained is a first approximation and needs to be fine-tuned based on the field experience and later with detailed scientific study.

- Gross primary production was estimated for seven **reservoirs** and the data was used to predict fish production potential assuming conversion efficiency from GPP to fish of 0.5% for small reservoirs and 0.2% for medium and large reservoirs.
- Predicted fish yield among small reservoirs is highest for Gollavagu (1072 kg/ha/year) followed by Rangasamudram (842 kg/ha/yr.) and lowest for Singetham (231 kg/ha/yr.).
- For reservoir under medium category, fish production potential is high for Saralasagar (1430kg/ha/yr.) and low for Pocharam (447 kg/ha/yr.).
- For large category, the predicted yield ranges from 731 kg/ha in LMD to 950 kg/ha in Nizamsagar.

Table – 30 Fish production potential

Name of reservoir	Area (ha)	GPP (mg C/m ² /h)	Fish prod. Potential (kg/ha/year)
Fish prod. Potential of Small reservoirs based on Gross primary productivity			
▪ Ramanpadu	450	450	657
▪ Rangasamudram	740	577	842
▪ Rallyvagu	301	555	810
▪ Gollavagu	411	735	1072
Fish prod. Potential of Small reservoirs based on Morpho-Edaphic index			
▪ Thummalacheruvu	580	74.5	394
▪ Indiramma sagar	118	77.7	418
▪ Singetham	440	50.7	231
▪ Pocharam	1662	765	447
▪ Sarlasagar	1077	188.4	1430
Fish prod. Potential of Large reservoirs based on Gross primary productivity			
▪ Nizamsagar	12950	1627	950
▪ LMD	8097	1252	731

■ Tanks

Morpho-edaphic index (MEI) developed by Ryder (1965) has been used to predict fish yield. The MEI for 34 tanks was calculated using the data on mean depth and specific conductivity and was used to predict the potential fish yield.

5.2.1.1 Fish production potential

- Mean estimated potential fish production for sewage fed water bodies is 809 kg/ha/year.
- Mean estimated fish production of Musi river fed water bodies is high (4155 kg/ha/year) (unrealistic) because of very high ionic concentration and additional data is required to estimate the realistic production potential.
- Mean estimated fish production potential for rain fed perennial water bodies is 636.7 kg/ha/year.
- The model used for potential fish production estimation is derived for perennial water bodies. Data on primary production, phytoplankton density & structure and water holding period are required to estimate the fish production potential for long seasonal water bodies.
- As the data available is limited, it has not been possible to compare the water bodies of Godavari basin with that of Krishna basin.

5.2.1.2 Fish Assemblage

■ Assessment of fish assemblage

Studies on fish diversity of nine reservoirs (3 in Krishna basin and rest in Godavari basin) were conducted. The number of individuals sampled was highest in Indiramma sagar (803 individuals) to lowest in Rali vagu (16 individuals) and the total number of individuals recorded from all reservoirs was 2073. Thirty eight species belonging to 11 families were recorded from nine reservoirs. Among the families, cyprinidae was represented by maximum number of species (17 No.).

The species richness varied from 15 (Rangasamudram, Sarlasagar, Ramanpad and Indirasagar) to 8 (Ralivagu). Since sampling has been done only on one occasion, the species richness appears to be low in all reservoirs. The α diversity (H' , Shanon-Weiner diversity) was lowest in Ramanpad (1.36) and highest in Nizamsagar (2.23). Except Ramanpad and Indiramma sagar, all other reservoirs have recorded alpha diversity around two or higher. Pielou's index ranged from 0.26 in Ramanpad to 0.85 in Ralivagu. Pielou's index was greater than 0.5 in six out of nine reservoirs signifying that the species are moderately closer numerically. Collection of data at regular intervals from different zones during different seasons of the year is expected to result in significantly higher species richness, higher alpha diversity and evenness in all reservoirs. Assessment of fish assemblage is given under **Annexure–5.5**.

- **Diversity:** Species richness and diversity indices in reservoirs of Telangana is as follows:

Table – 31 Fish species diversity indexes

	No. of individuals	(Species richness)	Shannon Weaver Index H'	Pielou's evenness index:
■ Rangasamudram dam (K)	78	15	1.86	0.43
■ Saralasagar (K)	246	15	2.08	0.53
■ Ramanapad reservoir (K)	417	15	1.36	0.26
■ Pocharam reservoir (G)	79	13	1.86	0.50
■ Nizamsagar (G)	297	14	2.23	0.67
■ Indirasagar (G)	803	15	1.56	0.32
■ LMD Karimnagar (G)	55	10	1.92	0.69
■ Ralivagu Mancharial (G)	16	8	1.92	0.85
■ Gollavagu –Mancharial (G)	82	13	2.07	0.61
Total	2073			

K: Krishna basin; G: Godavari basin

■ Highlights on fish assemblage and diversity

- The α diversity values in seven out of nine reservoirs reflects moderate to good health of fish community.
- *Amblypharyngodon mola* is most abundant in five reservoirs (Sarlasagar, Ramanpad, Pocharam, Indirasagar and CMD) as compared to other species in the community. In Nizamsagar, *P. sophore* followed by *A. mola* are dominant in community. Other abundant species are *Osteobrama cotio peninsularis* in Ramanpad, *Puntius sophore* in Indirasagar, *N. notopterus* in Rangasamudram.
- Exotic fish species, mainly Nile tilapia, contribute more than 20% in Rangasamudram, Sarlasagar and Gollavagu and these reservoirs need in depth study to predict the effect of exotics on native species. The contribution of exotics is negligible in rest of the reservoirs (5% or less).
- Endemic and native species are predominant (>90%) in six out of nine reservoirs and this indicates that the fish community is healthy in these reservoirs.
- A number of ornamental fish species are observed – *P. ticto*, *P. vittatus*, *P. sophore*, *R. daniconius*, *C. nama*, *Pseudo ambassis* spp., *Glossogobius giuris*, *N. notopterus*, *E. Maculates*, *Hyporampus limbus* and *Mystus vittatus* among others.
- Among the species recorded, *P. vittatus*, *P. sarana* and *S. aor* are under threatened category (Lakra *et al.* 2010).
- In general auto stocking of IMC was not observed in any water bodies.

5.2.2 Resource Development

5.2.2.1 Fish seed stocking-Reservoirs

The **reservoirs** are stocked by the state every year and the number of seed stocked depends on the size of reservoirs. This is by and large, in line with the national norms of 500/1000/2000 fingerlings (80-100 mm size) respectively in case of major, medium and small size reservoirs. Due to limitation of availability and financial provision, stocking norm was not strictly observed in many instances and in the earlier years e.g. only 300 FL were being stocked for large reservoirs during 2016-17. However, stocking @ 500/ ha is being followed by DOF during current year. In case of licensed reservoirs, the DOF takes up stocking as per schedule and fishing in the reservoirs is banned for two months (June-September).

5.2.2.2 Craft and gears

- Coracles used in **reservoirs**, are although versatile crafts, durable and have very good manoeuvrability in choppy waters, and are easy to use for laying and lifting of nets besides navigation and transport of fish and other material, their usage in most of the reservoirs and larger water bodies of the study districts is limited.
- Lack of awareness, training and supportive programs/schemes are attributed for the low adoption and switching over from Theppam which is the most commonly used craft.
- Limited use of mechanized boats mainly in bigger reservoirs and large perennial tanks for the patrolling purpose was observed as they are too expensive for the common fishermen/small PFCS to own.

- Speed boats with out-board engines supported by Tourism department are in use in some of the major reservoirs (Medak, Karimnagar, Nizamsagar dam etc.) for boat rides to tourists.
- Occasionally they are used for collection of samples for fisheries research activities.
- Use of Dugout canoes, structures carved out of palm tree are seen in a very limited way in a few water bodies.
- Where ever the catch is not very remunerative, no boats are used.

■ **Net material**

- Gillnets in **reservoirs** with 50% hanging coefficient are in use by most fishers as the catching efficiency is high.
- Monofilament gillnet has been found to be more effective than earlier used multi-meshed gillnet as the efficiency of these nets are significantly high. However, these nets are 'use and throw type' as they are not amenable for repairs.
- Although the expenditure is high on nets due to frequent replacement, it is more than compensated by high catches.
- White colour nets are popular because of their availability. Light green and light blue colour nets are also used by some fishers with no specific attachment/reasons for better fish catch.
- Nets with mesh size of around 20 mm are in common use for minor cyprinids, 25 to 40 mm for medium catfish like *Ompok bimaculatus*, *Mystus cavasius* and greater than 100 mm for major carps.
- Cast nets are also being used mainly in small reservoirs.

5.2.2.3 Resource use - Reservoirs

- All irrigation reservoirs are integrally linked to agriculture; some are used for multiple activities viz., drinking, Hydro-power generation, etc.
- Storage and release of water from dams are mainly governed by the requirements of irrigation, power generation and other primary purposes of the dam, rather than any considerations related to fisheries.
- Continuous draft (release) of water in support of agricultural activities (predominantly paddy cultivation in the reservoir commands). Volume/quantum of water released depends on number of crops taken in the command areas.
- In long seasonal reservoirs, the pace of depletion of water is faster due to use of water for irrigation purpose and in some cases for drinking purpose.
- In case of balancing reservoirs, the water renewal pattern is mostly marked by swift changes in levels, high flushing ratio (inflow and outflow).
- High flushing ratio associated to accelerated depletion of water during scanty monsoon years, more importantly from January to May months when draft of water for irrigation and drinking water is huge.

5.2.2.4 Fish seed stocking-tanks

Indian major carps (catla, rohu, mrigal) 70%, and common carp (30%) are the most commonly stocked species by the Govt. and Grass carp is stocked occasionally in selected tanks based on the requirement by PFCS. Freshwater prawn is also some time stocked in a few reservoirs and tanks by the PFCS through merchants. Generally, perennial tanks are stocked with fingerlings of 80-100 mm size @ 2000/ha and seasonal tanks with fingerlings of 35-40 mm size @3000/ha throughout the state.

5.2.2.5 Input use management and productivity

Due to traditional nature of fisheries/fish culture going on in both reservoirs and tanks, use of feed/manure is non-existent and is sporadically practiced in small number of tank where water is not used for drinking water purpose. Restrictions and public objections and additional investment required for such practices have also limited the usage. Where ever in use, producers depend on the agricultural by products mainly rice bran and occasionally oil cakes as major source of conventional feed to supplement and complement fish growth and production.

5.2.2.6 Craft and gears

In case of tanks, Theppam is the most commonly used craft and both gill nets and cast nets for fishing. In most of the long seasonal and seasonal tanks, shore seine/ drag nets are used for the final harvest of fish during summer when water level recedes to the low points. Use of bamboo basket trap nets are in practice in some of the perennial tanks mainly focused for catching fish varieties like murrel and eels and are generally entrusted to skilled fishers groups who are generally nomads specialized in these operations. They are paid on the variety and value of fish basis.

5.2.2.7 Resource use pattern in case of tanks are most sought after water sources for the development of fisheries and aquaculture activities in the state. These water bodies are lifelines of rural communities and serve multiple purposes and more importantly, they provide opportunities for livelihood activities of fishers.

Traditionally tanks are used for more than one purposes i.e. (i) irrigation, (ii) drinking water, (iii) Livestock use, (iv) other miscellaneous like washing of clothes, bathing and (v) fisheries etc. The First and second purposes of usage in case of tanks cause gradual depletion while the fourth impacts water quality. All these uses influence fishing activities. Since fisheries has least priority in these resource use ecosystem, it is at the receiving end and is being carried with these limitations.

Changes in resource category status –tanks

- Over the period, several tanks were converted into balancing reservoir by providing canal linkages in support of meeting irrigation and drinking water.
- Similarly many tanks that were earlier seasonal tanks have attained status of perennial tanks due to canal water connectivity eg. Pochampalli GP Tank in Yadadri district was initially seasonal and later with connectivity to Musi canal has become perennial. Similarly, Veerasamudra tank in Wanaparthy that was long seasonal department tank changed to perennial.
- These aspects of resource changes need to be validated and documented for the purpose of resource development.

5.2.2.8 Production and performance of water bodies

Fishing operations are on mainly traditional methods as a result, productivity is low (ranges from 100 -300 kg/ha in case of Panchayat tanks, 300-800 kg in case of perennial tanks and 300- 400 kg / ha in case of small reservoirs, 150-250 kg in medium and 80- 150 kg in respect of large reservoirs. This low productivity of water bodies has been causing huge economic loss to the state as also the fishermen communities.

■ Causes for lower fish production

- Monsoon failure in many of the districts of the state resulting in drought like scenarios.
- Implementation of Mission Kakatiya works undertaken by Govt. resulting in draining of water to undertake de-siltation and taking soil for tank dyke strengthening works.
- Continued predominance of conventional practices in fisheries activities and near-absence of production enhancing input application.
- Lack of private participation in fish production in natural water bodies mainly due to the near-monopoly of fishermen communities in access/right of fishing in Government and Panchayat owned water bodies.
- Leasing policies of Government which is virtually “non-transferability of water bodies” once they are leased to PFCS.

■ General observations

- The utilization of water resources optimally is imperative to the growth of sector and for improving the fish productivity in the state.
- Fisheries management is generally considered to be ineffective because of the common property nature of the resource coupled with exclusive dependence on FCS to manage and generate output from the activity.
- Significant number of Panchayat tanks are not being used for fisheries activities.

- Considering the risk factors, FCSs find it uneconomic to manage fisheries operations due to heavy cost of seed and watch and ward costs- weak cooperative set up and poor governance.
- The state is making continued efforts to bring in sustainable growth to sector through i) Judicious use of available water resources for sustained fish production, ii) Enhancement of resource productivity and fish production, and iii) Providing supportive services etc.

5.2.2.9 Predicaments for resource development

Reservoirs are spread over various types of terrains, soil types, receive drainage from a variety of catchment areas (plains, agriculture fields, forests and hill tracks) and are much exposed to diverse climatic conditions. These water bodies were constructed at different points of time and depending on their year of construction, catchment activities, water usage pattern etc. the resource has witnessed several changes in morpho-edaphic factors over the years.

■ Temporal and spatial distribution of rainfall

Rainfall aberrations -Inadequate rainfall in most of the arid and semi-arid regions; seasonality in rainfall distribution

- Large rivers like the Godavari and Krishna pass through extensive tracts of low rainfall areas, resulting in carrying much less water.

- In most of the large and medium reservoirs attaining FRL on annual basis during rainy season are not happening.

■ Soil erosion in the catchment of reservoirs and tanks

- Siltation of reservoir water bodies over the years resulting in reduction of WSA and making the basin shallow.
- Excessive silting due to catchment agricultural activities, deforestation and mining activities; movement of sediment and its deposition in various parts of the reservoir drastically reducing water holding capacity over a period.
- Depending on rainfall, number of rainy days and gradient of the catchment area, varied quantity of soil is gaining entry into reservoirs.
- Older reservoirs have witnessed higher silt accumulation.
- Shrinking of EWSA and reduction in water depth etc negatively affecting fisheries activities viz., fishing operations, stocking quantities, growth of fish etc and all of which have economic losses.

■ Weed infestation in reservoirs & tanks

- Occurrence /growth of weeds / bushes and more so in some small and shallow reservoirs (with variations among the reservoirs), also associated with nutrient inflow, shallowness of water body and influx of domestic/ polluted river sources.
- Weed infestation -Typa, nelumbo, water hyacinth, Ipomea, submerged weeds- Ceratophyllum, Najas, Potamogeton etc. also marginal grasses are common in case of tanks. The type of macrophyte community in some of the perennial tanks has made the tank water bodies totally unfit for fisheries activities.

Box: 1 Soil erosion in the catchment area of tanks

- Depending on topography of tanks, catchment slope, and soil type (a) status of catchment area and (b) age of the tanks, the extent of siltation varied. Older the tank, greater is the **soil accumulation**.
- Due to various activities in the catchment area, the black cotton soil is easily eroded and an enormous amount of silt is carried into the tanks and this has drastically reduced the capacity.
- Rate of sedimentation decides the level of reduction in storage capacity. In tanks having larger WSA, the eroded soil from catchment areas gets distributed (though not evenly) all over the tank while in case of smaller tanks, soil gets concentrated thereby reducing the volume of water.
- Tank wise details of catchment area slope/gradient and annual soil erosion rate age was not available to determine level of siltation.
- Ongoing Mission Kakatiya activity in the state is playing key role in de-siltation and deepening of tanks and contributing marginally (20-30%) in minimizing this problem.

■ **Encroachment in reservoirs & tanks**

- Deterioration in the structure of the reservoir results in flattened bunds giving scope/ rise to gradual encroachment of the bund / reservoir area.
- Encroachment of reservoir land by the farmers adjacent to catchment on several pretext of submergence of their own land, regularizing into patta land through various means and ways, undertaking land filling with soil loads brought from outside to raise the land level and using for agriculture activities

Box: 2 Encroachment in tanks

- Encroachment of flattened bunds and the peripheral tank beds is very common in view of greater pressure on land.
- Extent of encroachment in urban areas is much more due to rapid urbanization, high commercial value for the land and to certain extent in rural part by the by the neighbouring peasantry for agricultural activities.

5.2.2.10 Issues of concerns in reservoirs & tanks

■ **Tree stumps – reservoirs**

- Tree stumps spread over a large area of reservoir/ perennial tank basin reduces the area of operation of gillnets. Menace of tree stumps in some of the small reservoirs viz., Ralivagu, Gollavagu etc. are observed during the study.
- The fishers dependent on these resources are frequently experiencing damage to gillnet because of their entanglement with the tree stumps leading to high recurring expenditure on replacement of nets.

■ **Tank fisheries development**

Tank fisheries activities in the state are under stress since 2-3 years due to the vagaries of nature ranging from deficit/scanty rainfall to chronic drought conditions in some parts of the state. Erratic rain spread and inadequacy in fish seed stocking practice has taken a major ride negatively impacting sector growth in the state.

- Major share of tank water bodies is under government ownership as common property resource supporting ongoing agricultural activities, public utilities and fisheries is only a part.
- Although utilization of perennial tanks that are canal fed is better, the problem of weed infestation, pollution, siltation etc. limits their full utilization for fisheries activities.

All these factors have reduced the productivity of tank resources resulting in declined trend in total fish production of the state.

Field studies and interactions with FCS/FGDs indicated that the Panchayat tanks have very low productivity on account of several factors. Smaller tanks size, short duration of water holding and uncertainty of water holding for longer period, lack of supplementary water supply, depleting water sources exclusive for fisheries activities (preferences for irrigation and drinking, etc.), lack of proper management and fish seed stocking etc. have also contributed for the poor performance.

Box: 3 Notable aspects of tanks

- Depending on rainfall pattern and associated aberrations inflow of water into tanks varied and is not common to all districts.
- Catchment area activities, connectivity and cascading between tanks and other Watershed structures, status of main storm drain, pegging of channels and encroachment of water waste weirs etc. contributed for the reduction of water flow into tanks.
- Draft of water for irrigation irrespective of perennial and seasonal tanks;
- Drinking and other purposes in case of perennial tanks are the major water depleting reasons. These depend on (i) ayacut area to be serviced by the tanks, type and nature of crops and crop intensities and (ii) human population covered under tapped water supply schemes.

Resource pollution:

- Most of the water bodies in districts of Rangareddy, Yadadri are canal fed, receiving water from Musi river connected sources and are characterized by hyper-eutrophic conditions.
- The water in most of these tanks is deep green coloration due to high density of blue-green algae.
- Water-bodies located away from cities but receive sewage inflow due to their connection to polluted rivers like Musi/domestic sewage from human agglomerations are also polluted.
- A number of tanks and reservoirs located within/adjacent to cities like Hyderabad (Himayathsagar, Osmanasagar), Karimnagar (especially Ooracheruvu) and many other districts which receive urban sewage and industrial pollutants are also witnessing high degree of pollution affecting the development of fisheries activities.

Box: 4 Pollution stress in tanks

- Pollution stress and negligence in management have also major influence on fisheries.
- Immersion of Ganesha idols made of plaster of paris, paints etc., dumping of garbage in most of the tanks is happening unabatedly during the festival seasons especially in tanks that are closer to the human dwellings in both rural and semi urban areas.

The nutrient enrichment of these water bodies is happening on a day to day basis and has resulted in positive impact of better fish growth. The effects were positive during the initial phase when the sewage is sufficiently in diluted conditions (during monsoon). The improper management of sewage influx into tanks during later period is resulting in massive growth of diversified aquatic weeds mainly dominated by floating weed water hyacinth. The situation has also lead to public health concerns and has become habitat for breeding of mosquitoes and spread of associated diseases. Further, fishers have also complained of skin rashes and health related problems due to their proximity to polluted water.

High variation in diel dissolved oxygen concentration with super saturation of oxygen in the afternoons and low oxygen levels during night and early morning hours causing high stressful conditions to fish and associated fish kill mainly during summer are common. Air breathing fishes viz., catfishes, murrel and hardy invasive species like tilapia, African catfish are surviving and breeding in these water-bodies contributing to fishery in most of the heavily polluted water bodies. The native carp species stock has dwindled or not occurring.

In moderate and marginally polluted water bodies, the fish production is high and showing new dimension for development of these resources on concept of management led sewage fed fish culture similar to the lines of West Bengal and other states where in production of 3-5 tons/ha is being harnessed.

5.2.2.11 Natural and system related limitations in tanks

- The large number of smaller tanks owned by the department and Panchayats are rain dependent (short seasonal and long seasonal depending on precipitation) but cater to multiple purposes leading to accelerated depletion of water levels making resources unfit for pursuing fisheries activities. The deficit / delayed rainfall, tank seasonality, limited availability of water in seasonal tanks to only for 6-8 months and in many instances only for 3-4 months in small short seasonal tanks have hence considerable negative impact. This has limited the utilization of these resources to harness better resource productivity, restricted production activity and the output.
- In case of perennial tanks, the pace of depletion is not as severe as it is in case of short seasonal water bodies. During weak monsoon years, the situation gets aggravated and fishing activities are forced to be abandoned.
- The prolonged neglect of tanks over the period, changed rainfall, anthropological changes and utilisation of a large quantum of water resources in Godavari Basin for alternative activities have resulted in changed resource use pattern. The loss of connectivity between the tanks (cascading) due to various development activities including encroachment are the reality the state is witnessing over the period. The dried-up tanks across the rural hinterland of Telangana, limited canal waters/ bore well water support have resulted in distress among the fishers and those dependent on the related activities.

Practice related

- Stocking tank resources with smaller sized seed instead of fingerlings/advanced fingerlings/stunted fingerlings / yearlings etc; absence of stocking different cultivable carp species in appropriate proportion and limited use of production enhancing inputs have constrained growth of fish in tanks.
- Water bodies are benefited by domestic sewage as long as the entry is under control. Whenever there is excessive inflow of sewage more than the carrying capacity of the water bodies, negative effects on fish stock including mortality are reported.

5.2.2.12 Social conflicts

Conflicts in access to resource, sharing of water for crop activities, non maintenance of dead storage level (sluice gate) in tanks for animal drinking and fisheries activities different format of resource sharing/different scale of partnerships by colluding with merchants, etc. have limited the segment growth to a considerable extent and constrained harnessing optimal potential productions in these resources on which state is mainly banking on for the sector growth.

5.2.2.13 Scope and new opportunities

- Roping in of scientific principles to optimally exploit resource potential for fisheries development
- Positioning of appropriate institutional arrangements and promoting involvement of resource users in development process of reservoir.
- Internalization of seed production to facility availability in adequate quantity of quality seed at requisite time and place for better stocking.
- Promotion of scientific fisheries enhancement programs through trainings and capacity building programs.
- Facilitation for efficient governance and co-management in resource development.

Predominance of smaller sizes is the unique feature of the reservoir system in the state. This offers good scope for better resource management and culture based activities. In view of their sizeable number, the smaller reservoirs can cater to wider social spectrum of fishermen population. So also, in the next category, the medium sized reservoirs also offer better opportunities for fisheries activities, particularly for pursuing cage and pen culture which are sun-rise segments of open fisheries where ever resource feasibility permits the practice. The large reservoirs which are in small number are presently being harnessed for wide ranging purposes, more particularly, meeting irrigation requirements of the state which deserves to have priority over others. Nevertheless, fisheries activities, particularly cage and pen culture could be promoted in select large reservoirs.

5.2.2.14 Efforts of DOF

DOF is constantly making efforts for the long term scientific development of the reservoir fisheries and tank fish culture addressing both resource sustainability and community benefits making their livelihood on a routine basis.

- Reservoirs and tanks are being stocked regularly with fingerlings of Indian major carps under various schemes and programs. Initiatives of DOF for fish seed stocking with cultivable carps, organizing fishers to come together under the umbrella of Fishermen Cooperative Societies have strengthened the bargaining powers of fishers.
- Efforts of DOF has facilitated many to rope into the fisheries activities, increased their return/unit efforts and realize diversified benefits due to enhanced resource productivity, profitability and incremental employment generation.
- Handholding support of DOF in terms of providing nets, boats, bicycle/moped, pick up van, ice box etc. to FCS and women MM's in respect of marketing fish and to generate additional income etc is contributing for the reservoir productivity and added gains to fishers.
- Of late, the new initiative of cage farming is being demonstrated in selected reservoirs and efforts are being made to promote the practice.
- Similarly, initiative of fish seed rearing and fish culture in cages and pens, *in situ* seed rearing in reservoirs peripheral tanks, water pools/ coves etc. are also being planned for promotion to harness the overall resource productivity.

5.2.3 Paradigm in resource expansion

Under the resource augmentation initiatives of the Government, increase in number of new water bodies (ponds / tanks / water harvesting structures) is seen all across the state. Though these small water bodies are mainly to cater to the irrigation requirement of the beneficiary farmers, they have all the potentials for complementary use for fisheries activities. Although average area is less than one acre, the recent addition of these water bodies viz., check dams, farm ponds, nala bunds, quarry tanks, coal pits, new ponds/tanks constructed under NMPS, MNERGA soil conservation dept. NHM, etc have potentials to contribute for the inland fisheries growth.

The state is also making efforts to increase its water resource through revival of tanks and reservoirs and positioning new irrigation projects (balance reservoir projects, lift irrigation projects ...) in support of irrigation, drinking water in the coming years. The utilization of water resources optimally is imperative to the growth of the sector and improving the resource productivity in Telangana State. The on-going efforts of State government are directed towards harnessing the river water through various major and medium irrigation projects as one of many mitigation strategies to address prevailing drought conditions and address distress in agriculture sector.

The government has initiated several flagship programmes, addressing enhancement of irrigation facilities. Of late, several new projects to optimally utilize the balance of water available in the Godavari and Krishna basins and regenerate water in these basins with the least inter-state issues have been initiated resulting in conversion of many tank water bodies into reservoirs. Re-designing of irrigation projects and construction of new irrigation projects are receiving attention of the government resulting in expansion of water bodies both horizontally and vertically. About 23 Major and 13 Medium Irrigation projects are in various stages of development and it is anticipated to have complementary benefits for extending fisheries and aquaculture activities in the state in years to come.

Addressing issues of repairing and rejuvenating of tanks, the state has implemented another flagship program of **Mission Kakatiya** to restore over 46,000 tanks and water bodies dotting the terrain of the state, in a phased manner and thereby, reviving the entire ecosystem in the rural areas. The first two phases of program has enhanced storage capacity of tanks with the favorable monsoon of 2016. With Mission Kakatiya and improved water harnessing initiatives for irrigation enhancement in Krishna and Godavari systems, renewed focus on improving the water storage capacity of water bodies is put in place. It is proposed to take up all the feeder channels for repairs and rejuvenation in Phase-III along with construction of some water tanks.

In order to provide safe, adequate, sustainable and treated drinking water for the entire rural and urban areas the state has implemented another flagship program - Mission Bhagiratha'. Under this program also emphasis on tanks and use of reservoirs was laid retaining minimum 10% of water in all the reservoirs reserved for drinking water purpose. This has resulted in complementary benefits for fish growth in these resources.

At present bore-well irrigation is supporting nearly one lakh ha of land in the state, and has also led to the construction of several small water storage structures in the farmer's holdings. These storage structures also offer scope for utilization in support of several aquaculture activities. This has also brought into focus the immense potential for growth of the fisheries sector in the state.

5.3 Economic aspects

5.3.1 Factor costs

Both reservoir fisheries and tank fish culture activities are only limited to fish seed stocking and watch and ward which involve labour. Fish culture is a labour intensive economic activity and calls for special skill at various stages. Use of production enhancing inputs is minimal and limited to seed production. Apart from this, the only cost involved is license/lease rent to the Government and overhead expenses. Studies carried out have estimated factor cost per kg of Fish at Rs.45-48/- and a net margin of Rs.32- 35/kg of fish sold which goes to the producer.

5.3.2 Income and employment

Studies conducted in reservoirs/tanks across the study districts show the following range of income and employment. It is assumed that average production from one ha depends on stocking and resource productivity. In case of reservoirs an average stocking is based on size of the reservoir and weighted average is $500+1000+2000/3=1160$ fingerlings. Similarly, the average survival per cent is assumed as 0.4 and accordingly the estimated fish productivity is at around 400 kg valued at 32000/-.

In respect of perennial tanks, average stocking is 2000/ha and at 0.4% survival, the productivity/ha is estimated at 600 kg (800 fish x 0.75 kg). Hence, based on weighted average (tanks + reservoirs) the productivity is estimated at 500 kg/ha.

5.3.3 Economics of operations

Majority of Panchayat tanks are rain-dependent and with small areas. Till 2016-17, seed stocking was done by the lessee FCS/agencies. In view of shorter duration of water availability, stocking changes from year to year. As a result, catch details are not available. The present estimated output per ha is between 100-150 kg. However, from 2017-18, the seed stocking is done in these tanks also along with department tanks. Seed rate is 3000 fingerling (size 35-40 mm). Productivity of these tanks is expected to rise. Studies in these small water bodies show that the survival rate of fish could be around 25% while average weight may be around 0.5 kg/fish. Taking this norm there is feasibility of obtaining around 375-400 kg of fish from one ha of EWSA (around 150% rise from present productivity).

5.3.4 Economics of Fisheries - Reservoirs under licensing system

The DOF maintains reservoirs and stocks seeds on year to year basis. The licenses are issued to qualified and desirous fishermen on payment of license fee of Rs. 205 to Rs. 300/annually. In return, the fisherman is free to carry out fishing in the reservoir for any number of days except the two months period immediately after stocking (July-August). In actual practices, fishing is not done during rainy season. So, effectively between 180-200 days are used for fishing and the daily per capita catch is around 5-10 kg (av.7kg). He has nothing to spend except Theppam and its annual depreciation is around 50% of cost and meeting expenses on nets.

Table-32 Incremental income per fisherman

Operational costs		Total
▪ Average number of fishing days		180
▪ Average catch kg/day (ranges from 5-10 kg)	7 kg x 180 days	1260
▪ Income from sale of fish (in Rs.)	1260 kg x Rs.80	100,800
▪ Less: earnings forgone due to loss of labour wages (in Rs.)	@Rs.150/day	27,000
▪ Annual depreciation on craft (LS)		1000
▪ Cost on replacement of net (LS)		5000
▪ Net incremental income (in Rs.) per fisherman		67800

Note: Since stocking is done by the DOF, the cost of seed and incidentals are not considered.

5.3.4.1 Small reservoirs and perennial tanks on lease

■ Small reservoirs (per ha)

Table-33 Per ha net income in small reservoirs

Operational costs		Total
▪ Fish harvested from one ha (in Rs.)	500 kg @ Rs.80/kg	40000
▪ Less: Labour wages forgone (in Rs.)	40 days @Rs.150	6000
▪ Annual depreciation on craft and replacement of net etc. & other misc.10% of gross income (in Rs.)		4000
Net income/ha (in Rs.)		30000

5.3.4.2 Panchayat tanks on lease

Panchayat tanks are generally small in size besides being short/long seasonal. Their yield levels are much less. Income from one hectare of EWSA is:

Table–34 Operational costs in Panchayat tanks

Operational costs		Total (in Rs.)
▪ Watch and Ward (in Rs.)	one month x 1 person @ Rs. 6000/month / apportioned to 1 ha	600
▪ Harvesting (in Rs.)	30 fishing days @ Rs. 200/day	6000
▪ Lease amount (in Rs.)	@Rs.200/ha	200
▪ Subtotal (in Rs.)		6,800
▪ Sale (in Rs.)	400 kgs @ Rs.80/kg	32000
▪ Income/ha (in Rs.)		25,200
▪ Less: labour wages (in Rs.)	foregone 30 days x @ Rs.150	4500
▪ Annual depreciation on craft and replacement of net etc & other misc.10% of gross income		3200
▪ Net income * (in Rs.) Add back Cost of seed		17500

The economics as above show varying levels of income to the fishermen from different water bodies.

▪ Reservoir- licensee	Rs. 67800
▪ Reservoirs/tanks lessees (per ha)	Rs. 30,000
▪ Panchayat Tank lessees (per ha)	Rs. 17500

Income from Panchayat tanks depends on EWSA of tank allotted to individual FCS.

Since fisheries activities are pursued in government water bodies, computation of economic return suffers from deficiency. Besides, except for reservoirs, fisheries activities are only occasional and seasonal. Also, the income distributed among members cannot be strictly termed as Economic Return since the Water resources and seed costs are borne by the Government.

5.3.5 Challenges for accelerating resource productivity

- Inadequacy in stock improvement; stock enhancement and stocking management.
- Lack of efforts in maximization of water productivity.
- Limited availability of perennial tank/pond resources with dependable water holding for longer period.
- Lack of a reliable database relating fisheries resources.
- Lack of scientific management of fisheries resources in overall terms and inadequacy in technology protocols that are economically feasible and environmentally sustainable for pursuing activities in diversified natural water bodies.
- Lack of adequate regulatory safe guards for encouraging investment in sector activities and making sector sustainable.

5.3.6 Issues of concern

Of late, growing urbanization and rapidly changing social structures have also had a major impact on the fisheries activities in the state. The various anthropogenic interventions and multi-user conflicts have taken a major ride negatively impacting overall resource productivity, fish production and sector growth in the state.

- Horizontal and vertical integration of activities for enhancing resource productivity, overall sector growth and community benefits among others are not receiving anticipated attention.
- Many are dependent on the activity for livelihood and more so the fishers of the reservoirs.
- Many are in the verge of drifting to new activity for reasons of low and uncertain income, more so in urban and peri-urban and semi urban regions.
- Fishers are becoming weak stakeholders over the years and are becoming vulnerable.

The **SWOT Analysis** on Fish production is given in **Annexure 5.6**.

5.4 Resource projection

5.4.1 Projection of EWSA

Fisheries sector growth and production projections need to be worked out keeping in view the present status of the water bodies in the State. This exercise becomes focal issue since determination of Effective Water Spread Area (EWSA) that can be used for both stocking of fish seed and production of fish has to be done in accordance to ground realities of the resource characteristics. Any major variation may result in either over or under estimation of the area available for fisheries development.

Based on certain assumptions, the DOF has computed the Effective Water spread area of Perennial water bodies as 75% of TWSA, short and long seasonal tanks (under both Govt. and Panchayat) as 50% of TWSA. Accordingly, the effective WSAs are used for estimation of (i) fish seed requirement (ii) productivity estimations (iii) fish production and gross WSA for issue of licenses, lease amount fixing etc.

Field studies conducted in a number of tanks and reservoirs in the nine selected districts and physical assessment of good number tanks and reservoirs shows that the percentages assumed are too general, irrespective of various local/agro-climatic/soil factors, ongoing extrinsic and intrinsic changes in climatic factors, resource use and management etc.

There is clear absence of data on several of the above factors and has limited clear understanding of fish productivity potential and positioning of appropriate strategies in support of fisheries development. Hence, estimation of the resource potentials is a problem when studying these resources. Keeping these factors in view, the EWSA estimation by the DOF needs to be revisited to ensure realistic assessment.

In the backdrop of this, the study team felt the necessity for making certain valid assumptions for estimation of effective water spread area of both tanks and reservoir resources in the state based on actual observations made at field level and also interactions with the fishers and other key stakeholders in the study Districts. Though these norms may provide broad contours in respect of TWSA and EWSA, it is desirable that a more realistic estimates be made based on the present ground realities of resource characteristics and rainfall received during the area as they decide the actual EWSA and water availability in support of stocking and fish production.

Assumptions for estimating EWSA of Reservoirs

- Reduction in TWSA due to annual deficit of rainfall in river basins: Overall 10%.
- Multiple use of water and release for agriculture, drinking and other activities: Large and Medium reservoirs 20-30% and small reservoirs 30-40%.
- Siltation: Large and medium reservoirs 5% and small reservoirs 10-15%.
- Weed Infestation: Large and medium reservoirs: 3-5% and small reservoirs 15-20%.
- Encroachment estimated between 3-5% for large and medium reservoirs and small reservoirs 10-15%.

In overall terms

- EWSA assumed for large and medium reservoirs is 62-76%.
- Small reservoirs that are perennial 62-76% and long seasonal it is between 54-68% (variation between FRL and DSL is widening due to unchecked intensive draft of water and deficient monsoon years).

Assumptions for estimating EWSA of tanks

- Annual deficit of rainfall (which is a cyclical phenomenon) and related aberrations in general: 10-15%.
- Catchment activities, changed land use pattern and problems related to resource connectivity and water flow obstructions in general: 5-10%.

Assumptions for estimating EWSA of tanks

- Encroachment: 20-30% area in urban tanks; rural areas: 5-10% (overall 10%).
- Draft of water for irrigation, drinking and other purpose in perennial tanks 30-40%, seasonal tanks 40-50%.
- Siltation: Perennial tanks: 10-15%; seasonal tanks <10%.
- Weed infestation: Perennial water bodies: 20-30%; long seasonal tanks: 5-10%.

In overall terms, the EWSA assumed for perennial tanks is 70-76%, while for long seasonal tanks 62-68 % and short seasonal tanks 41-45% based on weighted averages of different tank resource type and their spread in urban and rural areas.

Highlights of resource projections■ **Reservoirs**

- The Effective WSA is projected on a dynamic model to enhance from the present 1.56 lakh ha available for stocking during the base year to 1.59 lakh ha by 2022-23.
- In large reservoirs EWSA is anticipated to enhance marginally (from 1.01 lakh ha to 1.03 lakh ha), medium from 35259 ha to 35729 ha and small from 19146 ha to 20694 ha on EWSA area basis respectively.
- The gain in EWSA for fisheries development from the base year is anticipated to increase marginally by about 3368 ha.

■ **Tanks**

- In case of DOF tanks, the Effective WSA is projected to enhance from the present 1.05 lakh ha to 1.43 lakh ha witnessing overall gain of about 36% and annual growth in area of (7.2% gain).
- Gain in EWSA for development is anticipated to increase by 38155 ha.
- Similarly, In case of Gram Panchayat tanks the Effective WSA is projected to go from the present 0.47 lakh ha to 0.83 lakh ha witnessing about 77% gain (annual growth of 9.5%).
- Gain in EWSA for development is anticipated to increase by 35473 ha.
- In overall terms, the Effective WSA in tanks is projected to rise from the present 1.52 lakh ha to 2.26 lakh ha witnessing about 49% gain (annual growth of 9.8%).
- Overall gain in EWSA for stocking in tanks is anticipated to increase by 73628 ha.

5.4.2 Projected fish production

Fish production has been fluctuating on a year to year basis, and has shown downward trends mainly on account of rainfall deficiencies. However, this may not be the only reason for such a declining trend. There are a number of factors affecting fish production, such as shrinkage of effective WSA, due to siltation, depletion on account of excessive draft of water for irrigation and drinking purposes, growth of weeds and also erroneous stocking policies, norms and timings etc. While natural vagaries cannot be wished away, a number of remedial measures could be thought of to enhance productivity of reservoirs and tanks. There is scope for doubling the present fish production with combination of measures such as de-silting, weed removal, scientific and optimal stocking norms and mortality reduction measures.

The State has envisaged to reach a production level closer to 4.42 lakh tons of fish by 2022-23 and this projection is achievable only if the sector development is steward towards technology and management led growth approaches with appropriate investment, infra structure support and institutional arrangement backed up with pro sector schemes and policies/ guide lines.

As part of study, an attempt has been made to project fish production for the next seven years (from the base year 2016-17) based on observations, findings, stakeholders interactions at different levels carried out through field studies, FGDs, case studies and interactions in the selected/study districts.

Taking into consideration the present resource status, utilization pattern, constraints, production from both reservoirs and tanks and other water bodies and production system under private activities the projections has been made and the table below shows summarized projections.

Table-35 Projected fish production (In lakh tons)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Reservoirs	0.29	0.35	0.39	0.45	0.48	0.53	0.56	0.56	0.56
Tanks	0.83	1.26	1.74	2.05	2.27	2.35	2.40	2.40	2.40
Others	0.33	0.41	0.63	0.95	1.20	1.25	1.26	1.26	1.26
Prawn prod.	0.05	0.10	0.13	0.15	0.18	0.20	0.20	0.20	0.20
Total	1.50	2.12	2.89	3.60	4.13	4.33	4.42	4.42	4.42

**Share of projected aquaculture production is discussed separately in aquaculture section*

The proposed schematic interventions would result in quantum jump in fish production to as high as 4.42 lakh tons by 2022-23. This rise in production could be achieved only in phases. Since the EWSAs arrived at have provisions for vouching natural aberrations, no major adverse impact is anticipated on this account.

The projections can be realized only with the condition that each of the conditions (assumptions) is put in practice. Any deficiency/delays in implementation of any of the schemes/conditions would have proportionate negative impact on the fish production.

The increase in production would be a result of (i) horizontal expansion of EWSA and (ii) vertical growth due to better management of available resources.

Horizontal growth is expected to be achieved through interventions like de-silting, de-weeding/stump removal from existing water bodies while vertical growth would be achieved through (a) incremental stocking of seed, (b) better management and higher survival percentages in respect of reservoirs and tanks, (c) developing part of resources on low input based fish culture and promoting resource integrated activities of cage, pen, cove fish culture, seed rearing etc. This would have cumulative effect on production and resource use efficiency for multiple benefits. However, the projections can be realized only with the anticipated interventions being put into force/implemented sequentially in a time bound manner.

■ **Productivity and production in reservoirs**

- Productivity of large reservoir is expected to grow from 140 to 200 kg/ha, and medium reservoirs from 170 to 250 kg/ha.
- In case of small reservoir (long seasonal), productivity is anticipated to enhance from av. 400 to 600 kg/ha under conventional practice and up to 650 kg/ha in low input based resource development. While in perennial system, productivity in conventional practice is anticipated to enhance from 475 to 650 Kg/ha and in low input based practices 650 to 750 kg/ ha.
- The overall present av. productivity of reservoirs is anticipated to increase from 237 to 350 kg/ha (increase by 47.7%) with an annual gain of nearly 8% and
- Overall share to total fish production of the state from 0.29 lakh tons in base year to 0.56 lakh tons (increase by over 93% and average annual gain of over 15.5%).

■ **Productivity and production in tanks**

Productivity gain in conventional fish culture of perennial tank is anticipated to make progress from 800 to 1000 kg/ha (gain of about 25% and av. annual gain of nearly 5%) and in low input based fish culture up to 1100 kg /ha. (60% gain and av. annual gain of nearly 12%).

Similarly, in case of long seasonal tanks from present 600 to 850 kg/ha under conventional fish culture (gain of about 41.7% and av. annual gain of nearly 10.4%) while in low input fish culture up to 900 kg/ha (about 50% gain and av. annual gain of nearly 12.5%).

Productivity gain in short seasonal tanks is anticipated to increase from present 400 to 750 kg/ha under conventional practices (gain of about 88% and av. annual gain of nearly 14.6%) and in case of low input based fish culture about 825 kg/ha (gain of about 106% and av. annual gain of over 17.7%). In seed rearing tanks the anticipated fish productivity as residual fish will be about 42 to 180 kg/ha.

Present production (all tanks) estimated at 0.83 lakh tons (2016-17) shall increase to as high as 2.40 tons by 2022-23 (increase by over 189% and average annual gain of over 31%).

Anticipated share of long seasonal tanks will be maximum (52%; 96210 tons) followed by seasonal tanks (39%, 72497 tons) and perennial tanks 16142 (9%) respectively to total tank fish production in 2022-23.

The projected production would come from combination of effects such as (a) increase in EWSA, (b) incremental stocking of seed (c) reduction in loss due to mortality.

The projections can be realized only with the condition that each of the conditions (assumptions) are put in practice. Any deficiency/ delays in implementation of any of the schemes/conditions would have proportionate negative impact on the fish production.

The detailed workings on projected fish production is given under **Annexure 5.7**

5.4.3 Low input based fish culture

Intervention of low input fish culture is proposed for natural resources where ever feasible in order to enhance resource productivity. A number of tanks and smaller reservoirs which are not used for human drinking water purposes can be exploited to enhance per unit productivity. As these resources offer scope for low-input based aquaculture under which locally available feed /material like rice bran, flour mill-left-over besides other pre-stocking techniques with use of lime, cow dung etc. could be followed. In fact some progressive PFCs have already initiated these practices in a small way but it is only in isolated cases. No systematic program is so far in place by the State.

Table-36 Projected area for low input fish culture (EWSA in ha)									
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Reservoirs	-	-	1677	2554	3442	4476	5701	5701	5701
Tanks	-	-	20587	33566	46693	57979	69264	69264	69264
Total	-	-	22264	36120	50135	62455	74965	74965	74965

Under the activity, EWSA of over 5700 ha of small reservoirs with less than 500 ha water spread and over 69000 ha of tank area of all the categories both under Department and GP is proposed in phased manner. It is anticipated to bring in about 75000 ha under low input fish culture.

5.5 Aquaculture

The commercial aquaculture is in its initial stage in the state as there only a few commercial aquaculture activities in the state. The government has no major say in commercial aquaculture activities except registration of the farm. There is no norm for stocking or species used (other than banned species). The farmer chooses species depending on his infrastructure and management capabilities. The normally grown species are Indian Major carps viz., catla and rohu and to a limited extent mrigal and common carp. The Grass carp is also stocked generally in ponds infested with weeds or where there is availability of weed as feed for it.

Box: 5 Species share in aquaculture

- Vary from district to district
- In general share of Indian carps catla, rohu is between 75% and 80% to total freshwater fish production
- Common carp account for 15-20%
- Grass carp (5-10%).
- Silver carp, catfish (Pangasius) and murrel account for <5%.

Box: 6 Aquaculture practices

- Growing new trend among aquaculture entrepreneurs towards farming other species like murrel, pangasius, tilapia, Freshwater prawn, vannamei which fetch better returns compared to conventional carps.
- It is informed that a number of farmers are cultivating pangasius fish in Rampuram, Rangapuram, Buniadhipuram, Gummadam and other villages in Pebberu mandal of Wanaparthy district.
- The activity of private aquaculture was initially started in some of the canal fed mandals with farming of African catfish and later after the govt. ban, farmers continued the activity by switching over to rearing pangasius fish.
- In a bid to get more profits wet feeding with chicken waste gained importance in order to increase the size/weight of fish, but resulted in water quality problems. Later, many have switched over to feeding with boiled broken rice, rice bran and oilcakes. Only a few are practicing feeding with formulated feeds and use Company produced floating feeds. The high cost of feed and the prevailing market price of fish have restricted usage of this feeding practice.

The activity at present is pursued in farms of smaller size ponds/tanks as small enterprises and is scattered, taken up in rural pockets. In the study districts of Yadadri, two farms of size > 10 ha size farming IMC and murrel, and also seed rearing of rohu was visited. Similarly in Pebbair mandal of Wanaparthy study team could visit one farm of nearly two ha taking up farming of pangasius and vannamei farming. Tanks constructed by private individuals and using it for aquaculture activities are very small in number and are scattered here and there. Other water bodies constructed under different central and state schemes are nowhere in the reckoning in so far as fisheries activities are concerned.

5.5.1 White prawn (vannamei) farming

Fish production from aquaculture systems in the state is mainly targeted to domestic markets, destined for local consumption and for sale in local fish markets. Only varieties like vannamei is farmed in negligible areas in locations like few mandals of Wanaparthy and Gadwal districts and is destined for export. The produce is supplied to whole sellers of AP (Nellore).

The farmed fish viz., IMC, Pangasius, Pacu etc are marketed on farm site and supplied to wholesalers/merchants. The farm produced fish is also being sent to outside state viz., Maharashtra, Karnataka, Kerala etc. As the demand in local domestic market is limited for fish varieties like Pangasius, tilapia etc, it calls for focus on value addition viz., preparation of fillet, and bone less etc in years to come in order to expand production of these fish species under land based farming.

5.5.2 Cage/pen culture for fish farming /fish fattening in reservoirs and large water bodies

Cage culture on commercial scale or for livelihood is not observed in most of the study districts. The Department of Fisheries is conducting trials in some reservoirs in LMD, Wyrā etc and the main species farmed is pangasius. Tilapia farming was experimented in selected reservoirs and the economic feasibility was not encouraging to promote / expand the activity on a commercial scale. The low market price and reduced market absorption worked against wider expansion of the activity at present.

5.5.3 Re-circulating Aquaculture System (RAS)

Re-circulating Aquaculture System is another new fish production system coming up under closed system of farming exclusively on feed and under intensive system. Aspects of selection of right candidate fish species of high market value and consumer preference, uninterrupted power supply at reasonable cost, availability of quality water, high quality and high dense feeds, needed support services including technology hand holding, consultancy, capital and insurance support to reinforce the practice for scale up to commercial levels are the new need of this segment. IPAT farming system is regarded as upcoming technology for enhancing fish production.

5.5.4 Backward and forward linkages

Although complexity in aquaculture activities is less in Telangana state as compared to state of Andhra Pradesh the segment is constrained by

- Lack of development approach as it requires complete production, supply and value chain approaches.
- Lack of commercially viable technologies developed for the fishes of demand with proven profitability, and sustainability.
- Low awareness on aquaculture activities - in most districts, fishers are new to high potential fish farming segment.
- Limitations of viable units in operation demonstrating the technologies and its economic viability, with many business components unanswered.
- Lack of skill with fishers/ entrepreneurs - limitations of trainings, technology hand holding, and limited supportive schemes back ward and forward support services.
- High dependence on out sourced seed of cultivable fish species viz., Nile tilapia, sex reversed tilapia, GIFT, Cohort strains, hybrids of tilapia, murrel, other catfishes Indian catfish, singhi, Anabas, freshwater prawn, vannamei etc. and the seed quality issues have limited the present expansion of activity.
- There is significant gap in availability of commercial feed inputs. The high cost of feeds has also restricted their usage in the ongoing fish farming. Only in vannamei farming commercial feeds are being extensively used.
- Most farms are not registered with DOF, waiting for approvals, facing delays in registration and availing scheme benefits.
- Limitations of infrastructural facilities.
- Lack of capital input and limited institutional finance support - activities are capital intensive.
- Limited market access including niche market for specific fish species farmed – eg. pangasius, tilapia etc
- High risk of disease out breaks, sudden water quality problems etc.
- Lack of institutional mechanisms to facilitate segment for better benefits with more synergy and complementarity.
- Limited availability of water bodies with assured water throughout the year/crop period in order to pursue the activities of aquaculture (cages and pens) in natural water bodies.
- Operation of ‘**Tragedy of commons**’ in case use of use of natural water bodies for aquaculture.
- Other constraints that are of multi dimensional in nature are the climate change, poaching, natural calamity of cyclone and floods, drought, erratic and untimely rains, high production cost on account of high input cost and transactional cost etc.

5.5.5 Challenges in Aquaculture

- Limited availability of Tanks / ponds under private ownership constructed exclusively for aquaculture activities.
- Inadequacy in appropriate support system- Farmers receiving little or no help from Government in support of private aquaculture; challenges of power supply – much spending on alternative power sources; limited access to quality water – use of bore wells to get enough water for aqua business.
- Lack of institutional arrangement for effectively pursuing scientific fish farming (semi intensive and system specific farming), responsible aquaculture with environmental consideration, organic fish farming etc.
- Lack of managerial experience in bringing down factor cost, enhancing cost effectiveness through better input management under diversified aquaculture systems viz., use of organics and in organics, feed, health care products....
- Lack of hands- on -experience in maximization of water productivity – multiple and conjunctive use of water in support of aquaculture, Energy management, Better health management etc.
- Inadequacy in innovative marketing, improved post harvest, processing and value-addition.

Efforts of DOF are going on for positioning appropriate support system in terms of hand holding for input based practices and facilitation for better access to inputs. Further, the positioned supportive schemes and programs to facilitate needed shift from extensive farming package to better farming approaches of increased stocking with desired species mix, use of production enhancing inputs viz., manure, fertilizers, feeds & feed supplements (semi intensive farming protocols).

5.5.6 New opportunities

The state offers huge potential for promoting freshwater aquaculture and has better opportunities for aquaculture development. It can grow as a sunrise segment, and has potential particularly in helping the rural poor and the women. Since the consumer preferences are changing towards murrel, catfishes, tilapia, smaller fishes, prawn etc., taking several crops in a year is becoming a reality.

- Fisheries and aquaculture could be a sustainable alternative for agriculture farmers owning water logged and problematic lands, abandoned agriculture land etc.
- The sources of growth in aquaculture segment in general are through area expansion and yield increase (increased inputs and/ or greater efficiency in use of inputs).
- Technologies are the main drivers of growth and diversification of fisheries towards aquaculture viz., poly culture carps and others species of fishes, freshwater prawn farming both under mono and poly culture, vannamei farming in low saline waters, semi intensive input based farming; integrated farming along with various agricultural, horticultural and animal husbandry farming systems are the new opportunities.
- Converging low input based fish culture in small reservoirs and tanks, also promoting fish farming in non conventional water bodies, small scale freshwater carp/catfish culture in seasonal ponds are the new opportunities that could be explored.
- In most of canal irrigated regions of the state, paddy is predominant crop and also other agricultural crops with scope for generation of agricultural by products. Availability of rice polish, bran (oiled/ de-oiled), broken rice, oil cakes/meals at reduced / competitive cost is another new opportunity for better promotion of aquaculture activities initially focused in these regions and later taking it forward to other areas of better positional advantages.
- New opportunities in aquaculture also includes pursuing of feed based aquaculture under closed systems; cage and pen fish culture in reservoirs and large perennial tanks, small scale freshwater carp culture in seasonal ponds, air-breathing fish culture in sewage fed water bodies, ornamental fish farming etc.
- Use of primary treated waste water in commercial fish farming is a new opportunity that has emerged mainly in urban and peri-urban regions and has thrown open new options for promoting aquaculture in the potential locations/regions.

5.5.7 Projected Aquaculture production

Apart from the two major conventional sources viz., tanks and reservoirs for fish production, the state is looking forward to enhance production through aquaculture in a planned way by emphasizing on promotion of new farming systems that have greater production potentials with high profitability and environmental sustainability. The focus of aquaculture production systems will be on both land based farming and water based practices of cages and pens. It is also intended to support closed farming systems viz., RAS on a limited way till it gain commercial feasibility for further expansion. Each production systems has very high potential for development, given necessary encouragement and push through financial and technical support. Of the 1.464 lakh tons of projected production from sources other than reservoirs and tanks, around 0.964 lakh tons is estimated to come from aquaculture sources (nearly 66%).

The projected production of 60000 tons of fish is anticipated from land based aquaculture followed by water based farming viz., Cage culture (20000 tons) and pen culture (6000 tons). Close farming system RAS will have moderate to small contribution to the fish production (100 tons) in the beginning and is anticipated to have better share to total fish production (400 tons) depending on the economic feasibility and success of this farming system in the state. Aquaculture development and promotion should receive high priority in view of its high return potential but calls for huge investment and enterprise. The present estimated area under aquaculture is around <1000 ha (784 ha) and the production is around 3905 tons annually. It is suggested to be raised to 60000 tons annually from year 2021-22 onwards with moderate targets during the first two years (7000-21000 tons). Productivity under this system is substantially high and ranges from 4 tons to 6 tons. It is feasible to project 4.5 tons in the initial one year which would increase to 6.0 tons by fourth year. This scheme could result in incremental area gain by 9000 ha from the present <1000 ha and production of over 40000-45000 tons fish and over 15000-20000 tons of freshwater prawn and vannamei shrimp during the projected period.

It is possible to bring an area of 1000-2000ha under mono culture of vannamei under low saline areas complying the environmental considerations as suggested in national guidelines. It is expected to yield about

5000-10000 ton/crop (production @ 5ton/ha in 100-110 days crop period) and one can take minimum 2 crops in a year. This will result in about 10-20 thousand ton production share to aqua production of the state value worth Rs. 350-700 crores. Similarly with promotion of freshwater prawn farming both under mono (about 1000 ha) and poly culture along with fish it is possible to produce about 5000 tons/year contributing to Rs.100 crores. Production of freshwater prawn from reservoirs and perennial tanks is anticipated to cross over 10000 tons/yr. (worth Rs.200 crores). In overall terms, the state has opportunity to produce about 15-20 thousand tons of prawn in support of international export that has potential to generate over Rs. 1000 crores foreign exchange to the state.

Table -37 Details of projected fish production – aquaculture systems (in tons)

Particulars	2016 - 17	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	2022 - 23	2023 - 24	2024 - 25
▪ WSA ha	784	1600	4200	8200	10000	10000	10000	10000	10000
▪ Productivity ton/ha	<4.0	4.5	5.0	5.5	6.0	6.0	6.0	6.0	6.0
▪ Aquaculture production (in Tons)	3905	7200	21000	45000	60000	60000	60000	60000	60000
▪ Gross Income (Lakh) @Rs.100/kg	3905	7200	21000	45000	60000	60000	60000	60000	60000
▪ State Income (in lakh) (factor Cost @ Rs 50000/ton)	1953	3600	11500	22500	30000	30000	30000	30000	30000

Note: Area requirement is given both in progressive and incremental method; Productivity is assumed at 4.5 tons in the first year since this is a new venture and entrepreneurs may tend to make some mistakes in management and subsequently learn by experience; Sale price is taken at Rs 1.00 lakh / ton; State income at Factor cost is assumed at Rs 0.50 lakh /ton.

5.5.8 Cage aquaculture -production projection

Cage culture is proposed to be promoted across selected large and medium reservoirs that have better water depth and shelter points to position cage batteries assessed after a detailed Techno-Economic/Techno-Commercial study. It is feasible to use up to 1% of the EWSA of reservoirs for cage erection and the proposal envisages positioning of 4000 cages or 400 Batteries of 10 cages/battery unit could be promoted. The annual phasing of cage construction and functioning is assumed to be on an year to year basis.

Table-38 Projected production from cage aquaculture

Particulars	2016- 17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Productivity/ cage tons)	-	3.0	3.5	4.0	4.5	5.0	5.0	5.0	5.0
No. of cages	-	850*	1700 (850)	2600 (900)	3600 (1000)	4000 (400)	4000	4000	4000
Cage culture production (in tons)	85	2550	6000	10500	16200	20000	20000	20000	20000
Gross Income(lakh)	68	2040	4800	8400	12960	16000	16000	16000	16000
Employment (Lakh mandays) @250 man days/ cage	-	2.125	4.25	6.50	9.00	10.00	10.00	10.00	10.00
State Income (factor Cost) (Rs. 60,000/ton)	-	1224	2880	5040	7776	9600	9600	9600	9600

*Note:1 productivity is projected to increase gradually from 3 to 5 tons even though this could go much higher. 2. sale price is taken at Rs 80,000 ton; 3. State income at factor price at Rs. 60,000/ton; 4. employment generation @ 250 man days/ cage including marketing; 5. Number of cages based on production /per cage; 6. Annual additions are given in parenthesis. *The DOF has proposed for established near about 850 cages during the year.*

The fish production from pen culture is anticipated to increase from moderate 1600 tons to 6000 tons by 2021-22. For the same year the projection made for RAS system is expected to contribute about 400 tons.

■ Pen and RAS aquaculture -production projection

Table – 39 Pen and RAS aquaculture

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
■ Pen culture production (tons)	-	-	1600	2500	3600	4500	6000	6000	6000
■ RAS system production (tons)	-	-	100	165	305	400	400	400	400

■ Summary of aquaculture production projections (tons) as against total fish production projections

Table – 40 Summary of project aquaculture production (tons)

OTHERS	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
■ Aquaculture	3905	7200	21000	45000	60000	60000	60000	60000	60000
■ Cage culture	85	2550	6000	10500	16000	20000	20000	20000	20000
■ Pen culture	-	-	1600	2500	3600	4500	6000	6000	6000
■ RAS system	-	-	100	165	305	400	400	400	400
Total	3990	9750	28700	58165	79905	84900	86400	86400	86400

In addition it is anticipated to produce over 10 thousand tons of freshwater prawn production from aquaculture sources. The projections can be realized only with the condition that each of the conditions (assumptions) is put in practice. Any deficiency/ delays in implementation of any of the schemes/conditions would have proportionate negative impact on the fish production.

5.5.9 Fish production Trends

During the last two years, drop in fish production is being witnessed across all the districts excepting in districts which received better rainfall and also in districts with better canal fed systems supporting tank water bodies and also reservoirs by lifting water from main reservoirs and feeding through canals on regular basis to support drinking, irrigation and fisheries activities.

- The production estimates are made merely based on the water spread area as in records, fish seed stocked and reported fish harvest by the FCS members.
- Impact on farmer's income is lower because of reported lower output, WSA area shrinkage associated to fisheries activities and usage of water for agricultural activities and other uses at various points of time during the culture period.
- Negative impact of tank over flow, fish escape from water bodies, loss of fish from reservoirs when the water is let out to canal for irrigation activities (case study of Pocharam reservoir), poaching by non members (vary from 5-10%) and such other leakages, own use of fish for family consumption, sharing of fish for good will etc and are not taken into account in the estimation.

The information on the five year fish production (2011-12 to 2016-17) is given below that indicates fluctuating trends in fish production.

Table – 41 Trends in Fish Production

Year	Fish production (in tons)	Av. Productivity* in kg/ha
2011-12	196,708	621
2012-13	214,591	677
2013-14	243,037	767
2014-15	260,017	821
2015-16	228,186	730
2016-17	193,732	611

*based on EWSA of water bodies as 316695 ha; Source: DOF, Govt. of Telangana

5.6 Fish seed production and rearing

There is growing need for quality seed to meet the demand of both enhanced fisheries (stocking reservoirs and tanks) and aquaculture. Thus meeting the demand is one of the major challenges for growth of fisheries and aquaculture sector in the State. Further fish seed cost is the single most cost component of high significance that need to be invested in the very beginning of the fish culture activity itself with many unforeseen uncertainties and risk factors ahead. The poor performance of stocked fish is likely to reduce growth and survival of fish which can cause considerable economic loss to the fishers. It is the major cost that decides very profitability of activity. Seed production of cultivable carps and access to quality fish seed in right quantities and timely supply is a pre-requisite for successful and sustainable fisheries and aquaculture development. Scenario on seed production and outsourcing in districts visited by experts is given in **Annexure 5.8**.

■ Pointers on seed production

- The state at present is producing seed of key cultured species with more emphasis on catla and rohu (over 80%) and exotic carps CC, GC, SC with priority on grass carp and common carp (10-20% in one or two hatcheries).
- The production of quality seed (active, healthy in appearance, uniform in size, potential for high survival, faster growth, less or no diseases) of cultivable fish species is at present in low focus though holds the key for the success of the sector in years to come.
- Out of 11 districts visited by experts, except Mahabubabad, in all the other districts seed production/ rearing activity was observed. The study districts have 2 Govt. Hatcheries, one private NGO KVK hatchery, 8 Govt. Seed rearing units and 4 private units.
- In both Govt. hatcheries, utilization of designed capacity is about 40-50%.
- Intensity and efficiency of activities under govt. and private system is diverse and varied significantly depending on the scale of operation and the involvement.
- In District of Wanaparthy, although Govt. seed farm is located adjacent to perennial reservoir with all built up infrastructure supporting the activities it is defunct and has been recently handed over to private entrepreneur for development.
- In Kamareddy district, though the seed production and rearing farm has all the infrastructure facilities of earthen/cement tanks of varied sizes with water facilities, office, seed packing etc. and located next to large reservoir, it is not active to harness its potentials.
- In two districts (Medak and Karimnagar) where in govt. Seed production and rearing farms are functioning, the share of internal seed production to total seed requirement of districts is only 10-23%.
- Private seed rearing is being pursued in the districts of Karimnagar, Mancherial, Wanaparthy, Jagtial and recently in Yadadri contributing to the district seed production and meeting part of district seed demand in a limited way.
- In the absence of reliable data, the share of private is approximated to 10-20% of district demand based on interaction with DOF officers and the seed producers.
- Most of the private seed growers are not registered with the state department and not availing any benefits thus are not accountable to state.

The total seed requirement of the 9 study districts is around 23.54 crores which is about 40.5% of the states requirement (58 crores). Whereas the total seed production from these study districts is only around 2.10 crores and contributes to only 12% of the requirement of the study districts that are pursuing the activity and 3.6% of the state total seed requirement.

5.6.1 Performance in spawn and fry rearing

The overall performance of spawn rearing and fry rearing in all districts is as follows:

Table : 42 Performance of spawn and fry rearing

Spawn rearing		Fry rearing	
Achievement (%)	No. of centers (%)	Achievement (%)	No. of centers (%)
100	3(10.79)	100	1(3.45)
75-100	1(3.50)	75-100	1(3.45)
50-75	2(7.15)	50-75	3(10.35)
25-50	7(25.00)	25-50	11(37.93)
1-25	5(17.85)	1-25	4 (13.79)
Nil	0(35.71)	Nil	9(31.03)

The achievement of govt. farms against target rearing of both for spawn and fry in general is poor. The overall performance of spawn rearing indicated achievement of over 50% target by only 21% farms and similarly for fry rearing only in 17% farms.

Though private seed production and rearing farms contributed to a greater extent for the seed production, absence of data has limited the performance assessment. Interaction with the owners of Private farms indicated better performance (80-90% of their designed capacity) as they make decisions on the demand and needs.

In the study districts spawn rearing and fry rearing is as follows:

Table – 43 Achievements under spawn and fry rearing

SI No.	District	Name of farms	Spawn rearing			Fry Rearing		
			Target*	Achieved*	%	Target	Achieved	%
1	Bhadradi	Kinnarsani	111	105	94.6	41	39	95.1
2	Kamareddy	Nizamsagar	65	0	0	25	0	0
3	Karimnagar	LMD	95	95	100	78	07	8.9
4		Keshavapattanam	150	0	0	55	00	00
		LMD(FFDA)	57.5	15	26	21	10	47.6
5	Medak	Medak	153	30	19.6	90	11	12.3
6	Rangareddy	Seriguda	35	10	28.1	11	03	27.3
			666.5	255	38	321	70	21.8

*Targets and achievements in lakhs

Out of nine study districts, seed rearing activity (spawn and fry rearing) in Govt. Farms is going on in 6 districts. The achievement against target in case of spawn rearing is only 38% and rearing of fry (21.8%).

Fish seed rearing practices, Brood stock management and breeding practices are given in **Annexure 5.9 to 5.10**

■ Highlights on seed production

- In both the Govt. hatcheries, brood stock are outsourced from nearby tanks two-three months prior to breeding and reared and used for captive breeding purpose. While in both the private hatcheries major requirement is being met from own farm raised brood stock.
- Cement Chinese hatchery/jar hatcheries are used. In govt. hatcheries the utilization is only up to 50% of the designed capacity because of leaking conditions of the tanks/water scarcity/ lack of man power / lack of rearing space or non timely rains.
- Scientific brood stock management practices-like sourcing good breeders with good genetic makeup; rearing own brood stock on formulated feed; mixing of year classes are not in priority of practices followed. No regular replenishment of breeder and absence of tools to identify age / year class.

- Other practices like removal of dead eggs is not followed which may result in low hatching rate and spawn survival. Normal survival from egg to spawn is low in Govt. hatcheries (around 50-55%) compared to private hatcheries (60-70%).
- Proper records are not maintained for assessing performance of the hatcheries.
- There are no species specific breeding centres for high value fish species and freshwater prawn in the state either in Govt. or private sector.
- **Gaps:** Lack of knowledge on brood stock management; negative selection, inbreeding depression over period resulting in reduced growth and fecundity, mixed breeding, poor record keeping etc.

5.6.1.1 Fish seed production of other species

- Species like tilapia and murrel are commonly seen in catches from reservoirs and tanks and there is good demand. Similarly, a good number of indigenous fish species with high consumer demand and market preference eg. mola, Jella, small and medium carps etc. are observed in the study districts but seed production or stocking of these species are not happening.
- Though murrel is declared as state fish, no initiatives for propagation and culture of this species by the govt. Under private initiative, culture of murrel is being pursued in one or two fish farms.
- There is no commercial seed rearing practice is seen for murrel, mono sex tilapia and such other commercial breeds of fishes.
- Present state seed policy does not seem to have emphasis on prioritising species to be bred/stocked based on the demand.
- There is interest in new breed of amur common carp but initiatives are yet to be taken to introduce into selected/ designated govt. seed farms (better performance of this breed is all ready evaluated both by R& D institutions and KVK system in the state).
- Systematic approach to quality seed production by way of registration of breeding centres, multiplication centres, seed growers and seed suppliers are very much lacking
- Most of the private seed rearing farms are not registered with the state department and are not availing any benefits. However, from the visit of experts to these hatcheries and seed rearing units it was found that they are capable of producing large quantities (Ex. Jagtial farm alone has claimed production capacity of about 175-200 crore spawn annually). The available farm infrastructure, brood stock strength, skilled manpower, professional management and experience justify the claims.
- Monitoring of interstate movement of fish seed, ascertaining quality through proper assessment are very much lacking.
- There is scope to bring fish seed growers into the state seed production network through registration and technical handholding apart from extending several facilitative services to them
- As such there is no certification system as the hatcheries are not registered with any authorities and at present inadequate monitoring system to check the quality

5.6.2 Fish seed rearing in non conventional resources

There are no activities of fish seed rearing in non conventional resources viz., seed rearing in peripheral regions/ tanks of reservoir shore/peripheral facilities of perennial tanks/ *In situ* seed rearing/ seed rearing in small water bodies (seasonal)/ resource tagging of seasonal and perennial tanks for seed rearing/ seed rearing in pens/ cages

5.6.3 Gaps in existing seed production and rearing systems

- Limited Infrastructure, structural problems and defunct rearing facilities
- Limitations of technologies, process and mechanisms in adoption/practices.
- Limitations in implementation, addressing production near to design capacity.
- Aberrations of rainfall, excessive dependence on rain for water supply, climatic factors, water scarcity, erratic power supply & High power tariff, etc.
- Lack of professional perfection of hatchery manager and associated staff supporting hatchery and seed rearing activities both related to science and art part of producing seed of desired quality, lack of skilled and unskilled man power.
- Poor awareness on factors that contribute to low quality seed and develop interventions (Better Management Practices to address the problems.

- Inadequacy in marketing arrangements.
- Uncertainties in making timely projections of demand and supply in accordance to the aberrations of rain fall and climatic factors, govt. programs etc.
- Lack of fish seed net works for smooth flow of seed on time and such others, etc.
- Limitations of timely management decisions because of administrative and financial reasons and absence of dedicated responsible staff limitations in Govt. run hatcheries and seed farm etc.
- Absence of special incentives for staff working in Govt. farms which is 24x7 job unlike other counterparts with fully administrative work.

5.6.4 HR related gaps in fish seed production

- In most of the seed production and rearing centres, activities are carried out more based on experience than the knowledge. Further there are no dedicated staffs exclusively for hatchery management and they are allotted multi task and struggling hard to come up with implementation of several programmes.
- There is a lack of knowledge on various aspects of seed production including brood stock management and breeding practices.
- The state has only one training centre at Warangal and is functioning with lot of limitations.
- The Krishi Vigyan Kendras has been implementing some training programs sponsored by NFDB mainly on husbandry aspects but again it is constrained by lack of staff, infrastructure and logistics. The KVK is willing to take up regular training program for DOF if required logistic and funds are made available.

5.6.5 Predicaments related to fish seed production and rearing

DOF efforts are continued to enhance the performance of many hatcheries by way of addressing the minimal gaps/constraints in a phased manner and on a prioritized approach

■ Govt. fish seed farms

- Inadequacy in brood stock ponds.
- Nursery and rearing tanks proportionate to targets fixed for output (spawn-fry-fingerlings).
- Limitation of quality water supply throughout.
- Back up water support through bore wells.
- Infra support for maintaining quality water – hardness correction etc.
- Lack of continued power supply and backup.
- Skilled labour force.
- Input related – feeds, health care products etc.
- Fish seed packing shed, exclusive storage rooms.
- Operational equipments/tools.
- Lack of knowledge on various aspects of seed production aspects including brood stock management.

General

- Hatchery and nursery operators of different scales are not aware of the options and opportunities available for them under various schemes/ programs.
- Technical standards/guidelines for the hatchery production and seed rearing are lacking.
- Lack of effective technical guidance.
- Lack of information on management practices that are documented with adequate scientific evidence and field data.

5.6.6 Fish seed stocking

Stocking of natural water bodies

The stocking of natural water bodies such as reservoirs, tanks were earlier done by the PFCS. Seed Supply and stocking by FCS was not a major problem since there were mercantile community who provide different services to these FCS such as (i) supplying seed (ii) short and medium term loan (iii) watch and ward (iv) assured market and above all, (v) total contract starting from seed procurement, stocking, watch and ward, Marketing transport etc. In this arrangement the merchants pay between Rs.35-40 / kg on pre agreed terms to the FCS which comes to the society as net income without contributing anything. The second arrangement is limited to providing money by way of interest free loans and lifting the stock when it is ready. In the process, they also bear some risk of uncertainty.

Stocking for aquaculture

Aquaculture in the state is not to the scale of commercial activities at present, being pursued on a small scale in nearly 1000 ha with multiple species of fish and prawn viz., Indian major carps, common carp and grass carp, pangasius, pacu, freshwater prawn, vannamei etc as candidates for farming. Excepting seeds of major carps rest all are outsourced mainly from neighboring state of AP.

5.6.7 Seed supply chain

- Most private seed growers procure their own spawn requirement directly from private hatcheries of AP for further rearing to fry/fingerlings and beyond and supply in support of fish seed stocking by FCS in the state.
- Seed supply chain in the districts indicates that the FCS have direct link with the seed producers from erstwhile Andhra Pradesh areas where seed production infrastructure is well organized and developed.
- Since they turn out huge quantities of seed, they achieve economy of scale and can supply seed of required quantity and quality at most competitive rates.
- As the FCS-Suppliers bond is time-tested and long standing, suppliers do not insist on spot payment and show some leniency in payment. This helps the FCS in stocking without having to shell out money.

5.6.8 Marketing and employment generation

Seed marketing chain

- Main stakeholders involved in the fish seed marketing are hatchery and nursery operators.
- Simplest form existing is a hatchery operator/seed grower selling directly to grow-out farmers, either through delivery or pick-up. Role of middlemen or seed traders is limited.
- This type of direct marketing from the hatchery/seed rearing units to fish grower is often seen when hatcheries produce fingerlings in their own rearing units or with seed growers having established access to farmers.
- Some hatchery and nursery operators may use agents to increase sales, especially in remote areas but is not conspicuous in the study districts.
- Market channels for fish seed is relatively short and simple because of the high risk involved in selling the product due to sensitivity of fish to handling stress and high risk of mortality.
- At present, the seed marketing system is working well with private farmers.
- There is no organized fish seed marketing net work existing in the state.
- Role of PFCs, Women Matsya Mitras and such organisations is limited in marketing.

The private seed producers has large network of ponds for different stage of production including brooders pond. Generally, they outsource brooders from FCS both nearby and far off places and will have access for huge quantity of brooders. Thus, the private production capacity may far-outstrips Government production of spawns. However, mere availability of facility is not enough if the required species, quantities are to be produced and supplied at competitive prices.

Employment generation opportunities

By outsourcing the seed, the State is losing huge number of man-days of employment. As per studies conducted in other states, for rearing of spawn into fry in an extent of one hectare (50 lakhs spawn) around 63 man days are required while for rearing fry to fingerlings (35- 40 mm size). Considering the huge requirement of seed for the state the employment generation at varied levels of seed growing is anticipated to be very significant.

5.6.9 Limitations of fish seed segment

- Availability of quality seed of cultivable freshwater fish species has always been a limiting factor for intensification of fish production and also for coverage of additional area proposed to be developed under aquaculture
- Unmonitored seed flow of both fish and freshwater prawn as spawn/post larvae, fry and fingerlings at different levels of production chain is happening.
- Absence of data base maintained at district level, precise estimates of seed in flow, quality and seed related transmission of disease /health related problems through seed in to state are not available.
- Major limitations in assessment of performance are poor maintenance of records of various activities. In case of private farms, though they appear to perform better and contribute to seed production (based on the interaction) but no records were available to ascertain the facts. They are not accountable to state as they have not registered with govt and not availing any benefits.
- At present is no reliable statistics. Reliable statistics can influence policy directions to build effective support services for small-scale aquaculture producers.

5.6.10 Constraint analysis

- Inadequate availability of quality seed in the state is considered as a major constraint for fisheries and aquaculture development.
- Several hatcheries and seed rearing farms are under performing, underutilized its designed capacity and a few of them are defunct/not functioning as a result seed supply is not happening within districts and beyond.
- Poor growth, mortality, low survival due to poor seed quality is increasingly seen as a major impediment to the success of ongoing practices and contributing to the economic distress of fishers involved in the activity.
- The state as such has no fish seed policy prioritizing species to be bred, regulations on breeding policy, norms for stocking different water bodies, inter-state movement of fish seed, ascertaining quality through proper assessment. All the activities are being carried out on GOs issued by DOF from time to time.

5.6.11 DOF initiatives

At present, the seed production centres (hatcheries) act as both spawn producers and seed growers of both IMC and common carp on directions of authorities and targets given.

- Considering limitations, efforts are more towards achieving targets than seed quality aspects. Incidences of mixed breeding of different species to achieve the target is also happening that will have negative effect on quality of seed in terms of growth and also genetic pollution if these seeds are stocked/ gained entry in to natural water bodies.
- State has also initiated strengthening of state owned hatcheries and seed rearing farms by renovating them for utilization to their potential and provides additional man power beside encouraging societies and private parties to take up seed production and rearing on long run to totally internalize seed supply in a few years from now.
- Defunct Government hatcheries are also being leased out to private entrepreneurs with the assurance of buy-back of seed (some in the process) . This may go well but it needs to be seen how it works in the long run.

In order to address the existing huge deficit between internal production and growing demand, the state has also launched several programs on seed production. Efforts are continued to enhance the performance of many hatcheries by way of addressing the minimal gaps/constraints in a phased manner and on a prioritized approach. The main goal of many of these initiatives is to:

- Achieve self sufficiency in the state and reduce dependency on the other states.
- Promote private sector in seed production through setting up of hatcheries and seed rearing farms and other ancillary units to produce quality seed for stocking.
- Increase over all fish production through supply of quality seed and decrease cost of seed production by internalization of seed production.

5.6.12 Free seed supply

Expansion of fisheries activities in the state over the period has resulted in growing demand for fish seed – free seed supply is a key component of DOF support service to fishers since two years. The DOF in a bid to boost state fish production and facilitate better stocking of water bodies has focused on free seed supply initially to stock reservoirs and department tanks during 2016-17 and later in the current year to all suitable water bodies (both DOF and GP tanks and reservoirs) with recommended levels.

Seed supply initiative is regarded as one of the pro active initiatives, an entry point support for resource development and support for generating additional revenues and employment to improve quality of life of fishers. The new policy initiative is regarded as pro activeness of the government towards the fishers on popular slogan of ‘Free Fish seed to all water bodies’ for enhancing state fish production. The intervention is perceived as one of the powerful tool to bring change in better resource utilization and scientific mode of development, ease out fishers /FCS from the hands of merchants/ any other hidden power groups within system (financers) wherever in practice, facilitate internal capital formation at FCS level by strengthening savings in FCS account to meet the future financial needs in support of activity during subsequent years.

The state in order to achieve the targeted production, has initiated a massive program of stocking all feasible natural water bodies with fish seed of Indian major carp and exotic carps mainly catla and rohu among Indian major carps and common carp and grass carp among exotic carps. Since 2016-17 the state govt. is fully supporting fish seed stocking activities, initially supporting stocking of perennial water bodies, both reservoirs and tank, and in the current year also supporting gram panchayat tanks (both seasonal and perennial). The stocking density of large reservoir has also been enhanced to 500 fingerlings/ha instead of earlier stocking of 300 fingerlings/ ha. The specified seed size for stocking perennial water bodies is 80-100 mm and for seasonal tanks 35-40 mm. In the backdrop of deficit in seed availability within state, over 80% is being procured through outsourcing channel by e-tender process from the neighboring state of Andhra Pradesh and others. Highlights on DOF –Free seed supply program are given under **Annexure 5.11.**

Box: 7 Salient features

- A policy action to provide required boost for sector growth against the backdrop of the growth slowdown
- Supply of fish seed on 100% grant to stock fish seed in all the reservoirs and tanks
- Transfer full benefits to the fishers in support of enhancement of their livelihood
- Control/minimize involvement of intermediaries
- Boost up state fish production
- Progress: **Target : During 2016-17** : 27.63 crores fingerlings; all perennial reservoirs and tanks: 3,939 No.; Proposed cost: Rs. 22.21 crores
- **2017-18** : 67.70 crores; 24372 water bodies including Reservoirs, Departmental tanks and Gram Panchayath tanks: **Achievement** : 47.11 crores (stocked as on date (18-10-2017);12061 water bodies that received sufficient water

5.6.13 Limitations and challenges and opportunities

■ Limitations

- Difficulties in procurement of seed in required quantities.
- Teething troubles behind in terms of delay supply, dependence on outsourced seed supply, quality issues in supply, administrative and procedural hurdles
- Transportation over long distances, which adds to the cost of inputs
- Initial lack of eager want of the initiative by FCS and others at different levels (counters strategies of merchants, wrong rumours on initiative, negative comments on quality of seed and delay in supply etc.)
- DOF adoption of push strategy – eligibility of PFCS for fish seed stocking by default, inadequate efforts in creating awareness on the program, its objectives and expectations
- No frame work for the participatory implementation with defined roles and responsibilities of the beneficiaries
- Lack of efforts for imbibing uptake strategies after withdrawal

■ New Challenges

The last mile connectivity has always been a challenge, with fishers facing high seed cost, problems of timely availability and quality, exploitation by the seed suppliers of outside state, witnessing draining of sector money allotted by the state for development to neighboring states.

■ New scope and opportunities

- Scope for aligning fish seed variety, number, size supply in accordance to resource typology, past history and experience of PFCS on performance of fish varieties.
- Bridging consumers demand and market demand.
- Enhancing overall profitability of the activity.

5.6.14 Seed demand, supply and projections

Seed demand and supply

The state at present is not equipped with required infrastructure and technical staff to meet the huge demand and has no option but to look elsewhere to meet the demand on a short term. The state needs to have strategies to achieve self sufficiency in meeting the demand in the long term.

The seed requirement is estimated based only on assumed EWSA of 75% of TWSA in case of reservoirs and perennial water bodies, 50% for long seasonal and 25% for short seasonal tanks. During 2016-17, area under both long seasonal and short seasonal tanks has been merged and regarded as seasonal category with 50% as EWSA.

Fish seed requirement for stocking different resource category was estimated considering stocking density @500/ha for large reservoirs, 1000/ha for medium reservoirs, 2000/ha for small reservoirs and perennial tanks with 80-100 mm size; and 3000/ha for seasonal tanks with 35-40 mm size throughout the state. This needs a relook in the light of revised EWSA worked out based on field realities and situations as referred in projections made for fish production.

Assumption of area, seed production (spawn) and seed rearing for estimating projections of fingerling requirement and necessary backward infrastructure support.

Model for production of one crore spawn and SWOT analysis fish seed production are given in **Annexure -5.12 and 5.13.**

Fish seed Demand projection

Table – 44 Seed requirement Projections (in crore)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Est. Spawn req.	255.34	272.40	283.16	292.38	303.83	303.20	304.82	304.82
Est. Req. of Fingerlings of varied sizes	40.10	45.47	49.97	54.35	58.05	59.88	60.18	60.18
Add 10% :		4.55	5.00	5.44	5.81	5.99	6.02	6.02
Est. total Req. of Fingerlings	58	50.02	54.97	59.79	63.86	65.87	66.20	66.20
Est. Spawn req.		318.63	329.27	339.01	343.57	344.50	335.63	335.63

- The state has present designed capacity for spawn production of 222 crores. While the Est. requirement of spawn is about 319 to 336 crores (can meet up to 44% of initial spawn requirement). Considering the projected requirement of spawn, the gap in designed capacity is estimated at 97 to 114 crores for the projection period.
- Estimated present fish seed production from the DOF farms is at 4 to 5 crores fingerlings (35-40 mm size) and from the private sector about 11.3 crores. The total fingerling production from both the sources is estimated at 15 crores.

As per the projection plan, for technology led development of different water bodies the requirement of fingerlings will be in different sizes of > 10 cm, 80-100 mm and 50-60 mm and the estimated fingerlings in equivalence of 35-40 mm size for meeting the requirement is worked out to be between 57- 86 crores (on survival assumptions of 80%, 70% and 60% for further rearing of 35-40 mm fingerlings to 50-60 mm; 80-100 mm and >10 cm respectively).

5.6 Fishermen Co-operative Societies (FCS)

Enhancement of resource productivity and fish production in the state can happen only with shared goals and efforts of the DOF and PFCS. In this backdrop, the fisheries activities in the state are traditionally linked to Cooperative institutions. This system inherited from the undivided Andhra Pradesh, is being continued now with more and more FCS being formed / registered across the districts after formation of Telangana State.

The states entire fish production activities are dominated by the Primary Fishermen Cooperative Societies by virtue of the GOTS policy of leasing the water bodies only to the societies. This has motivated fishermen communities to get into Cooperative fold in order to get benefits of number of schemes and programs. This approach is good from the point of view of affording equal opportunities to the fishermen community in engaging themselves in various economic pursuits and earn livelihood. This is also in tune with state on poverty alleviation among the fishermen communities.

Although this system of leasing resources entirely to FCS for fisheries development is conducive from the point of equitable distribution of wealth and welfare, but over period has led to monopoly with no accountability, no data records and sharing. The lack of traceability and transparency in working of these Societies has resulted in negative impact on the comprehensive sector growth. It is seen that there are two sets of society's i.e. Homogenous and Heterogeneous, the first category societies are dominated by single or two major communities where the leader wields good power and controls the rest. In respect of second category where members are drawn from different communities and villages, the situation is very disturbing with disputes, differences, power groups etc which go unchecked and the DOF has technically/legally/administratively no role nor control on them except when the societies are found at fault (which seldom comes to the notice). The societies are not maintaining transparency in their dealings and go unchecked. It is also seen that the societies do not feel the necessity to keep contact with the Department except on matters relating to subsidies and benefits. Hence, unless drastic steps are initiated, the style of functioning of FCS will not change materially.

It is unreasonable to term all the FCS as poorly managed institutions at one go. Good number of them does perform well and deliver their responsibilities. Efforts made to understand and assess the working of the FCS in study districts were successful to a limited extent since most of them do not adhere to transparency in their working for reasons best known to them. However, it is reasonable to conclude that there are two sets of conditions relating to their working namely:

- Where an FCS is dominated by one single community such as Mudiras or Bestas, their performance appears to be good. This is because of Office bearers obligations towards their community and often their urge to "Unite" in sharing the usufructs. Besides, they also show more understanding and adjustability in their working, be it sharing the cost or benefits.
- FCS which do not have homogenous composition of membership have been performing very badly due to internal rivalries/inter-community feelings and sense of "Neglect" by the other community members. This situation gets aggregated when a water resource benefits more than a single village. Inter-village and Inter-community differences take a serious proportion of problems thereby jeopardising the very working of this institution which is expected to strive for equality among members and cooperative concepts.
- Good number of FCS is also confronted with litigations and legal battles.
- Over-indulgence/interference of politics also is another reason for bad and poor management of the FCS.

Average size of the society ranges from 46 to less than 100 and in very few cases, membership is larger than 100. The FCS have been admitting/associating some of their community men as an obligation and with a view to helping them get benefits from schemes and income. Most of these societies have not built any reserves and have fragile financial standing/status since the annual income from the water bodies allotted to them is distributed among members (in some cases non-members and community members). Most of them claim to

be financially weak and in majority of cases, report losses in their reports. It is difficult to cross-check the authenticity of their claims. Maintenance of secrecy in operations and dealings, and inadequacy in sharing right information by the FCS has limited the conclusive observations on working of the institutions.

5.7.1 FCS functionality

- Many societies are controlled by merchants /market intermediaries without much involvement of members. Most FCS is indirectly managed by Trade Lobbies in many instances. This has resulted in
 - Less organizational powers for members in the societies.
 - Inadequacy in sustainable development of FCS.
 - Gaps in organizational management.
 - Lack of entrepreneurial leadership.

Box: 8 Effectiveness of PFCS

- Effectiveness of PFCS functioning in resource development is the key for the very success of fishing sector.
- FCs is performing regulatory functions by organizing members for watch and ward and also participation in fishing / harvest; marketing of fishes; facilitating for training and other educational activities.
- Providing organizational base at the grass root level for the DOF in support of resource productivity enhancement, sharing experiences for resource development approaches.
- Support for compliance to conservation measures.
- FCS is availing benefits of Govt., schemes and is functioning with the backup of state promotional initiatives.
- State does not have self declared societies/NGO promoted societies.
- Under IFDS program, it has been made mandatory for the society to have completed financial audit for last 2 years to be able to avail benefits which are available for societies.

- Variations are observed in the functioning of society wherever the leaders (president/executive) are educated with better group management skill and dynamism (RAMNPAD/GOPALDINNE); Also in societies where members mainly belongs to higher socio-economic status (Singhaboopalam-Kothagudem) and all members belong to single community.
- Wherever association of FCS with DOF was better, functioning of such FCS was good.
- In all the FCS interacted by the experts, it was found that the loyalty of the members have been retained and focus of the activities were mainly on maximizing the output from the resource allocated, increasing the income and livelihood benefits

Gaps – related to functionality: Lack of ownership in development of resources for various reasons both by the FCS or its members is a matter of concern. There is high level of absenteeism and lack of involvement by members in many PFCS to whom the access of state resource has been allotted on priority for development. Lack of participatory functioning, transparency and absence of innovativeness in leadership towards diversified activities are the issues that need to be addressed.

Gaps- General

- Lack of knowledge on resource productivity potentials, new technologies, process, and management tools & approaches to harness potentials.
- Huge deficit in social preparation of members through trainings, technology mainstreaming, managerial capacity building on leadership, operational efficiency, compliance to regulations etc.
- Lack of exposure to members for better technology adoption or improving their existing operations with better management.
- Scarcity of multi-skilled man power in FCS for pursuing diversified activities of the sector using the available resources.
- Higher dependence on traders in most instances.
- Vulnerability to illegal fishing as evidenced by rise in incidences of theft/pilferage of fish (apparently due to rivalry between villagers and communities on issues of resource sharing, conflicts with other users and social problems).
- Leadership problems in some of the FCS and inadequacy in organization management.
- Lack of proper procedures in FCS management and monitoring of progress – fish production, financial progress, benefit sharing, conflict resolving etc.

- Within FCS there is varied power and perceptions of member's and office bearers are running the show.
- Lack of participatory approaches in society governance.
- Internal exploitation of members, Conflicts in terms of adding new members to the society and sharing of resources, hijacking of benefits by few members of the society etc.
- Production estimates shared by society are not realistic and under-quoted.

■ Constraints and limitations

- Within PFCS there are disputes and internal rivalries relating to business and scheme benefit sharing, especially where there is heterogeneity of membership and minimal in homogenous group (viz., Mudiras, STs etc).
- Society executives showing more interest to improve their own lot.
- Minimal role play and involvement of DFCS and State Federation for the welfare of society members.
- Poor in-house mechanisms for resolving conflicts within group.
- High cost on purchase of fish seed and nets (frequent replenishment of gill nets- once a month or once in 2-3 months depending on stumps, submerged vegetation and nature of basin).
- Problems of transportation to market when catches are in excess (generally over 70-80% of fish harvested spread out in 3-4 months during summer).
- Problems of storage and marketing resulting in distressed sale for lower prices.
- Lack of access to finance and absence of institutional finance services.

There are **constraints** like in tribal areas no efforts appears to be visible to promote any FCS since the Tribal communities have better understanding and believe in village head as leader. Further, there is limited scope for private initiative for individuals and for improved fisheries operations like aquaculture/input based fish culture. Limited staff in DOF and presence of limited sector related institutions/agencies for institutional collaborations at different levels for sector activities is also a constraint that needs to be resolved.

Box: 9 Why FCS join hands with merchants?

- **Resource access rights** from Govt. to FCS more on concept of inheritance. Many FCS are on lease for generations.
- **Vulnerability:** poor economic background, inability to meet huge investment for seed stocking and meet cost of lease.
- **Opportunity value:** emergence of new opportunities and gradual shift in occupation by fishers; subsistence v/s commercial activity; ease of doing business.
- **Lack of awareness,** no institutional support, lack of entrepreneurship, lack of training, technology hand holding etc.
- Arrangement with merchant does not involve spending of money for resource development.
- Merchant take care of all production and development related activities.
- Access for easy money as advance for sharing and additional money after sale of fish depending on pre agreed price.
- Arrangement has facilitated in sparing their time for other occupation/activities to earn additional income.

5.7.2 Per capita resource availability

In the backdrop of Govt. defining the area limits per member (as TWSA) for different water bodies, per capita resource availability for FCS and members (fishers' family) was worked out based on TWSA and EWSA of the water bodies (provided by the DOF) for the most recent year (2016-17). This has been worked to understand the status of FCS in terms of resource access for their fisheries related activities. The estimates are made both for leased reservoirs and tanks and Licensees for reservoirs. As for the license system, licensee per capita has been worked out in terms of existing licensee numbers as well as targeted numbers. Further in case of tanks, fishermen per capita have also been worked out as given under **Annexure 5.14**.

It was seen that the total number of members and the allotted water bodies are not in accordance with the DOF norm of one member for one hectare of water spread area.

5.7.3 Enrollment of new members

Most of the FCS have been admitting “NON MEMBERS” in addition to the regular and registered members for various reasons/ compulsions. Such as

- Social obligation/community obligation with new generation of young person’s aspiring to get into fisheries activities.
- Meet financial requirements of the FCS through additional injection of funds from informal arrangements with non-members since many old members may not be financially sound to contribute their share of expenditure though they are eligible to share the income.
- Good number of non-members take overall responsibility of stocking and marketing of fish and thus bring additional resources.
- Some of the FCS takes help of such non-members in reducing the stranglehold of merchants who often dictate terms.
- It was seen that the number of non-members has swollen to almost 40- 50% of the regular number of members in most of the FCS.

5.7.4 Perceptions of members

- On-going activities in resources/water bodies that are leased to PFCS in most instances is less remunerative.
- Resources are gradually becoming non-performing assets from the view point fisheries development due to
 - Predicaments of seasonality.
 - Short duration of water retention.
 - Multiple use and exploitative usage mainly for irrigation.
 - Increased siltation, weed infestation, encroachment, pollution, stumps, etc.

5.7.5 Challenges & opportunities

- Declining productivity and profitability are working as disincentives for the younger generation of the PFCS resulting in change of profession and migration to semi –urban/ urban areas in pursuit of new activities.
- Ensuring decent income to the members of FCS for the efforts and investment put in- FCS members complain of meagre income or total loss during drought for the hard labour and investment.
- Strengthening PFCS in both the factors of cooperative success viz., functions and management, economic factors and governance – need more participatory approaches in societies, ownership of members in development of resources and inclusive institutional growth.

There is a great potential to entice youth towards fisheries sector. The DOF has a chance to make a difference in the FCS functioning and bring enhancement in system productivity and fish production.

5.7.6 DOF initiatives

The members of FCS are also being supported through various inputs, accessories etc under different developmental schemes and welfare programs. Major focus is on supporting for crafts and nets as they need to replace from time to time. Recently new arrangements have been made to facilitate FCS members for applying online to avail scheme benefits through eLaabh system wherein release of subsidy is made directly to the beneficiary’s bank account.

5.7.7 Women Fishers Co operative Society (WFCS)

■ Women in fisheries

Women Fishers Co operative Societies are promoted by the DOF with a view to empower the women folk and enable them to be self-reliant; pursue viable and sustainable livelihood activities under cooperative set up and to provide equal opportunities to female members of the fishermen communities. Depending on the scope of activities, WFCS have average membership of 30-80/society. They are mainly into selling of fish, post sale services of dressing of fish for a nominal cost/kg and net/crafts making activities. The Women FCS have been playing a crucial role in marketing of fish and many of them help their spouses in finding quick and remunerative markets and thus reduce their tension/anxiety of fish sale.

A silver line in the Women Cooperative scenario is the emergence of Women FCS and their groups under the banner of MATSYA MITRAS. State has made a beginning by bringing interested fisher women under the fold of identical groups with common interest and collective actions in development; facilitated them to function as organized groups in marketing and such other related activities. The WFCS were initially supported by the Government with facilitation for formation of Women Mastya Mitra groups within their societies and extended support in the form of seed money (around Rs. 25000) to meet their operational expenditure initially till they build up their own resources.

Some of them have performed well, built up their own financial resources by pooling part of their incomes which is according to the cooperative spirit. No major issues were observed in the working of these societies, though they experience financial crunch for expanding their operations. As a result, their average earnings are more or less static (between Rs. 300- 400/day). Since inception, many of these groups are active, playing a dominant role in fish marketing at primary and secondary level. Empowerment of WMM's on various aspects of value addition can bridge the gap in gender inequality.

Box : 10 Women in fisheries - Notable observations

- Participation of WMMs during experts visit is extremely encouraging.
- Womens' awareness in sector activities was good and is mainly supporting the family income meeting the diversified needs including asset building in a limited way.
- Women MMs sell both fresh and dried fish in a limited scale and the volume is moderate. Dry fish is procured from outside (Andhra Pradesh) in limited quantity.
- Over the years there is an increase in participation of women in sector related activities mainly in fresh and dry fish marketing and also in a limited way fish product development and marketing.
- Interaction with the WMM groups revealed significant improvement in their attitude towards sector activity they are performing.
- There is an increased role in family decision making process, improvement in reutilizing their earnings for their economic growth.
- Similarly, increase in gender aspiration and expectation on the sector activities was observed.
- Also observed more progressive gender attitude towards sector.

Activities of WMMs are mainly are constrained by lack of finance support, infrastructure like cold storages / better markets etc though some of them (eg. Ramnagar market, Karimnagar Dist.) have shown good marketing acumen and performance. Lack of handholding support to these groups is an aspect that needs a serious consideration.

5.7.8 Exclusive Tribal Societies

As per records, there are 50 Tribal, 36 SC and 38 ST Fishermen Cooperative Societies in the state with an average membership of 37-94 per FCS. They also get financial and other benefits from both State and Central schemes. As for working of these societies, it was seen that in view of homogeneity there are no major organizational issues or problems in their management. However, their level of knowledge on scientific management of fisheries is limited and is mainly pursuing the activity through traditional practices with their own empirical experiences. Due to their inhabitation in isolated pockets and distance from mainstay of social life, their outlook also appears more conservative, though they are more innocent and open for any new ideas. There is huge scope for their skill up gradation in fisheries activities. A study of some of these societies gave an indication that the members have ambitions and zeal to progress but at the same time, their conservative outlook prevails on them. These societies exhibited more transparency in sharing the factual information on their working.

5.7.9 District Fisheries Cooperative societies (DFCS)

A study of the performance of the DFCS in the selected districts indicates that these institutions are operating at low key and their presence/activities/performance in terms of outreach and extending guidance to its member societies, formation of new FCS, marketing of fish collected from FCS, liaison between line departments and FCS is not visible. Interactions with PFCS also showed that they do not see any reason or benefit in joining the DFCS. There is both visible and operational disconnect between these institutions. Out of ten DFCS, the study area has four in Karimnagar, Medak, Khammam and Warangal districts.

5.7.10 State Fisheries Federation

At present there is three tier system i.e., FCS-DFCS-Federation of local institutional functioning is in operation. Earlier a Four-tier system was in place i.e., FCS-DFCS-Regional FCS and Federation.

■ Activities and performance of Federation

- Federation is mainly carrying out activities of implementing Fishermen welfare schemes and Fish marketing.
- The hygienic fish marketing units and also fish canteen operated by Federation are well networked in support of business and supply of quality fish to consumers at reasonable price. The vehicles with cold storage facilities are supporting the mobile fish sale service of the Federation.
- All the FCS members have to necessarily become members of Federation to avail benefits of the Scheme under Integrated Development of Fisheries being implemented with NCDC assistance.
- The focus of Federation on strengthening of member FCS's is very limited and as supportive activity, the Federation has trained 500 fishermen under NFDB funding support.
- Federation is making considerable profit mainly through sale of fish.
- The progress made in fish marketing indicated progressive growth in value of transaction from Rs. 385.04 lakhs during 2013-14 to 587.58 lakhs during the year 2015-16. Federation registered a profit of Rs.114.46 lakh during 2015-16 and was higher compared to previous year of 2014-15 (Rs.78.85 lakhs).
- As per the requirement, Federation is convening annually four Managing Committee meetings and two general body meetings to take decisions on all policy and program related issues.
- Federation has registered with FISHCOFED at the national level and is representing member societies to protect the interest of members.

■ Gaps and limitations

- Supportive activities related to community mobilization and awareness, enrolling of members to PFCS is limited and presently not being addressed.
- Developmental programs targeting members of PFCS and fisher community addressing their socio-economic upliftment are up coming under the new program of NCDC funding.
- Similarly, support for fisheries resource management, aquaculture activities, procurement of inputs, crafts, gears and other fishing equipment, organizing capacity building programs to members of societies are upcoming under the program of Federation.
- The Federation is not in a position to provide any support due to Trust Deficit since it is run by the Government.
- The Federation also cannot assume any direct role but only play supportive and facilitative role in educating fishermen, training and awareness creation.
- The acute shortage of exclusive staff and in adequacy in field level functionaries positioned at district level has limited the activities of Federation in reaching the FCS and undertaking various activities in support of fisheries and aquaculture development.

■ Expectations of Federation

- Some of the expectations of the Federation are that subsidy schemes of DOF need to be routed through Federation.
- They also strongly feel that there has to be staff support from Govt. (on deputation).
- At present DOF is supporting administrative expenses to a limited extent and the expectation is for meeting the total administrative cost.

5.8 Marketing

5.8.1 Fish Trade and marketing

In view of the fact that larger majority of the population are meat and fish eaters in the State, availability of hygienic outlets for customers in their vicinities goes a long way in balancing demand-supply conditions. In broad terms “Marketing of Fish” assumes different dimensions in the state.

Fish produced/harvested in different types of water bodies finds different outlets/ channels. One common practice/system is spot-sale of fish on the tank/ reservoir shore and a “make shift” market exists on the shores of each water body.

After the first point of sale (depends on reservoir and tank production), the fish is taken to the local markets within the villages/nearby smaller towns by “aggregators” agents of wholesalers. The existence of large number of “Rural Fish Markets” indicates that fish markets are highly dispersed across the State.

Study of the system of marketing shows the **imminent/prominent role of Merchants** located at Metros and Districts. This class also known as wholesalers plays a key role in not only disposal/sale of fish but also dictate market prices. As per an estimate almost 80-90 per cent of fish produced in the state is sold under this system. The merchants have deep-rooted links, perhaps for decades, with the FCS/fishermen. The FCS/Fishermen also find it convenient to supply their catch to the merchants since they do not have to worry about transport, storage, marketing, price realization etc. The merchants in turn, advance money by way of interest-free accommodation (loan) to be repaid conveniently or adjusted against the produce.

Both fish production and marketing chain is dominated by mercantile community who rule the roost in all aspects of production and marketing. Merchants are indirectly managing stocking and seed procurement, watch and ward and all other expenses. From supporting seed stocking, watch and ward, harvesting, transportation and ultimate sale are virtually controlled by the merchants who have deep rooted links with not only individuals but also Fishermen Cooperatives which until recently were solely dependent on the merchants for financial, logistic and marketing activities. They take entire fish catch and pay the FCS at Rs. 35-50/kg depending on the advance terms. Around 70-80% of FCS uses this channel as they are saved from the worry and get money at their doorstep. The merchants have good knack of cultivating locals by enticing them with money, commission and other perks/incentives and gaining their confidence. Even though they are stationed in Metros and Big cities, they control a network of their agents/contact/ liaison persons across the State through whom they transact business. Since DOF has started supporting FCS in stocking of resources with 100% subsidy, this internal arrangement with merchants is gradually getting reduced by 30-40%.

However, it would be an unfair observation if some credit is not given to these intermediaries/ merchants. Firstly, they take calculated risk in various stages of fish production i.e. stocking of fish, watch and ward, climatic vagaries, collection/assembly of fish, transportation to the proposed destination and finally disposal of fish. Each stage is not without some amount of risk and uncertainty. They also are exposed to huge losses in case of crop failure, theft, pilferage and glut in market.

Box: 11 Marketing channels

Prevalent fish marketing channels

Reservoir/ tank – Fishermen

- Direct marketing to consumers through on site sale/ sales in: organized or unorganized (road side) market.

Fishermen to fisher women to consumer -Vending & supply at consumers door step.

Fishermen to aggregators / retailer / wholesaler to consumers)

FCS (resources leased to societies) – private contractors /merchants on pre agreed advance amount, management of production system, pre fixed market price for the produce, share between society and the contractor, varied modes and mechanisms for deducting/adjusting the advance amount paid, duration, method of harvesting by hiring the services of FCS members/outourced fishermen on agreed terms etc)

Aggregator to consumer directly or through channels of

- A. supply to retailer- consumers
- B. supply to retailer cum wholesaler- consumers
- C. supply to only wholesaler - **Consumer**

NOTE: in case of tanks role aggregators are minimal

Fish marketing arrangements for reservoirs and tanks

In case of reservoirs, fishing is done on daily basis by individuals/societies. Where individuals are operating, their catch is between 3-4 kg in case of large and medium reservoirs to 10-15 kg in case of small reservoirs and most part of it is sold on-site. Also local small time aggregators buy fish. Women Societies also purchase fish on site in support of their retail marketing.

In case of large long seasonal tanks, where harvest time is limited to 2-3 months and perennial tanks 4-5 months, the catch being bulk, only around 20% is estimated to be sold on-site while 80% is lifted by big-time /wholesalers' agents and also some Aggregators. At each stage, margin between Rs. 10-15/kg is added. Thus, price received by fishermen is around Rs. 80-90 while sold to consumer is between Rs.110-120/kg. Profit margins remain more or less the same in each level of transaction.

Where Aggregators and wholesalers agents operate, they have financial dealings with the fishermen by way of advance and do not carry any interest. Price is invariably 10-30% less than the market rate. The aggregators also consolidate the fish from different supply sources, segregate on variety and size wise, meet the local market needs by way of supplying smaller and less expensive fishes and supply high value fish to other states.

Large number of village markets does exist and they work twice a day. In each village there is one aggregator with 10-15 Agents. Each collects fish from 40-50 fishermen. The aggregators advance money (Rs.5000-10000/fisher) free of interest in return to assured supply of fish to them at 20-30% lesser than prevailing market rate and deduct advance amount paid in installments. Generally, market price of fish is high during July to February and low during March- June based on supply and demand.

In most districts integrated markets with provisions for selling fish, meat, chicken, vegetable is common. Both wholesalers and retailers operate in these markets. Average daily transaction per trader is around 100 kg. Each trader has 6-7 agents who collect fish from the landing points of reservoirs and tanks.

Some of the markets are managed by women societies (eg. Ramanagar whole sale fish market, Karimnagar district). Fish is procured from nearby tanks/reservoirs. Each woman sells between 40-50 kg with average margin of Rs. 15/kg and each woman makes Rs.750/day.

Apparently there appears to be a Sellers's market in the state. This is borne out from the fact that most of the fish harvested is demanded and sold internally through the prevailing marketing channels. In recent years demand for live fish is on the rise and this is happening rapidly.

The presence of Aggregators is clearly visible in one form or the other and this is also serving market channel. Aggregators are working at two levels i.e. at village and city level. The village level aggregators collect / handle around 500/600 kg of fish /day depending on the season and type of water bodies attached with.

The **wholesale markets in larger towns** source fish from the neighboring water bodies and there is very good arrangement between the suppliers and traders. They also constantly procure part of fish from AP during lean period in order to meet local demand.

A study of the marketing system for fish across the selected districts shows that consumers/local agents reach to the fish catching/landing centers by themselves and buy the required quantities. Fresh fish being in great demand in recent years, substantial quantity of fish is disposed off on the tank-site/reservoir site itself. The buyers are mainly aggregators and direct consumers.

Box: 12 Characteristics of fish markets**Infra :**

- Wholesale markets- old, unhygienic, lack of drainage facilities, quality water, less sheltered, not backed up with facilities of cold chain.
- The left over fish are generally packed in thermocole boxes along with ice and the stock will be carried forward for the next day sales.
- Unscientific fish handling resulting in low keeping quality.

General functioning

- Marketing at present is more exploitative.
- Lack of marketing strategies.
- No auction system of fish in any of the market channels.
- Women MM in most of the study districts visited are playing active role in marketing of fish and women fishers are plying key role in extending after sale services.
- Inadequacy in markets management.

Institutional support

- Direct involvement of DFCS and also marketing facilitation/support by State Federation in marketing of fish is very limited or none in many districts.
- PPP models in promoting fish markets to enhance share of producers in consumer rupee, ensuring increased benefits to producers in the entire value chain are non-existing in the prevailing system.
- No lending policy/focused group activities within societies.
- No institutional programs to enhance entrepreneurial attitude of market players.

Growth in fish production in tanks and reservoirs is one of the key drivers for constant supply of fish to the markets (over 70%) and bringing this transformation for regular fish availability in the state catering the need of consumers. Due to lack of transportation and non-availability of proper storage facilities, harvested fish from tanks and reservoirs is not evenly distributed to interior areas leading distress sale.

Entire fish catch is marketed fresh and only small quantity of fish in reservoirs that is rejected by the merchant for reasons of quality goes for drying, preparation of dried fish meat cubes etc. in support of for family consumption/ marketing. Use of technologies in fish markets and marketing viz., e-marketing and Mobile apps and websites etc to minimize prevailing middle men system in marketing at different levels are very minimal and is limited to major markets in urban parts.

Despite several challenges and head wins, the fish markets in the state have had a strong consumer base with good turnover on day to day basis. In recent years, merchants' role has slightly reduced in fish trade with the entry of younger generation of fishermen.

The details on key intermediaries/market player and major functionalities is given under **Annexure 5.15**

5.8.2 Whole sale markets in Hyderabad

- Witnessing more consumer foot falls for fish.
- Sale of high end varieties is lead by macro economic factors of better purchasing power associated to broad earnings and interested to spend more on food items, health consciousness and pride status and price affordability compared to marine fish.
- Wide species diversity ranges over fish varieties at different levels of market and is being sold in formats of fresh, live, fillets, cubes etc. depending on species and consumer needs.
- Wholesale markets owned by Town municipalities have outlived their utility and badly need renovations and improvements.

5.8.3 Gaps and limitations in Fish markets

Domestic market is generally supportive of low value fish; however, there is emerging small section of high income people supporting high value fish viz., murrel and fresh water prawn. As of now there is no product diversification and no organized/institutionalized marketing networks. At the primary level, domestic market is highly imperfect, unorganized, most operating unhygienic with inadequate marketing services, devoid of ice, lack of cold chain and storage facilities. Absence of formal market networks (online trading portal, enabling buyers situated even outside the state to participate in trading at the local level) is another noticeable gap. Limited alternate marketing system to cater to the increasing demand for fish can be augmented through selected FCS members/ women fishers/ MM's/ producers groups etc. There are very few local institutions of collective action with market oriented frame work in operation. The other gaps that need to be address are:

- Limited HR support.
- Limited awareness and lack of emphasis on timely supply of quality fish to meet market demands.
- Non competitive market price and produce absorption.
- Weak retail marketing chain.
- Limitations of institutional support related to both backward and forward support services.
- Absence of institutional finance support etc.

Box: 13 Limitations in fish markets

- Risk of selling entire fish from different sources.
- Very perishable nature of the produce.
- Variations in quality of fish during procurement.
- Allowances for certain % of spoilage.
- Additional expenses on loading and unloading.
- Use of ice and associated cost.
- Additional transportation cost.
- Lack of storage facility, availability of ice, absence of cold storage etc.
- High over head cost for ice and transportation.
- Low economic status and low risk bearing capacity compels them to sell at consumer's price.

5.8.4 Fish trade – inflow and outflow

Wholesalers have links with merchants of other states and sends fish on a regular basis. The fish of state is preferred as most production is harvested from the natural resources and has the brand of better taste. Studies carried out in the selected districts on the volume of fish being sent outside the state indicated that there is regular outflow of fish from aggregators directly to wholesalers in Urban and Semi-urban markets.

While precise figures on this could not be determined, a trend analysis indicated that during peak harvest season (March to May-June) around 5-10% of fish captured finds market outside the state through the intermediaries, even in the face of local demand and this is purely on commercial consideration as also long standing links and commitments between the trader in two or more states viz., Kolkatta, Karnataka, Maharashtra etc. Approximate assessment shows that annually on an average between 20-25 thousand tons of fish could be crossing over to other states.

5.8.4.1 Outsourcing of fish

Case studies and interactions with the intermediaries at Rural, semi urban, urban and state level indicated that during lean season (including in May-June when festivals and marriages are celebrated across the state), the middlemen invariably outsource fish (both freshwater and marine fish) to meet needs of urban markets and to keep the marketing going. An estimated 10-20% of the fish thus comes from outside the state (Mainly AP, Karnataka). Precise estimates need to be worked out but through structured and focused market research.

5.8.4.2 Specific observations on inflow /outflow in markets

- Out of the total fish produced in the state, only about 5-10 % of the fish is marketed outside the state.
- The fish caught is marketed domestically through a network of wholesale, major and minor retail, roadside markets or at the spot of fish catch like tanks/ponds, etc.

- Majority of domestic markets are running in unhygienic condition without fish storing and handling facilities and inadequate availability of potable water, good quality ice, electricity, waste disposal system.
- There is considerable time lag during the transportation of fish from the landing/catch centre to the interior/distant markets/areas which is resulting in poor quality of material flow in the chain.

Fish supply gap in the state is mainly limited to lean season (post monsoon) of 3-4 months (June-Oct.). In district markets the gap in supply is generally for 2 -3 months while in urban markets it will vary in accordance to internal deficit supply from resources, festivals and special occasions. Of late with increased activities in fisheries and increased arrivals from reservoirs and tanks the gap is getting narrower.

Outsourcing to meet supply gap 10-20% is getting partly compensated with fish being sent outside the state. The study found that AP topped the list of the States from where maximum quantity of fish arrives to state. The inflow and outflow of fish witnessed in the state is also a major factor which keeps fish prices steady in the state.

The macro level analysis of the quantum of fish traded in these selected markets, which was done under the present study, indicated that over 2.03 lakh tons of fish is being traded in the state on an annual basis (500-600 tons/day). The estimated share of outsourced fish on a day to day basis accounts for 75-100 tons.

It is anticipated that the demand for fish may rise to around 3.35 lakh tons by 2025. If projected demand is considered, the gap between demand for and supply of fish comes to about 1.0 lakh tons annually (100%). Thus, meeting the growing fish demand always holds the key for the continued improvement of sector utilizing its vast and diversified water bodies innovatively in support of better production and productivity.

5.8.5 Market performance

As per the available information furnished by the DOF, there are three wholesale cum retail markets, two in Hyderabad and one in Karimnagar town. There are as many as 80 retail markets comprising 45 organized and 35 unorganized retail markets across the State spread over in urban and semi urban regions, towns and rural areas. Majority of the unorganized markets have no shelters. Some of these markets are constructed by the traders themselves and some leased by the Panchayats / local bodies / private owners. Each of these markets handles any quantity between 1 to 10 tons every day.

The estimated total volume of trade being handled is

Table : 45 Estimated volume of trade

Market Channels	No.	Vol. in tons & marketing days	Est. volume (tons)*
➤ Retail organized	45	5 x 350	78450
➤ Retail(unorganized)	35	4 x 350	49000
➤ Whole sale markets (Metro)	02	50 x 2 x 350	17500
➤ Whole sale markets ➤ Ramnagar Fish market, Karimnagar	01	10 x 350	3500
On shore market(10-20%) of harvested fish			
➤ Reservoirs			5000
➤ Govt. tanks			11000
➤ GP tanks			3000
➤ Itinerant sellers (Mobile)			7500
➤ Sub total			174950
➤ Estimated sale outside: 10%			17495
➤ Sub total			192445
➤ Sale through Unreported channels (5% of total)			9622
			202067

Note: This does not include domestic consumption by fishermen

Note:1 i) Reservoirs EWSA x 250 x 25% on shore; ii) Tanks Effective WSA x 400 kgs X 25% on shore

iii) GP tanks EWSA x 150 kgs x 0.30% on shore, iv) itinerant sellers 5% of total

vi) estimated sale outside 5-10% of production (based on case studies and FGDs)/interactions with Wholesalers Aggregators and others)

5.8.6 Consumption and per capita fish availability

The state has the potential to boost fish consumption considering its huge non vegetarian population as its economy is expanding with better purchasing power of people. Increased economic status of people is adding to increases in commodities consumption. The consumer awareness on nutritional value of fish is increasing; simultaneously the growth of urban population and increase in spending on food is also happening.

Though accurate projections of present **fish consumption** cannot be arrived at, an attempt is made using the following norms:

- Present total population (as per Samagra Kutumba survey).
- Estimation of non-vegetarian population among the total population.
- Est. Fish eating population out of non-vegetarian populations since all of them do not eat fish.
- Estimated consumers in rural and urban areas.

The present estimated consumption of fish is computed using the Consumer survey covering more than 500 respondents across the nine selected study districts. The weighted average fish consumption among rural consumers was 9.66 kg. annually while in case of urban consumers it was 4.88 kg. Aggregate consumption was arrived considering 60% and 40 % as total fish eating population representing rural and urban consumers respectively. The consumption is estimated to range between 1.83 lakh tons and 1.98 lakh tons. The volumes of fish transacted in markets across the state indicates that the estimated trade was around 1.95 lakh tons (except unreported sale/ trade). There is striking match between the consumption estimates made through the Survey and market studies carried out independent of the survey. Taking this as the base level, projections can be made for the next seven years (This aspect is discussed in chapter 6 on Strategies/ suggestions).

Per capita availability of fish: Taking the total fish production of 1.94 lakh tons for the year 2016-17 as the basis, per capita availability of fish has been worked out. The population figure for the state at 350.04 lakhs has been reckoned as the basis for the workings and also of the study districts. The non vegetarian population is considered at 80% (after accounting for several discounting factors) of which fish eating population is taken at 90%. This would mean a total of 252.03 lakhs as the fish eating population of the state. Accordingly, per capita fish availability in Telangana would be 7.69 kg per annum or 21 g. per day.

The same workings for the nine study districts as a whole shows that the per annum figure of 7.88 kg and per day availability of 22 g. is slightly higher than the state average. The grouping of the study districts in terms of per capita daily fish availability is given in the following table:

Table – 46 Per capita availability of fish per year (kg) and day (g) in study districts

High			Medium			Low		
KRN	MBD	YDR	MDK	KMR	MAN	BDR	WPY	RGR
31.59	18.63	15.06	11.24	9.41	8.29	5.03	4.10	1.44
87	51	41	31	26	23	14	11	4

(The national annual per capita consumption of fish for the entire population is estimated at 5-6 kg where as for the fish eating population it is found to be 8-9 kilogram). (The Indian Council of Medical Research recommends this to be 12 kg per annum)

The per capita availability of fish annually as also daily indicated a wide variation among the study districts. The workings on per capita fish availability are given in **Annexure – 5.16**. The inter district variations within study districts indicated highest per capita fish availability in Karimnagar 31.6 kg/annum and 87 g./day followed by Mahabubabad (18.6 kg & 51 g.), Yadadri (15 kg and 41 g.) and Medak at 11.24 kg and 31 g. In contrast, the per capita availability in respect of other districts is significantly low (4-9.4 kg and 11-26 gm.). Rangareddy district registered lowest per capita availability (1.4 kg and 4 g./day)

The estimated annual fish availability of 7.88 kg for the fish eating population in the state is in agreement with the est. National value. However, considering the recommendation of ICMR, there a deficit of over 4 kg / person and this could be the new challenge for the state.

5.8.7 Fish processing and value Addition

- Lack of Post-harvest infrastructure is an important bottleneck in the production and processing chain.
- Fish handling and long distance transportation is currently being handled with the use of ice supplied by private ice plants. Use of block ice is in common practice.
- Infrastructure of cold storage is limited and cold chain system is not prevailing in the state.
- For the present domestic market processing is currently not very relevant, due to the high demand for fresh fish and barely matching supply.
- Similarly establishment of commercial fish processing units for IMC in the state is currently not very relevant.
- There is lack of processing chain even for the limited production of pangasius and tilapia from the activities of cage farming in reservoirs.
- Processed fish and fish products at present fish is marketed by “high end malls” in frozen condition catering to the needs of rich people.
- For domestic supply, fish is generally transported with or without ice. In present process of fish handling, use of even ice is very limited (<20-30%) for reasons of high cost, availability and affordability.

5.8.8 Govt. initiatives

- The state government has taken initiative to construct fish markets viz., Retail and Whole sale markets, vending units through mopeds, autos and kiosks in villages, towns and cities. It has plans for taking up market up gradation and to establish 40 new fish markets in districts across the region and also whole sale markets.
- Positioning of modern fish stalls, cutting, dressing, and storage facilities, as well as provision for dressing waste and waste water management systems, ample parking, and exclusive floors for retailers and wholesalers need consideration in the newly constructed markets (Begum Bazar and Monda Market) that are in progress.
- In this direction, the recent initiative of govt. to construct fish markets at villages and towns is a well coming move.

5.9 Human resource Development

5.9.1 Department of Fisheries

On an average there are between 16-20 mandals in each district and the DFO is required to be in touch with the mandals and FCS. He has to carryout multifarious responsibilities and in most instances, beyond fisheries tasks, and also performs the works of support staff too. The present set up at district level comprises a District Fisheries Officer, supported by a Fisheries Development Officer, Assistant Inspector of Fisheries (AIF- not in all districts), Junior Assistant, Fishermen and Field men. Some ministerial staff is also provided to this office.

It was informed that a Fisheries Development Officer is covering nine Mandals while an AIF three Mandals. In districts having higher number of Govt. and Panchayats, the concerned officer/staff has to undertake frequent visits/ meet the fishermen and other concerned Panchayats and this makes it difficult for an FDO or AIF.

It was also seen that in many newly created districts, the FDOs were positioned as DFOs on an officiating basis and in such districts, there are no FDOs posted due to staff shortage. This has seriously affected the performance of the staff and implementation of planned activities. Since the Government policy is to restrict new recruitments, there is no provision for the DFOs to engage/outsource workers/technical personnel and reaching out to far-flung areas is not possible.

Interactions with the District in-charges and other support staff shows that due to acute staff shortage the available personnel are loaded with works and with new schemes being implemented, there is continuous work pressure beyond physical limits. As a result, they are not able to do justice to the multiple tasks.

They are not in a position to keep constant touch/ link with fishermen and societies. It was also seen that some Fisheries Development officers have been elevated to officiate as District Fisheries Officers in newly created Districts which goes well, the vacancies created by such an upward movement of the officers.

It is observed that the present staff at district level is inadequate in the context of expanding fisheries sector activities, introduction and implementation of new schemes that call for close links/contacts and effective monitoring and follow up, keeping track of the same and documentation and data management etc.

The District Fisheries Offices have been functioning with skeletal staff and struggling hard to come up with implementation of several programmes. These offices also are constrained by required staff. It was understood that if some additional field support is available (through contract or outsourcing), they would be in a better position to deliver the programmes to the satisfaction.

Comprehensive District Fisheries and Aquaculture strategy document for the integrated development of sector in the district are lacking and the District staffs are not provided with road map document for each of Key Resulting Area (KRAs) specific to the district and also hand holding support by the Head office with clear guidelines on implementation of programs.

5.9.2 National Fisheries Development Board (NFDB)

The Board is part of the Ministry of Agriculture and Farmers Welfare, Government of India and is active in supporting fisheries sector development activities of the states. As an autonomous organization under the administrative control of the Department of Animal Husbandry, Dairy & Fisheries, various programs of DOF related to enhancing fish production and productivity, marketing, processing and value addition, trainings and demonstrations are being supported. The KVK's, Federation and other outreach institutions have also availed support from the Board and organized several sector related programs involving fishers and women MMJs on aspects of fish production, processing, value addition etc. on various occasions. The Board is also supporting construction of major fish markets in the state and various activities under 'Blue Revolution' programs that is being implemented in the state including capacity building and HR development at varied levels of supply and value chain and is constantly helping in the integrated and holistic development of sector.

Additionally, institutions/ organizations viz., National Cooperative Development Corporation (NCDC) and National Federation of Fishermen's Cooperatives Ltd. (FISHCOPFED) are also extending supportive hand for the fisheries sector growth in the state. The starting of two Fisheries Colleges in Karimnagar and Pebbair, Wanaparthy district and a Fisheries and aquaculture training centers are anticipated to have greater positive impact on HR development front in the state.

5.9.3 Other institutions

The state has fairly good number of institutions with social and economic agenda and alleviation of rural poverty and exploitation of vulnerable sections (i.e. NGOs/KVKs etc). Similarly, the state is a hub for many professional institutes viz., MANAGE, TSPARD, NIRD, EEI and ICM that have both national and international stand. However, their role in fisheries sector is much to be desired. It is not fair to assume that these institutions would take initiative on their own to provide services of training, awareness building, demonstrations etc since they have other "Paid"/Remunerated"/sponsored activities. The Five Krishi Vigyan Kendras, one FRS, one DTC and one DAATC also work in support of fisheries sector development.

The study districts lack in supportive institutions like input suppliers, Non Governmental Organizations, exclusive training centers etc. Except for seeds produced in some small units and net material dealers, no input supply unit was seen to be operating in the districts visited. Non use of feed/fertilizer by fishermen could be the reason for any private entrepreneur to open any input supply unit. Though there are **NGOs**, none of them was found to be involved in any activities directly or indirectly relating to fisheries and aquaculture promotion.

As far as **SHGs** are concerned, a majority of them are engaged in other than fisheries activities while a few could be associated with fish marketing (fresh and dry).

The **Krishi Vigyan Kendras** have been implementing some training programs sponsored by NFDB but again they are constrained by lack of staff, infrastructure and logistics. The KVKs are willing to take up regular training programs / demonstration activities for DOF if required resources are made available.

The three KVKs functioning at Bhadradi, Wanaparthy and Mahabubabad have mandate to support fisheries sector growth in general and raise the skill levels/knowledge levels of the fishermen. Additionally, they are also expected to carry out Field Demos on new and innovative technologies.

These institutions have necessary infrastructure to carry out the mandated tasks. They are expected to have a Fisheries expert on their roll or outsource experts' services wherever required. However, the KVKs do not have separate financial allocation for fisheries related programmes and hence depend on the sponsors. They have been imparting short term training to farmers under sponsorship of NFDB and DOF. These institutions are complementing the efforts of the DOF in Technology transfer and Skill up-gradation. However, financial constraint has limited their role play in providing effective backward linkage support.

Academic institutions are very limited in number and whatever existing is functioning with limited fisheries related activities. Absence of civic society bodies exclusively involved in sector development programs and role of NGO at present is very limited.

Lack of **institutional finance** support in the entire supply-value chain of sector is the main challenge the stakeholders are witnessing. The average farmer operates small-scale; they do not have the access to finances to invest in high-tech aquaculture production techniques such as cage-based aquaculture, fish seed rearing etc. Limited financial strength of PFCS and individual small-scale farmers is one of the major constraints of sector.

Lack of integration and effective interaction with sharing networks between local institutions, their members (PFCS, DFCS) and supportive institutions including R&E institutions etc; lack of mechanisms and approaches in position to facilitate better coordination between institutions for better solutions (Federation/ DOF to take active role and concern in this regard) and inadequacy in the availability of qualified manpower in sector supportive institutions to address related issues and concerns are the other constraints.

5.9.4 Institutional trainings

The HRD activities organized by DOF related to training of fishers and other stakeholders on the fisheries and aquaculture activities are limited. Organized training of fishers and interested entrepreneurs is being organized in the Inland Fisheries Training Center, Hanumakoda. Institutional trainings are being organized mainly by the KVK's with the sponsorship and financial support from NFDB, DOF and others on case basis. The Fisheries Federation provides training to Fisherwomen on handling of fish and other value addition related activities but on a limited scale.

The new HRD policy relating to empowerment of DOF field personal, fishing communities and other stakeholders on a continuous basis is receiving consideration. Under IFDS program, trainings and other HR related development activities are proposed with an allocation of Rs.2.87 crores. Financial assistance from NFDB is also being utilized for training of license holders in reservoirs.

Box : 14 Gaps and constraints in institutional trainings

HR related gaps

- There is wider skill gap and also growing skill gap at all levels of supply and value chain.
- Gap in skilled labor force in the sector
- Most FCS have young and overwhelming members with eagerness to pursue sector related activities provided the DOF supports and handhold them. Similarly the women fisher folk are interested to participate in the sector related activities and are look out for opportunities to work.

Observed inappropriate fixing of targets (seed/fish production) without linking to ground realities of resources, ongoing activities, human resource available etc.

Information monitoring gaps

- Inadequate information and monitoring support by DOF is a major constraint in development of resources in the state.
- Lack of info at local levels to support production enhancement.
- Lack of comparability and compatibility between FCS in information sharing and clear absence of socio and economic data to support enhancements.
- Lack of field level mechanisms to monitor the activities that are in progress.
- Absence of self reporting system as mandatory requirement for PFCS to avail benefits of Govt.
- Lack of simplified methods for data collection, productivity estimations, production estimation and reporting process.

Gaps in harvesting and post harvesting

- Inadequacy in awareness and methods of hygienic handling, use and proportionate use of ice to fish is lacking.
- Lack maintenance approaches of fish quality after harvest.
- Inadequacy of trainings, infrastructure and accessories for holding fish in hygienic condition.
- Awareness on quality aspects of ice and extent of use is limited.
- Lack of awareness on per-capita fish consumption.
- Perception on fish availability and demand is limited.
- Perception on meeting the qualitative and quantitative requirements in terms of variety, price and post sale services in marketing are limited.

HR related constraints

- Lack of awareness.
- On- site technical hand holding.
- Lack of State level programs for promoting relevant and concerned institutional convergence in support of HR

5.9.5 Initiatives of DOF

- Infrastructure for District Training cum demo centres for skill development to improve the training infrastructure across the state is a good move of the government and about 12 such units are proposed at a unit cost of 75 lakhs.
- It is being planned to improve the infrastructure of IFTC Warangal. Measures were initiated to design training modules, delivery mechanisms, sourcing resource experts for imparting trainings, setting up of back end support of instructional farms, demo units etc.
- Workshops are being organized/planned/ proposed with institutional support of KVKs, NIRD for assessing the training infrastructure and assessment of the training needs.
- Resource agencies have been identified for implementing training programs.
- A draft capacity building plan has been prepared in terms of training requirement, exposure visits requirement, brochures and pamphlets for each aspect of activities in Fisheries for all the stakeholders.
- Exposure visits to Re-circulatory Aquaculture farms, Eco hatchery units, etc have been initiated for department staff and entrepreneurs.
- Entrepreneurs and progressive fishermen are being facilitated during events like World Fisheries Day, Fish Farmers day.
- Efforts are being taken up to set up diagnostic labs and providing water testing kits to all districts. NBFGR partnership is under progress for setting up diagnostic lab.
- Workshops have been conducted with various stakeholders to invite suggestions on policy for development of Fisheries in Telangana.

- Exhibitions of latest technologies like eco hatcheries, solar based fish drying machines, etc have been arranged in NFDB and at Karimnagar.
- It is expected that these policies and programs are implemented within a time-frame.

The govt. initiatives of creating a special aquaculture promotion cell for expeditious processing and clearance of applications; integrated approach in development of all major and selected medium reservoirs by positioning exclusive Fisheries Development Officer along with supporting staff for handholding and oversee the development initiatives; establishing State Institute of Fisheries Development (SIFD) to cater to the training needs of department personnel, fishermen and women, and to extend technical and diagnostic support services; focus on organizing in -service and refresher trainings and exposure visits both for technical staff and progressive farmers; institutional collaboration with professional institutes viz., MANAGE, TSPARD, NIRD, EEI and ICM in imparting necessary training to staff as well as the other stakeholders of the sector are well thought strategic initiatives of DOF that are anticipated to result in positive impact on sector development in years to come.

Institutionalized approaches in sector development by appropriately positioning dedicated cell/ unit heads at the cadre of DDF/ ADF in addition to the existing Units of Head office to exclusively monitor and facilitate effective implementation of programs/activities related to sector supply-value chain and similarly for strengthening DOF structure at district level has been prioritized.

5.9.6 Strengthening of HR- DOF initiatives

- In the direction of bringing change (both structural and functional) to the existing DOF staff pattern considering sector expansion, new growth opportunities and anticipated paradigm shift in both activities and stakeholders, commercial activities etc. several training programs and exposure visits are planned to enhance the capability of existing staff.
- The vacancies throughout the state have been communicated to the government and notifications for direct recruitment for sanctioned posts are awaited.

New needs

- The present staff strength at the district level fisheries office is inadequate in the context of expanding fisheries sector activities, introduction and implementation of new schemes that call for close links/contacts and effective monitoring and follow up, keeping track of the same and documentation and data management etc.
- With more and more number of Centrally sponsored and State programmes for fisheries sector growth, there will be need to enhance the number of field level functionaries especially at Mandal and District level.
- Identification of high potential, Moderately potential and low potential areas would be necessary to determine the type and level of field personnel to be positioned.
- Training of fishermen who account for huge number across the districts, may call for formulation of long term/permanent strategies of the DOF under which round the year training programs are to be organized and fishermen are covered in large number.
- Filling of the vacancies and training programmes planned would enhance efficiency of DOF personnel which in turn promote new technologies.

5.10 Infrastructure & input supply

In order to sustain growth in the sector, several of the economic activities of fisheries and aquaculture that have potential to generate wealth, welfare and employment need to be pursued intensively. These activities require adequate backward and forward support services (both direct and indirect) to nurture and bridge the prevailing gaps. This often comes from Government and private sector agencies. The first linkage is directly related to production processes while the second can be both direct and indirect but having direct bearing on the production process. Availability and adequacy of such infrastructure determines the level of and scope for growth of any economic activity. Wherever private participation is predominant, infrastructure activity can thrive by using available linkages or create its own facilities.

In the state, fisheries activities is predominantly pursued by traditional fishermen communities whose economic standing and propensity of investment is very low, in as much as this section of the society pursues the activity only as a source of livelihood and the returns from this activities may not afford creation of such infrastructure facilities on their own, and on a large scale. Hence, the fisheries sector growth largely depends on the initiatives and involvement of the State.

The present level of infrastructure network is deficient keeping in view the growth trends and potential available for development. Broadly, following facilities are available in the state for fisheries sector growth.

Box : 15 Infrastructure linkages

Backward linkages		Forward linkages	
Hatcheries			
Govt. 8 (6 are functional)	capacity:27 crores spawn	Fish Landing Centers 32 (Mainly in reservoirs)	
Private 5	Capacity:195 crores spawn	Fish Markets	83(Retail organized: 45 and unorganized:35)
Total	Capacity 222 crores spawn	Whole Sale:	3 (2 in Hyderabad and one in Karimnagar)
Fish seed rearing farms		Ice Plants/Cold storage	42 (concentrated in few districts)
Govt. 32	Farm area: over 200 ha		
Production	capacity as fry: 11.38 crores		
Private 8	Farm area: 40 ha		
Production	capacity as fingerlings:11.3 crores		
Overall-40 farms	240 ha of farm area		
Fish Feed Mills	None (3 proposed)		

5.10.1 Market infrastructure

Considering the status of prevailing unhygienic conditions of the existing fish markets and the various marketing channels the Govt. has taken up several initiatives on renovations, up gradation and construction of new markets both whole sale and retail markets spread across the state. It is a well coming initiative on the part of the DOF. Considering the future production growth (targeting for doubling fish production) and the changing consumer behavior opting for quality fish sold in hygienic ways, these initiatives of Govt. will have long term positive impact on the consumer sentiment and will be supportive in enhancing per capita fish consumption in the state. The retail and whole sale fish markets shall be constructed in potential cities, towns and villages in a phased manner by extending 100% grant to the local bodies. Under the programs of DOF, about 50 % subsidy shall be extended to the Fishermen cooperative Societies and private entrepreneurs towards retail markets, Ice factories, crates, Kiosks, mobile fish vending units, insulated fish transport vehicles and plants for processing of fish with upper ceilings as prescribed from time to time.

5.10.2 Ice plants

Aggregators also require incremental quantities of ice and many bigger aggregators/ fish merchants own ice plants to meet own requirements and also supply to others. Keeping in view of this, the present infrastructure for ice production is being worked out. The general practice is to use 1:2 ice to fish ratio for internal transportation of fish and 1:1 for long distance transport. The annual Ice requirement in the base year is estimated at 0.81 lakh tons (detailed in table below) as against the present designed Ice plants (43 No.) capacity of 272 ton /day (or 0.95 lakh ton based on 350 days production). Interaction with Ice plant owners indicated present utilization efficiency of designed capacity is only to an extent of 60% and the production operations are limited to about 250 days in a year. Based on these assumptions it is estimated that the present ice production in the state is about 0.41 lakh tons thus meeting the requirement of about 51%.

Table – 47 Estimated ice requirement

Market Channels	Est. volume (in tons)*	% share to total fish prod. (Base year-1.94 lakh tons)	Est. Ice req. in tons
▪ Retail organized (60% usage) (1:2)	78450	40.44	23535
▪ Retail (unorganized) (40% usage) (1:2)	49000	25.26	9800
▪ Whole sale markets (Metro)	17500	9.02	
▪ Whole sale market-Ramnagar Fish market, Karimnagar	3500	1.80	
▪ Subtotal – whole sale (80% usage) (1:1)	21000	10.82	16800

Table – 47 Estimated ice requirement.....

Market Channels	Est. volume (in tons)*	% share to total fish prod. (Base year-1.94 lakh tons)	Est. Ice req. in tons
▪ Reservoirs	5000		
▪ Govt. tanks	11000		
▪ GP tanks	3000		
▪ Internet sellers (Mobile)	7500		
▪ Subtotal – onshore & Itinerant (5% usage)	26500	13.65	1325
▪ Total	174950	76.52	
▪ Estimated sale outside: 10% (100% usage) (1:1 ratio)	17495	10.00	17495
▪ Sub total	192445		
▪ Sale through Unreported channels (2-5% of total)	9622	5.00	-
▪ Transportation of FW prawn (1:1)	5000		5000
	202067		73955
▪ Additional 10% of total (Aqua production etc.)			7396
▪ Est. Total Ice requirement			81350

5.10.3 Fish processing and value addition

Organized fish processing units running on commercial scale are at present not existing in the state. At present Fish processing and value addition is insufficiently developed and limited to informal points where in, de-skinning and de-boning of fish, fish fillet making, drying of fish, making of dry/desiccated fish meat cubes/chunks, etc are presently in practice on a small scale.

5.10.4 Other infrastructure

Other Post-harvest infrastructure supports are limited to providing fish transport vehicles to FCS, mopeds to fishers involved in rural marketing and fish storage ice boxes to WMMs for handling of fish in market in support of their business. Other input support to fishers on periodic basis is mainly in the form financial support/supply of nets and craft on subsidized prices.

Community hall: In support of PFCS for organizing meetings (General body and managing committee meetings) DOF is also supporting construction of RCC building in the name of community hall at district levels. Study team had opportunity to visit facilities in Karimnagar, Kamareddy, Yadadri, Mancherial, Rangareddy districts. The created facility is also being used for trainings and awareness camps to fishermen, conduct social functions of community, use as shelter during calamities, venue for organizing community Health education etc.

5.11 Centrally sponsored and state plan schemes

The state is implementing six centrally sponsored schemes and the financial utilization during last year was nearly 91%. Under welfare scheme only Group Accident Insurance Scheme (50:50) is being continued since 2014-15. Major efforts of DOF are going on for the implementation of Blue Revolution program on Integrated Development & Management of Fisheries. Inland fisheries /aquaculture had good financial provision but achievement side was not encouraging.

Technical progress and impact of schemes on the sector in terms of productivity gains, income and employment, community benefits, welfare gains etc. could not be assessed due to absence of related documents

Under the State Plan, over 20 Schemes are in implementation and the major focus is on strengthening of seed farms; stocking of seed in reservoirs and tanks; cage culture and construction of community halls. Better utilization to the extent of 100% in case of cage culture during 2014-15, followed by 92% in construction of community hall and 82% in fish seed supply during 2015-16 has been reported.

In term of achievements under state plan schemes, provision for vending machines was utilized to the extent of 45% during 2014-15 and 2015-16, while that under seed supply was used up to 82% of provision during 2015-16. The only provision which was used to the extent of around 92% for the two years (2014-2016) was community hall construction. Some beginning has been made in respect of cage culture and the achievement was 100 % in the year 2014-15.

5.11.1 Performance of Ongoing Schemes

Achievements under 14 scheme heads (including under “Fisheries Development” head) indicate that, against an amount of Rs.28070 lakhs budgeted, the actual amount released was Rs.20259 lakhs (72%) Of this, Rs. 18581 lakhs was spent under these schemes with an overall utilization per cent of around 92%.

Variations between allocation and actual release were in case of (i) Strengthening of Fish Farms, Fisheries Development, SCP TSP, supply of ice boxes, managerial assistance to Federation, solar panels and some smaller schemes. On the other hand, in case of supply of fish seeds to FCS, supply of fishing inputs to SC farmers, Godavari Pushkaram, and Krishna Pushkaram had received more than budgeted funds.

During the current year altogether 6 major schemes viz., Enhancing seed production, Enhancing Fish Production, Harvesting support, Marketing support, Infrastructure Development and Capacity building are under various levels of implementation with a total budget outlay of Rs. 9808 lakhs and subsidy component of 87.66 lakhs (90%). The schemes on Infrastructure Development are being implemented with nearly 98% subsidy support, followed by enhancing fish production (95%), seed production (82%), harvesting support and marketing support (75%). The share of budget for capacity building is low (0.75%).

Under the program on cage fish farming, installation of about 67 cage batteries (670 cages) has been targeted for the current year with a financial outlay of Rs. 29.30 crores under Blue Revolution program. The Installation of cages is under various levels of progress.

The free seed supply program is being implemented in all the districts supporting stocking of all water bodies. Under the program it was targeted to stock 24372 water bodies including Reservoirs, Departmental tanks and Gram Panchayath tanks with seeds of Indian major carps and common carp. The targeted seed stocking was 67.70 crores and the achievement made till mid Oct. 2017 was Rs. 4711 lakhs.

The State is also implementing National Cooperative Development Corporation (NCDC) New Delhi funded Flag ship program on Integrated Fisheries Development (IFDS) with a financial outlay of Rs.100,000 lakh during the current year. The activities are being implemented under the institutional Frame work of Telangana State Fishermen Cooperative Societies Federation Ltd., Hyderabad. The program is designed for a period of two years, between 2017-18 and 2018-19 and has altogether 38 components to extend all kinds of assistance to the community people. The key activities focused are on

Improvements and positioning of new Fish seed farms

- Stocking of water resources
- Fish production through ponds and other modes
- Marketing projects
- Infrastructure Development Projects & Innovative Projects
- The programs are under the scheme are targeted towards internalization of seed production achieving self-sufficiency, better quality fish seed stocking of desired variety, size and density, enhancement of resource productivity and production and providing supportive backward and forward linkages.

Activities under the program are spread out in different districts across the state and are in various phase of implementation. In order to avail the benefits of scheme, the fisher/ entrepreneur need to be a member of any PFCS.

Table- 48 Action plan for 2017-18 and 2018-19 to 2023-2024

(Rs in Lakh)

SI No	Scheme	2017-18			2018-19 to 2023-24		
		No. of Units	Total cost	Subsidy/ Grant	No. of Units	Total cost	Subsidy/ Grant
1	Enhancing seed production	92	2600.00	2125.00	3000	34250.00	31225.00
2	Enhancing Fish Production	102	5150.00	4912.50	3680	44600.00	42950.00
3	Harvesting support	4000	800.00	600.00	22500	9000.00	6750
4	Marketing support	195	285.40	214.05	80810	37750.00	28512.5
5	Infrastructure Development	67	900.00	881.25	482	13425.00	12668.75
6	Innovative Projects	0	0.00	0	40	800.00	685
7	Capacity building	12220	73.00	33.00	21275	1037.5	787.5
Total		16676	9808.40	8765.80	131787	140862.50	123578.75

5.12 Policy frame work

Policies form a part of the institutional support. The state has neither a separate fisheries policy nor a broad-based institutional success in the sector. Internalizing production and use of quality fish and prawn seed, feed, credit, extension, R&D and database are regarded as critical instruments for driving sector growth.

5.12.1 Access rights to resources

Most resources of the state are leased to FCS for fisheries development and to support prosperity of its members. Hence, FCS is the main local resource owners and the very success of the sector intrinsically depends on the effectiveness and involvement of them in the development process.

In case of reservoirs, three systems of access rights are prevalent i.e (i) licensing system, (ii) lease system and (iii) Patta. As many as 17 reservoirs are covered under licensing system while others are leased out to Fishermen Cooperative Societies and water bodies in Tribal mandals are given on Patta basis. In the licensing system, individuals have direct involvement in fishing and are restricted to the particular licensed reservoirs only. The cumulative number of licensees operating in the reservoirs keeps changing on a year to year basis.

Licensing system in reservoirs

In selected reservoirs, licenses are being awarded to individual fishermen with certain conditions

Conditions for awarding license

- Should belong to fishermen community; age-group of 18-60; well-versed in fishing ; know swimming and use of prescribed type of net/ boat.
- Female member of the family is not eligible for license and allowed to get into reservoir for fishing.
- Licensee has to pay the fee as may be prescribed from time to time and within the time –frame.
- Abide by DOF rules and procedures as may be introduced/amended from time to time.
- License is non-transferable to anybody including the household member of the licensee.
- Local FDO is mandated to receive, process /scrutinize and award license to the aspirant and use his discretion in issuing license certificates.
- Certificate is valid for one year and fresh application has to be made on the expiry of the license period.
- Total number of license holders per reservoir depends on the WSA as decided by the DOF.

Lease System- Reservoirs and Tanks

Lease system is being pursued from the pre-bifurcation period in respect of reservoir management. Under this system a lease agreement is entered into between the Department of Fisheries and Local Fishermen Co operative Societies. This Lease Deed is a comprehensive legal document that sets terms and conditions obligatory to both the parties under this agreement and spells out operational, legal, procedural, technical administrative details. Main constituents of the Lease Deed are:

Box : 16 Main constituents of the Lease Deed

- Obligation of lessee not to disturb/damage structural frame of water body in carrying out operations including drawing of water through mechanical means like use of engines, disturbing sluices in the process of fishing/capturing fish; nor shut sluices in the course of fisheries operations
- Not to erect any structures/tents in the vicinity under the control / jurisdiction of PWD
- Not to use any explosives/dynamites/ electric fishing
- To make good any loss/damage caused to structure of tank or to any person/official as may be caused during the course of fishing operations
- Not to claim any compensation for any loss incurred by the lessee during the course of fishing operations
- Allow the Lessor or its representatives access to the leased water body and not to obstruct his movement/inspection/survey
- Not to sub-lease or assign the leased water body to any third party including right for fishing either full or part of the leased water body without prior and explicit permission of the Lesser
- In the event of lessee not complying with the condition of payment of lease amount, the Lesser has right to allot the water body to any other party and in such a case the Original lessee will be bound to pay the differential amount between the original lease fee and fees paid by the second lessee
- The lessee should stock seed in the water body conforming to the species and number / stocking norm as may be prescribed by Lesser from time to time.

Resource Access: License systems

License system is prevailing only in selected reservoirs as notified by the GOT and is observed that the number of fishers going for license fishing is declining. This could be attributed to (i) reduction in the number of active fishermen, (ii) formation of new FCS in the jurisdiction of the reservoirs to avail scheme benefits, (iii) Restrictions imposed on the licensees by the DOF etc.

Operational aspects of access rights

■ Licensing system	■ Lease System
<p>Perceived advantages</p> <ul style="list-style-type: none"> ➤ There is scope to exploit available potential in reservoirs since they are licensed individuals and they would always be keen to get best out of their labour. ➤ There is absence of any restriction /control of the reservoir or on the management of the reservoir fisheries activities since DOF support stocking. ➤ Fishing activities bring instant money to the licensee almost on a day to day basis and he is at liberty to sell his catch to any buyer who offers higher price. 	<p>This system aims at equity in sharing of income among the members of the FCS.</p> <p>Main advantages</p> <ul style="list-style-type: none"> ➤ Management of reservoir fisheries activities is vested with a legally empowered entity which can mobilise resources, manage stocking and watch and ward. ➤ It facilitates equal opportunities to members for better collective actions, innovations in doing things, better borrowing powers, employment and income sharing. ➤ It facilitates better bargaining power in selling fish and other products since the produce is bulk in quantity and can fetch better prices. ➤ Ensures transparency in transactions/ dealings ➤ Discourages any clandestine /unlawful activities.

Disadvantages

- There is possibility of over-exploitation of fish stock by individuals who are mainly driven by the motif of maximizing their earnings even at the cost of the reservoir reaching critical stage of fish stock.
- Even though the DOF prevents fishing during some months of the year due to stocking and also use of certain types of nets, there is always the possibility (incidences are not uncommon) of fishermen engaging clandestinely in fishing activities since there could be lapses on watch and ward.

Operational System- tanks

The tank water bodies are mainly covered under leasing system. Leasing system is in conformity with the DOF norms/pattern. The only difference in disposal of GP tanks is that in case any FCS declines the offer of lease, the tanks are auctioned and permission is to the highest bidder. There is good number of such cases where the tanks are auctioned. The reasons for FCS declining the offers are (i) distance from the village to the site is longer, watch and ward becomes difficult, (ii) due to smaller size of tanks, size of operations is very small and uneconomic for FCS and (ii) due to lower water level and fishing operations cannot be carried out in a big way. Some private individuals volunteer to take tanks on lease out of sheer enterprise and risk bearing outlook.

Interactions with Panchayat officials/Committee members show that where the tank is located in far-off places, the local FCS find it difficult to manage and they in turn, work out an arrangement with some local enterprising people (including their own members) and sub-lease the tanks (though it is not allowed, this arrangement is mutual, unwritten and purely based on mutual trust).

General observations on resource access

- Almost 100% of the tanks (both department and gram panchayat) are settled with allocations made to PFCS on lease/ auction to interested persons to pursue fisheries activities.
- In reservoirs both lease and licensing system is followed and the fee ranges from Rs. 205 to Rs. 305 depending on the type of net used in case of licensing system.
- As a policy measure, all water bodies are allotted to the Cooperatives. Except in case of 17 reservoirs under licensing system, all fisheries activities are better organized in the state through Fishermen Cooperatives.

Limitations

- No obligation/ interest in development of reservoir- stocking management.
- Inadequacy in implementation of good governance.
- Weak law enforcement.
- Opportunities for formation of internal rivalry groups within organization.
- Scope for vested interests to hold sway / control on management of the activities.
- Umpteen opportunities to the Managing Committee members to enter into secret arrangement/dealings with seed suppliers, wholesale fish traders to the detriment of the society in general and members in particular.
- Limited share of income to the members due to increased share holders as members of FCS0 addition of new members is further adding to the misery.
- It does not provide adequate employment (in terms of number of days in watch and ward, fishing etc) to all members.
- Where an FCS comprises members coming from cross sections of communities, there is possibility (examples are many) of internal rivalry/ competition in respect of management and control of the FCS.
- Although State have implemented reforms and instituted improved processes; fishers and enterprises are often unaware of them.
- Lack of mechanisms to obtain direct feedback on how the actions/interventions of Govt. are helping the situations on the ground- are lacking.

5.12.2 Fish seed stocking policies

The **reservoirs** are stocked by the state every year and the number of seed stocked depends on the size of reservoirs. This is by and large, in line with the national norms of 500/1000/2000 fingerlings (80-100 mm size) respectively in case of major, medium and small size reservoirs.

Box: 17 Observations on stocking practices

Reservoirs :

- Actual practice of stocking is 50-60mm fingerlings instead of 80-100 mm for large & medium reservoirs and for small reservoirs even size of 40-50 mm.
- Good will stocking of IMC seed 35-45 mm size by the merchants or even smaller size seed.
- Also stocking of freshwater prawns arbitrarily by several lakhs in some of the selected reservoirs-LMD, UMD, Pocharam, Gollavagu.
- Fish varieties and stocking ratio assumed low priority and stocking is mainly on availability basis rather than any preference in accordance to resource type/ fishers choice.
- There is total absence of in situ/ peripheral seed rearing in practice in support of internal seed stocking of choice.

Tanks:

- Stocking of 3000 fingerlings for seasonal tanks size of 35-40 mm.
- Suggested SD of 2000 fingerlings /ha for seasonal and perennial tanks of 80-100 mm size.
- Assumption taking 70 - 75 % as survival.

The **reservoirs** are being stocked with fingerlings of Indian major carps under various schemes and programs. The initiatives of DOF for fish seed stocking with cultivable carps, organizing fishers to come together under the umbrella of Fishermen Cooperative Societies have strengthened the bargaining powers of fishers and has facilitated many to rope into the fisheries activities, increased their return/unit efforts and realize diversified benefits due to enhanced resource productivity, profitability and incremental employment generation. However, due to limitation of availability and financial provision, in earlier years even this level of stocking was not regularly done either by FCS / DOF till 2015-16. Regular stocking was not strictly observed in many instances. Considering these limitations in stocking, the DOF intervened with exclusive fish seed stocking policy for both DOF tanks and all reservoirs in the year 2016-17, accordingly, large reservoirs were stocked @300 FL/ha. However, stocking was enhanced to 500/ha during the current year. In case of licensed reservoirs, the DOF takes up stocking as per schedule since beginning and fishing in the reservoirs is banned for two months (June-September).

Till recently, **Both DOF and GP tanks** were stocked by the societies at their cost availing subsidy facilities of DOF up to 50% under various schemes depending on the type of FCS and the community participated in the activity. Only since 2016-17, the DOF positioned new scheme of total support of government for fish seed stocking and initially extended seed stocking support for the feasible Department tanks and reservoirs. The support was to stock all the perennial tank water bodies with advance fingerlings of 80-100 mm size @ 2000 /ha. Considering the increased response of FCS for the program and to enhance fish production, during the current year, feasible GP tanks are also being supported for fish seed stocking by the DOF. Fish seed stocking support was extended @ 3000/ha (35-40 mm fingerling. In the initial year of fish seed stocking initiative, in most instances there was double stocking both by FCS and DOF and the incidence has come down in the subsequent year. Generally the FCS collect money from its members in the month of May-June to meet the expenses related to fish seed, watch & ward/ security depending on internal arrangement and other miscellaneous cost. The profits were distributed among the members at the end of every year after realizing the sales amount and adjusting the incurred expenditure.

- Present system of fixing common stocking rate on a general note throughout the state may be dispensed with and stocking rate and species combination may be worked out at district level based on the type and nature of water body and its productivity basis.
- Water bodies with direct connection with rivers may be stocked with local self populating species in addition to IMC in order to maintain ecological balance and providing livelihood to fishers throughout the year.
- Stocking small sized fish for short seasonal tanks does not seems to be appropriate as there is need for large sized fish at lower stocking rate for water bodies with short duration for better growth.

- Consideration should be given for seed stocking of improved Tilapia, murrel and amur common carp etc. specially for tanks which are comparatively high productive and on pilot scale in some of the small tanks with improved management practices like manure application and feeding with supplementary feeds on a limited scale.

Box : 18 General observations on stocking policies

- Although provision is prevailing, instances of Gram panchayats developing water bodies as an institution purchasing seed from the Fisheries Department is not observed during the study. Allotment to existing FCS in the village is the common practice in adoption. Availing access of GP tanks on auction basis by the interested public was also not observed during the study.
- It was reported by some of the DOF officers during the study that consultation with Dept. of Fisheries by the concerned Gram panchayats in allotment of tanks to FCS or while auctioning to private for development of fisheries is not being complied with.
- Disposal of resources based on viability norms of productivity, seasonality and nature of tanks in fixing up unit economics of the tanks in support of lease / rent cost though in policy is not observed during the study.
- It is perceived that due to the construction of various projects under Jalayagnam and Mission Kakatiya every water body has changed its seasonality and potentiality and created a favourable situation for adopting Good Management Practices by the fishers, the productivity of all water sources is perceived as increased by several folds. This also formed one of the strong bases for changing unit area norm to accommodate new members. In ground reality, based on feedback of FCS members and experts observations this is not happening (Details in write up on resources).
- Prevailing delays in statutory clearances required for registration of farms by the state government and release of support benefits need attention.
- Regular field level monitoring of scheme progress both in implementation and the output is very much lacking. Mid- term corrections on the basis of feedback, ground level performance and in house learning is not happening.
- Organizing new Fishermen Cooperative Societies for those people engaged in fishing activity but hailing from fishermen castes in scheduled areas, new initiatives taken by DOF for early settlement of the Cooperative disputes, efforts of DOF to lead transformation in sector through bringing in additional products and services, strengthening relationship with stakeholders and integrated efforts towards supply to ensure ramp up are well appreciated in support of sector growth.

5.12.3.1 Resource access and Resource development

The present policy allows lease period up to five years, but in practice it is beyond for indefinite period and there is also a proposal to enhance this to 10 years. As a result, wide diversity in participation of PFCS exists at present in most instances there is great deal of compromise and negligence in involvement by the members persist. Though it is a welcoming move, there is need for modifications in terms of management led growth, enhanced production and profitability in the activities, effect accountability and transparency in sharing data on production and process of management adopted etc. instead of blanket renewal of licenses annually. Without stringent measures for active involvement of FCS and participatory process instilling ownership and technology led resource development, the situation is not going to improve in favour of sector growth.

In order to augment increased production in public water bodies and improve livelihood options to fishers of FCS, the GOT has taken a policy decision of extending support to fishers for fish seed stocking initially to all the DOF tanks and reservoirs during 2016-17 and later to all suitable water bodies including GP tanks. All water bodies which are suitable for stocking have been identified for seed stocking by government. On promotion of input based fish culture activities in tanks which are not used for drinking water purposes, the state has taken stand for allowing use of feed input that do not pollute or alter the water quality. Accordingly, a few tanks are being supported for promoting low input based (use of locally available feed ingredients for feeding) fish culture on a pilot basis. Training programs on improved tank management practices are planned for the Fishermen under IFDS program.

The direct impact of this policy are (i) pressure on FCS will get substantially reduced though immediately but there would be gradual weaning away of fishermen from Merchants and their stranglehold. The use

of low inputs in practice is anticipated to open up new opportunities to the FCS to switch over to feed/input based fish culture in future years and would enhance resource productivity and fish production.

Addressing issues of desilting/deweeding of water bodies, the DOF is pursuing this through irrigation department under Mission Kakatiya program. At present this is one time activity, but in reality it is recurring one, and hence need alternative approaches. Considering the field progress and the quality of work execution, revisiting the approach with better alternatives are needed. Farmer's participatory approaches with one time grant support under the supervision and control of DOF need to be thought of (Ex. Bundu tank, Jharkhand approach).

On horizontal expansion of sector activities, DOF is contemplating utilizing non conventional water bodies that have come up under various development projects and programs including Watershed, mission Kakatiya, NHM, quarry tanks, abandoned mines, and quarry tanks etc. It is estimated that over one lakh ha of this small category water bodies has been listed by the irrigation department. Information is lacking related to their present utilization status, fish production and extent of contribution to the total district fish production. However, Field level observations and interactions with user groups could not be facilitated by the DOF staff in the study districts both for the expert team and for field enumerators for reasons of scattered nature of information with diversified institutions and insignificant role being played by these resources to the district fish production. The absence of clear data on the resource characteristics, usage pattern, ongoing fisheries and aquaculture activities has restricted the validation by the study team.

During the study, change in resource use pattern, seasonality of water bodies due to canal linking, change in actual area and use for alternative activities beyond fisheries, encroachment, presence of water bodies not reported in the secondary data of DOF etc... are witnessed. The absence of data base on the resource characteristics and resource use status has constrained the development of utilization strategies in support of sector related activities and resource integration modules. No survey as such is carried out till date. These need to be considered while surveying and digitalizing the resources.

5.12.3.2 Fish seed policy

DOF has devised various schemes like construction of captive fish rearing ponds, strengthening of existing fish seed farms, leasing of government farms to private entrepreneurs, construction of new fish seed farms, seed hatcheries, etc. Positioning of region focused new seed production hatcheries-Chinese / eco hatcheries and seed rearing farms are receiving focus. Also established Eco-hatchery in LMD Karimnagar and using it has a platform for exposure visits to fishermen, entrepreneurs and department staff. The DOF has plans for sanctioning new Seed farms and hatcheries under IFDS programs for interested societies and members of societies all over the state. Upgrading of existing govt. farms into integrated fish seed farms with emphasis on enhancement of hatchery capacity for spawn production of multiple species of cultivable carps, and also seed rearing throughout the year has taken priority. Strengthening of existing fish seed farms is being taken up to improve the seed production. Out of 32 Govt. Seed farms, at present 5 seed farms have been taken up for strengthening. More govt. seed farms are being identified for strengthening under IFDS program.

The DOF initiatives on promotion and supporting hatcheries in private sector as also exposing the new entrants on hatchery/ seed production will have good response from the private players. However, since this concept is being explored for the first time after formation of the state, any stringent conditions would not attract investors and entrepreneurs. This needs to be considered while implementation of the program.

The GOTs policies on promotion of new hatcheries and seed farms are a step in right direction. It would help streamline seed production within the state.

As a step towards incentivizing private seed production farms to upgrade infra for higher capacity, technology and training support, other types of handholding support including seed buy-back for govt. schemes etc. private participation in seed production, seed hatcheries, seed rearing units are being encouraged/promoted involving members of cooperative societies under IFDS. Private entrepreneurs can avail subsidy through Blue Revolution scheme. Provision for seed buyback from government seed farms and also from private farms has also been made. This intervention of DOF is expected to promote seed rearing both at PFCS level and private entrepreneurial level (spawn rearing to fry, fingerlings and beyond/fry rearing to fingerlings and beyond,

production of stunted fingerlings/yearlings etc) under IFDS, subsidy of 75% is provided to PFCS members for setting up captive fish seed rearing units, seed rearing units, etc.

Captive seed rearing activity is planned under IFDS for extending exclusive support programs for seed rearing viz., *in situ* seed rearing, peripheral rearing, pen seed rearing and other non-conventional seed rearing practices by integrating with existing resources and ongoing fisheries/aquaculture activities. The DOF has initiated process for identification of suitable water bodies and sites for pen culture in all districts including seasonal water bodies for seed rearing. Seed rearing in 40 cages with technical support from CIFRI is also being pursued. Facilitation for establishment of fish seed villages, hubs, mandal level seed nursery/rearing units, establishment of fish seed holding facilities and supply units, seed production enhancement activities under IFDS are proposed at present.

With the partnerships of NBFGR, CIFRI, CIFA possibilities for establishing Brood fish bank, breeding of exclusive fish species of commercial importance viz., murrel, improved tilapia, pangasius, Ompak, freshwater prawn, selected indigenous fishes etc are being explored. In this direction, Brood bank is being established in Pochampad, Nizamabad at a cost of 5 crore to avoid inbreeding and produce quality fish seed and supply such fish seed to the approved farms for multiplication. Brood stock of quality strains supplied by CIFA will be raised in the farm and the produced quality spawns will be supplied to Government and private seed farms for further rearing and supply for resource stocking/farming. The DOF has plans of roping in Private entrepreneurs / cooperatives to establish captive rearing ponds near reservoirs and major tanks to meet their own requirement.

*The **concept of brood bank** is to maintain the brood fish with good performance (good growth, high survival and disease free) in one center with a definite goal, raise brood stock with standard practices to produce quality seed(spawn) and supply to identified multiplication centers to build brood stock and multiply seed on large scale to meet the required need. The brood banks will only act as breeding centers with continuous breed improvement programs and supply quality seed from time to time to multiplication center, while multiplication centers will act as large scale seed producers and replace their breeders once 4 years from the brood bank and also will give feed back to brood bank on the performance and the trait that needs improvement. The brood bank need good infrastructure with facilities to maintain live gene bank of different species, acclimatization and quarantine facilities, technically trained staff in genetic management of stocks etc.*

Murrel being most preferred fish species in the state with high consumer demand and fetches high market price, the absence of commercial farming in the state is a limitation. Apart from lack of commercial viable technologies, the state is experiencing limitations in terms of availability of quality fish seed of this species and is mainly dependent on neighboring AP to meet its growing demand.

The proposed policy on promotion of fish species viz., late maturing and fast growing species like Amur carp, Jayanthi rohu, improved catla and other species developed from time to time is a good approach for enhancing fish production.

5.12.3. Establishment of Fish/Prawn/Shrimp Farm or Fish Seed Farm or Fish Hatchery

In addition to the Indian Major Carps, certain species of fish/prawn have commercial importance. Prawn seeds are being stocked through seeds procured through tender process.

5.12.4 Free seed supply

At present there is no quality control for seed gaining entry into the state. The DOF is following QC of Andhra Pradesh Aqua culture Seed (Quality Control) Act 2006. But all clauses in the Act are not being enforced at present.

Free seed supply by DOF is a welcome initiative as this would enhance the profitability of fishing activity and enhance the fishermen income. However, if this is just a temporary support of 2-3 years it would not have desired impact. Studies conducted show that the FCS have not cultivated the practice of saving and building up of financial strength and heavily depend on external support which is provided by merchants. If the seed supply scheme is discontinued, merchants might re-enter the scene.

The overall perception of the fishermen has been that the growth of fish is low due to poor quality of seed. DOF program of early stocking this year is a good decision and it would result in enhanced yield. However, it is necessary to discourage double stocking both by FCS and over-stocking of seed (Detailed write up in fish seed chapter-4).

Use of inputs: As for according permission to use inputs such as feed in tanks not used for human purposes, this would open up new opportunities for the FCS to switch over limited use of supplementary feed and other production enhancing input /input based practices and would enhance productivity. This is subject to the condition that the fishers are adequately trained and exposed to these type of farming practices. Regular monitoring mechanism has to be ensured to minimize initial issues related to distorted perceptions and associated conflicts among the resource users.

5.12.5 Primary Fishermen Coop Societies

The Societies are not maintaining transparency in their dealings and go unchecked. It is also seen that the Societies do not feel the necessity to keep contact with the Department except on matters relating to subsidies and benefits. The DOF has technically/ legally/ administratively no role nor control on them except when the societies are found at fault (which seldom comes to the notice).

5.12.6 HR and institutional related

The collaboration with resource institutions viz., KVKs, Fisheries Research station, Palair and host other expert outreach institutions located in Hyderabad and elsewhere in the country apart from Fisheries Central Institutes in support of training fishermen and fisherwomen, department staff and entrepreneurs is a welcoming step that is anticipated to have long term benefits in leading the sector growth.

It is expected that the designed programs are to be implemented within a time-frame.

Allotment of supervisory officers at regional/ zonal level for overseeing activities and progress of cluster of districts is a welcoming strategy in support of implementation and monitoring of the activities.

5.12.7 Enhancing DOF staff strength

The state has come out with many initiatives to bridge the gap in HR at the district and state (HQ) level for effective implementation and monitoring the fisheries and aquaculture activities. Recruitment of Contractual staff is in progress for Fisheries Field Officer (31 posts), Fisheries Assistant (79 posts) and Fishermen (79 posts). These job roles are created for the purposed of implementation of IFDS and effective implementation of all the activities in the department.

5.12.8 Fish Marketing & input supply

With the multiple strategies of DOF viz., seed stocking, support for fishing crafts and gears and development of hygienic markets across the state, it is expected that the stronghold of middlemen and merchants would get substantially reduced. Hence, along with market development, some regulatory measures could help remunerative price to the fishermen and societies.

Provision of Insulated ice boxes, mobile fish vending kiosks and vending units with mopeds, ice plants would result in value addition and create incremental employment. This may be further expanded to other areas.

5.12.9 Welfare schemes

Provision of adequate resources to fisheries sector growth and also for community welfare viz., housing, disaster & risks, Group Accidental Insurance and others by the DOF will result in accelerated growth.

5.12.10 Riverine fisheries development and Ranching Policy

Challenges for development of riverine fisheries

- Reduced and regulated water flow, industrial and domestic pollution, sedimentation, increased fishing pressure
- Destructive fishing and poor enforcement of regulations
- Sand mining in river-beds resulting in degradation of riverbed
- Loss of aquatic biodiversity due to degradation of riverbed negatively affecting the livelihood of community in the catchment

As such the DOF has no specific programs on river ranching and conservation measures like mesh size and close season, ban on exotic fishes that are detrimental to the local fauna.

5.12.11 Eco – tourism and sport fishery

Under IFD Scheme, 10 Aqua Tourism units at a unit cost of 10 lakhs each are proposed. No guidelines or policy are available at present.

5.12.12 Fish Biodiversity

Conservation of aquatic biodiversity is important from the ecological, socio-economical, nutritional, cultural, aesthetic, recreational and pharmaceutical point of view. The rivers, canals and water bodies of Telangana have good number of fish fauna. Many of the species are near to threat of extinction and vulnerable species and need to be conserved.

5.12.13 State Draft Policy

■ GOTS policies on Fisheries Sector Growth

Sustained growth of any economic sector reflects in the development initiatives / interventions by the State and Governments' Policies and programs that have direct bearing on the sector activities. With 98% of the population of the state being meat eaters, it becomes all the more important for the state to ensure the demand and supply conditions go in a coordinated manner so that there is symbiotic condition between two segments namely producers/ suppliers and ultimate consumers. There is incentive for private enterprise to engage themselves in various production, and value addition and marketing processes.

Experience has shown that the Government cannot by itself directly get involved into any business or economic activity but can only create an enabling environment for the private sector. At the same time, the State cannot afford to be a mute spectator of concentration, monopoly and exploitation and hence has to frame suitable format for sustained growth with equity.

The proposed draft policy envisages major goals of achieving self sufficiency in fish seed production, adoption of saturation approach in fish culture in water bodies (Minor, Medium & Major Reservoirs), impetus to cage culture, pond culture & prawn culture etc., improving economic status of every practicing fisherman and woman, and encouraging fisherwomen's participation in entire value chain, establishing infrastructure for seed production, harvesting, processing, value addition & marketing in association with cooperatives and private entrepreneurs. Salient features of the present policy are reviewed and the details are given in status chapter-3.

- The new Initiatives of DOF for transferring of all minor irrigation tanks and other sources vested with the Gram Panchayats to the Fisheries Department for the purpose of fisheries development and leasing of fishery rights; amendments to the existing lease period increasing to 10 years; and fixing uniform lease amount throughout the state are welcoming moves of the DOF in the interest of scientific development of available water bodies in the state.
- Positioning of new guidelines related to registration of aquaculture farms/ establishments in support of segment development and steps taken to by DOF for promotion of aquaculture in suitable areas is well received by the aqua farmers (Details of study team observations and suggestions are given in write up on aquaculture).
- Free supply under fish seed stocking program is one another good initiatives of DOF to enhance fish production in the State and to ease out FCS from the exploitation of merchants.

- The new provision made in cage farming for accommodating members of Fishermen Cooperative Society or license holders who have fishing rights in the water body, families displaced by the project and private entrepreneurs is highly encouraging for taking the segment forward both in the direction of community benefits and commercialization with the participation of private entrepreneurs into the activity.
- Ban on all activities of African catfish, big head fish, restrictions and regulation of exotic fish culture and monoculture of exotic species viz., Tilapia (*Oreochromis mossabicus*) will comply with the national regulations on exotic fishes and is beneficial to the sector growth.
- Empowerment of Panchayat Raj Institutions both at mandal and district level for reviewing fisheries sector performance in their respective jurisdictions is a good move to bring system improvement and foster better relations between the stakeholders and service departments. These steps will facilitate achieving convergence of schemes/activities for filling the gaps in delivery of services efficiently.

Chapter – VI

Suggestions, strategies and action plan

6.1	Resource use and development	6.9	Infrastructure and logistics
6.2	Fish seed production	6.10	Processing and value addition
6.3	Strengthening the Co-operatives	6.11	Suggestions on Department initiatives, schemes and programs
6.4	Fish marketing and consumption	6.12	Overall strategies for enhancing sector growth
6.5	Promotion of fish consumption	6.13	Suggestions on Pointers for action
6.6	Accountability & data base	6.14	Suggestions on State Draft Policy
6.7	Reorganization of DOF	6.15	Planning priorities
6.8	Thrust on institutional arrangements		

6.1 Resource use and development

6.1.1 Suggestions on resource use

In view of dwindling EWSA, the DOF should draw up a plan for retrieving the lost WSA on account of siltation, weed infestation and encroachment. The GWSA - EWSA gap should be reduced through desilting, removal of weeds, tree stumps and retrieving the area through eviction of encroachers. This program should be dovetailed with fish stocking and projecting of fish production.

The Projected year wise targets for the state could be broken into district wise targets. Modifications in annual phasing could be effected depending on local conditions and during the process of implementation of Action Plans.

■ Management of tree stumps

- Selective clearance of trees and bushes up to the draw-down limit is essential where fishing operation is conducted by means of shore seines/ drag nets.
- Complete removal of trees and bushes in large and medium reservoirs involves huge expenditures and capital investment and impractical.
- The presence of stumps will provide substrate for periphyton and associated organisms and enrich the food resources of water bodies. Hence, a decision on extent of removal needs participatory discussions with the user groups. This could be addressed by the DOF by facilitating with concerned FCS and or licensed fishers on case to case basis for taking appropriate action. Support and facilitation by DOF in addressing this long pending issue of fishers need focused attention.

■ Management of water pollution

- Creating awareness on management of pollution and its possible negative effects through focused trainings of fishers/ FCS managing these affected water bodies is needed.
- Trainings for resource user groups on use of sewage water for better advantage of fisheries activities, educating them on various means and ways to combat the problems and also judicious utilization of treated sewage water for fish production activities as one of the sources of organic/nutrient enrichment are needed.
- Provision for making drainage canal to divert the excess sewage entering into water bodies could be prioritized in convergence with Mission Kakatiya activities.

- Exclusive financial provisions for participatory approach of making diversion canal also could be thought of in consultation with FCS.

■ **Utilization of water bodies used for drinking water purpose for fishing activities (Multiple use of water bodies)**

Most of the reservoirs are built for multi-purpose activities of irrigation, hydroelectricity and drinking water (e.g. Nizamsagar and Singur supply water to Hyderabad; LMD and UMD to Karimnagar and Warangal). However, a few reservoirs may be exclusively reserved for supply of drinking water for major cities. Such reservoirs are characterized by low and slow fluctuation in water level. In such cases, the catchment areas must be kept free from anthropogenic activity and the inflow into the reservoir is expected to be free from sewage and factory effluents. The following suggestions need considerations

- As fish are known for their proven ecosystem services, promotion of fisheries in drinking water reservoirs needs priority and the concerned authorities has to be educated on the benefits of integration practice.
- Fisheries activity needs to be promoted on extensive culture model limiting to stocking of fish seed and harvest of the grown fish.
- Apart from catla and rohu, fishes which feed on organic matter and detritus like mrigal and common carp may also be included among the species to be stocked. Stocking of Common carp also help in control of water lotus and lilies that pose major menace in many tanks. Stocking of silver carp on small proportion (5%) as service species is advantageous to keep algal growth under control. Similarly, stocking of grass carp (5-10%) to keep the submerged vegetation under control is advisable. Fish seed stocking helps in i) biological harvest of algae, ii) control of detritus, iii) keep the water clean, iv) prevent eutrophication and v) prevent occurrence/accumulation of anoxic gases viz., methane and hydrogen sulphide in the bottom layers.
- Activities like cage culture and pen culture where inputs like feeds are used in significant quantities should not be encouraged as the unused feed and fish excreta would increase the organic load and pollute the water.
- The fishing gears like gill nets and cast nets may be permitted all round the year. Operation of shore seines in late post-monsoon should strictly be banned as the use of this net would churn the water and increase the silt turbidity significantly and seriously put strain on the water treatment.

Box: 19 Management of spillways

- Water bodies (small reservoirs and large perennial tanks) that have only spillways could be provided with barricade mesh. Usually the flow at the spillway will be mild and debris may be sparse.
- Erecting mesh barricade at the point of entry of inflow may not be practical given the force of entry of water and the debris which may be carrying like boulders, tree branches etc.
- Erecting barricade across crest gates should not be done and will not be permitted by the Irrigation Dept.
- However, proper care should be taken to prevent clogging of meshes and chances of damage to embankment.
- Implementation could be done only in consultation with the irrigation Department and is anticipated to minimize escape of fish to downstream.

■ **Use of non conventional water bodies**

The other water bodies such as watershed structures, rivers and nalas (seasonal) also support economic activities, mainly agriculture, drinking water for livestock population and supplement fisheries activities. Field surveys of these water bodies are needed. It is necessary to hasten the process of identification, assessment and inclusion of such new/ non- conventional bodies for fisheries and aquaculture activities.

■ **Promotion of low input based fish culture**

The DOF will be required to carry out a quick study of areas in each district and identify water bodies that can be used for low input based aquaculture in natural resources under the management of FCS. Since vertical growth is the need of hour to enhance productivity potential of the water bodies (selected reservoirs and tanks of different types) and also to bring efficiency in terms of incremental stocking, survival, weight and productivity increase with minimal interventions, a time-bound program should be formulated and implemented in association with the PFCS across the state.

Suggested activities are

- Carrying out a quick reconnaissance survey of small reservoirs and all the types of tanks across the State suitable for promotion of low input based fish culture and shortlist them initially.
- Finalise list of water bodies that could be brought under this new system of culture in consultation / association with the stakeholders.
- Launch mass education programs to all the PFCs and conduct training cum orientation/motivation programme at district and mandal levels by DFOs and FDOs.
- Formulate appropriate schemes for support/assistance under different agencies / programs (state, centre, NFDB/ RKVY, ongoing NCDC etc).

6.1.2 Development of resources**6.1.2.1 Large and medium reservoirs**

Positioning system specific management regimes for medium and large reservoirs are needed. The following suggestions need consideration for the sustainable development of these resources

- Assessment of trophic status of water bodies.
- As stock enhancement strategy, encourage stocking of economically important species.
- In the absence of auto stocking/natural breeding of IMC, regular annual stocking with IMC is inevitable.
- Promote stocking advanced fingerlings (>10 cm) with initial institutional support system and later internalization of seed production within reservoir system.
- Focus on stock enhancement of native carps and also develop fishery for high value carnivores.
- Undertake stocking of medium and minor carps also grass carp and freshwater prawn in consultation with beneficiaries wherever feasible.
- As one of the inclusive strategies for resource development, seed rearing in cages or in periphery of reservoirs need to be explored and promoted.
- Promotion of cage / pen fish culture deserves special focus as major water based aquaculture system within reservoirs and large perennial tanks.
- Development of fish aggregating support in suitable sites with permission of Irrigation Dept. to create additional surface area for periphyton development and associated fauna and flora could be explored. These devices also offer shelter for escapement of small fishes from predators.
- Good governance through strengthening FCS, scientific stocking, regulated fishing, closed season etc.
- Promotion of Eco-tourism.

Box : 20 Suggested Strategies

- All out efforts for stocking on regular basis; staggered and multiple stocking of reservoirs could be encouraged.
- Conditional approval for use of shore seine to reduce pressure of weed and predatory fishes etc.
- Restricting closed season operation only for large and medium reservoirs with established auto stocking.
- Inter institutional coordination to tackle common problems of mutual interest in support of respective segment growth.
- Support for motorized boat for watch and ward and strengthening surveillance to minimize poaching and also high cost incurred for watch and ward.
- Support and facilitation for centralized landing centers/spots for large and medium reservoirs to minimize present scattered landing centers / spots.
- Support for infrastructure – creating shelter & storage facility (structured/semi structured) at landing spots.
- Proper maintenance of fish catch data (use E-Das of CIFRI)

6.1.2.2 Development of Tanks and small reservoirs

There are three scenarios that emerge in the context of development of short and long seasonal tanks, in addition to one that involves perennial tanks and small reservoirs.

Scenario 1	Scenario 2
<p>Short seasonal tanks retaining water for 3- 4 months</p> <ul style="list-style-type: none"> These resources could be used for seed rearing from spawn to fry/fry to fingerlings /spawn to fingerlings. If not all, at least some resources nearer to spawn production centres (may be around 10-20%) could be used for seed rearing in support of reducing pressure on seed production/rearing centres and make seed locally available to nearby perennial tanks /reservoirs/private aquaculture farms. Roping in of resource tagging approaches and integration of systems using FCS as major stakeholders with proper handholding and assured market need attention. Resources can also be used for production of stunted fingerlings by stocking advance fry / fingerlings. It is possible to take spawn – fry- fingerlings rearing (one crop); Spawn – fry (2-3 crops); fry – fingerlings (2 crops), fry – advanced fingerlings (1 crop) in these resources. <p>Categorization of small seasonal tanks based on water holding and facilitation for development of resources appropriately are needed</p>	<p>Short seasonal tanks retaining water for 5-6 months</p> <p>These resources can be used for multipurpose activities (seed rearing + fish culture (residual seed); rearing of fingerlings – stunted fingerlings + fish culture (residual seed) etc.). The resources could also be used for</p> <ul style="list-style-type: none"> Fish culture purpose by stocking large sized fingerlings (20% area). Seed rearing from fry to fingerlings/rearing stunted fingerlings (60% area). Rearing advanced fingerlings to stunted juveniles (20%). Residual fish seed and growing them to table size fish for consumption and marketing. <p>The seed output of short seasonal tanks could be synergistically / complimentarily used as source for stocking long seasonal and perennial water bodies, also for stocking reservoirs wherever feasible.</p> <ul style="list-style-type: none"> Under low input based fish culture use of feed, manure etc could be promoted for the success of activity. Positioning of appropriate schemes to support and facilitate the activities of seed rearing and fish culture in small seasonal tanks.

Scenario 3. Long seasonal water bodies (> 6months but <12 months)

- Promotion of conventional fish culture by stocking fingerlings of 80-100 mm size/stunted fingerlings.
- Supporting low input fish culture and stocking with large sized fingerlings (80-100 mm) at low stocking density for better returns.
- Positioning of supportive schemes to facilitate seed rearing in peripheral tanks (small sized tanks constructed for the purpose).
- Promotion of Self Populating fish species (SPS) of high market demand for culture.
- Promotion & facilitation for pursuing the activity with intensive training.
- Positioning input support schemes – initially extending support of 90-100% for spawn, feed & other inputs.

Scenario 4. Perennial tanks/small reservoirs

- Development of perennial tanks/small reservoirs under low input fish culture approaches (up to 40% area).
- Manipulation of stocking density, species mix in accordance to resource characteristics, water holding catchment activities and source of water (canal/ input water from polluted water bodies – musli or domestic sewage systems) and market needs.
- Use of large sized seed, advance fingerlings/stunted fingerlings/yearlings when ever available in accordance to grow out period etc...
- Promotion of multiple stocking and multiple harvesting by linking to *in situ* rearing or outsourced seed in support of the activity.

Promotion of sewage fed fish culture – a new opportunity

- Some of the tanks are fed with sewage water eg. Tanks connected with Musi river in Yadadri, Rangareddy districts etc that could be used for sewage fed fish culture- stocking with hardy species like murels and other air breathing fishes instead of routine stocking of IMC (may be around 10% of the tanks).

- Promotion of common carp (amur carp) in water bodies of high organic matter, grass carp in weed infested tanks; incorporation of silver carp (5-10%) wherever water is witnessing hyper eutrophic situations.
- Provision for diversion canal for management of sewage inflow into tank –Under Mission Kakatiya.

Promotion of other activities

- Promotion of fish culture of indigenous fishes of high value [*A. mola*, *P. sarana* (buddavarka)].
- Culture of freshwater prawn by stocking juveniles as additional candidate species wherever feasible.
- Pen seed rearing for production of advanced/stunted fingerlings and fish culture.
- Promotion of peripheral / *in situ* seed rearing in 10-20% area during early monsoon season (spawn- fry/fingerlings) to meet own stocking and /or also sell part of the produce.

Small reservoirs

Promotion of culture-based fisheries regime by

- Regular stocking
- Low input based fish culture
- Adoption of BMP in resource management

Box: 21 Strategies for tank fisheries development

Resource expansion

- Roping in of abandoned resources – coal pits, quarry tanks, water harvesting structures, resources developed under NHM, NMPS, NFDB and such other development schemes/programs to activities of fisheries and aquaculture.
- Resource development by addressing issues of siltation, weed infestation, pollution etc and convergence of institutions- Mission Kakatiya, Irrigation, Forest departments; Pollution Control Board, Lake Development Authority, Local panchayat.
- Institutional facilitation and coordination by DOF; positioning of supportive schemes, one time grant support, bringing collective actions of FCS etc.
- Promotion of cluster approaches for resource and activity development and networking with FCS for pursuing diversified activities.

Promotion of Low input based fish culture in tanks and small reservoirs wherever feasible

- Use of low cost inputs viz. agricultural by products i.e., rice bran, oil cakes; green manures/ crop residues, substrates in support of periphyton growth, organic manures etc.

6.1.2.2 Water bodies productivity Health card (WPHC)

- Need new initiatives of DOF on development and distribution of WPH cards to the resource users in support of maximization of output from natural resource based fisheries and aquaculture, resource level input cost minimization, efficient use of resource productivity, enhancement of productivity through science based approaches that are cost effective and environmentally friendly, regionally focused etc.
- Facilitate technical resource information support to fishers on the nutrient status, water quality parameters, soil type, catchment sources, present fish productivity potentials, along with recommendations on appropriate practices to be undertaken in order to improve resource health, productivity and fish production.
- Development of WPHC for all the water bodies in the state could be taken up in a phased manner along with resource specific recommendations for further development by outsourcing to technical experts with domain expertise.
- Establishment of supportive labs for extending support on a continued basis at nominal cost to commercial aquaculturists in the later phase and to fishers on demand basis.

Policy suggestions for tank fisheries development are given in **Annexure – 6.1**

6.1.2.3 Riverine fisheries

- Policy related to river ranching and other conservation measures for enhancement of riverine fisheries needs attention.
- River ranching need to be effected by ranching brood fishes of local indigenous fish species collected by nearby pools and water bodies during the pre monsoon season.
- Positioning exclusive hatcheries/prioritizing existing hatcheries to propagate selected breeds of indigenous fish species during monsoon months on regular basis to take up specific ranching activities.
- Protection of breeding grounds within the water bodies, providing shelters/ bio reefs/ Aggregating devises etc. in support of establishing breeding niche are the other approaches that could be explored.
- Effective enforcement of ban season in July and August month to facilitate breeding of local indigenous fishes, nursing of juveniles and support possible auto stocking of stocked fish species.

Box: 22 River restoration strategies

- Periodic de-silting of rivers to increase water holding capacity.
- Reduce fishing pressure in rivers by educating fishers and providing alternate employment for their livelihood.
- Checking entry of polluted water through appropriate measures and in consultant with particular institutions viz., Pollution Control Board etc.
- Adoption of Technology for breeding native and endemic species; establishing hatcheries for breeding local fish species adjacent to rivers.
- Ranching of rivers with local fish species.
- Better vigilance on sanctuaries and protected areas.
- Identifying stretches important for native and endemic species and protect them – e.g. Khandakurthi for *L. fimbriatus* on Godavari river; Bagarius sp. around Wadapalli (Krishna).
- Providing additional niches to biodiversity.
- Declaration of fish sanctuaries.
- Inter-sectoral coordination and between water user groups, fisheries department and experts prior to construction of dams across various rivers and streams.
- Ensuring better water flow and assured water in rivers and their streams.
- Positioning monitoring and regulation mechanisms to monitor and regulate sand mining, water pollution, prevent use of destructive gears and fishing methods.

6.1.2.4 Eco – tourism and sport fishing

The DOF in collaboration with Tourism department could explore the possibilities of establishing aqua eco tourism spots in selected districts initially on a trial basis.

- Water bodies that are located nearer to cities, amid forests and in popular tourism sites which are pristine and unpolluted can be developed as eco- tourism spots.
- The stretches of rivers, reservoirs and large perennial tanks having natural scenic beauty and positional advantages can be developed by providing all the tourism amenities- Home stays, water sports/games, trekking, nature walk, aqua adventures, boat rides, fish hanging, aqua biodiversity gallery, aqua eco systems Museums etc., video shows and educational events on nature, aqua-eco systems, workshops, exposure visits etc could be part of activities.
- Angling in rivers is not permitted by Government of India due to ruling by Court from the point of view of conservation of mahseer which are in threatened category. Stretches in rivers may be identified for development of sport fishery. If and when the ban on angling is lifted, the stretches can be developed for angling. Hatcheries for mahseer breeding and seed production may be developed near rivers for ranching rivers and for stocking lakes around urban areas.
- Promotion of sport fishing gives prospects for foreign exchange earnings as people from developed countries love to visit tropical countries for holidaying and sport fishery will definitely be a special attraction for anglers.
- Awareness to Resort Managements may be created about aqua eco tourism and profits from sport fishing.
- Large ponds may be created in resorts and mahseer angling may be promoted.
- Annual competitions may be held to make aqua eco tourism popular. Awareness on conservation and propagation of indigenous fish fauna may be conducted at regular intervals to fishers and the officers need to be trained in breeding of these fishes.

6.1.2.5 Overall suggestions on resource use and development

- Updating resource revenue records with present realistic data, users and usage pattern, practices, management status and arrangements, issues & problems, scope and opportunities for scientific development.
- Need systematic survey of resources for the extent of area as per revenue/ irrigation records, rejuvenation of water bodies, fencing etc.
- Use of Remote sensing and Geo-informatics data to integrate information on weather, water body characteristics, mapping of farming activities practices and preparation of sector development plans.
- Focus of fisheries development need to be on the development and implementation of innovative process for achieving full potentiality of the sector through growth and improvement.
- The active involvement of resource users (PFCS) would be critical to ensure optimization of yield levels, economic viability to the producers and sustained development of the resources.
- To realize the untapped potential of fisheries sector in inland capture and culture fisheries, both resource management and its development assume greater importance.
- Development of pathways for urban tank to bring in concepts of eco tourism, participatory management, responsibility of resource management by user groups etc.
- Awareness on the ecosystem service of fisheries activities in terms of restoration of ecosystem for the benefit of community residing surrounding tanks.
- Creating exclusive facilities for the immersion of Ganesha idol or for any other types of ritual activities in the tanks.
- Checks and control on private business operators – mainly use of water of urban and semi urban tanks for commercial activities, drawing water for commercial supply and trading, also digging private bore wells with in tank bed.
- Development of BMP practices for the wide range of resources with diversity in characteristics and productivity.

6.1.3 Promotion of aquaculture

The role of policies and institutions, assumes critical significance for promotion of aquaculture activities in the state. The DOF needs to take up multi - pronged approaches to promote production of both high value fish and prawn farming in support of meeting niche market demand and also production of IMC and other common cultivable fish species for the open market.

- Aquaculture segment of sector is regarded as platform for activities of opportunities and inclusion and is regarded as one of the major engines for the economic growth of the rural Telangana.
- Aquaculture activities that need immediate attention for promotion are commercial seed rearing & fish culture, prawn farming, cage farming in selected reservoirs, pen culture in both reservoirs and perennial tanks, In situ seed rearing for desired size in pens wherever feasible, ornamental fish farming etc.
- Marginal areas for enclosure culture, especially pens for fish production need to be promoted on a special drive mode.
- There is need to promote farming activities on economy of scale to make it more economically viable and profitable.
- Create exclusive awareness activities on the schemes and programs in support of taking decision on pursuing the new activity and those already into the activity to expand by registering them with DOF.
- Organize trainings on technologies, better management practices and sustainable aquaculture solutions.
- In support of the activities, DOF need to position supportive programs/ incentives to facilitate farmers and entrepreneurs.

6.1.3.1 Aquaculture in private farms

- Saline and waterlogged area and derelict water bodies in canal fed mandals are important resources for promotion of aquaculture activities in the state. Such land could be owned by Govt. or private individuals.
- It was observed that due to water logging problems, the state has over 20,000 ha of problematic land area in the canal fed agriculture systems that are unproductive for any agricultural operations.
- Aquaculture in such lands/areas has greater opportunities both from the view point of resource utilization for profitable alternative food production activities and also to restore upland areas for agriculture through in built soil reclamation process naturally taking place due to construction ponds in the low lying water logged areas.
- Private owners who have abandoned such water logged lands could be identified and motivated to either take up fishing on their own or consider leasing out such land to others desirous of pursuing commercial aquaculture under varied farming systems and profit sharing arrangements.
- The initial productivity potential of these tanks will be about 3-4 tons/ ha and could be taken forward for a projected production of up to 5 ton/ ha.
- Establish aqua farming clusters and aquaculture hubs in different districts of state where potential exist and promote 'Cluster Fish Farming'.

- Position simplified procedures for registration and effect modifications to existing guidelines to hasten up registration/regularization of ongoing farms.
- Support and facilitate establishment of infrastructure including post harvest facilities in identified regions.
- The activities of aquaculture need to be promoted and strengthened with simultaneous development of markets.

Box: 23 Suggested approaches

- Pursuing promotion of activities on a “Mission mode” approach
- DOF should take up a quick reconnaissance/exploration survey of such water logged areas in high rainfall/ canal fed zones either by its own or in collaboration with the agriculture Dept./Soil and Water Management Dept.
- Carry out a pre-feasibility study for identifying suitable lands and determine extent of such land that can be used for promotion of aquaculture activities.
- Also carry out an assessment of aquaculture potentials of existing and newly constructed water bodies if developed under various supportive programs of Govt.
- Develop specific DPR for promotion of Integrated Aquaculture Activities on ‘Aqua –park’ concept, declaration of aquaculture zones with special package of supports and sops.
- Promote private entrepreneurs to become partners and facilitate the owners (lessors) and intending entrepreneurs and finalize Terms of lease etc.
- Facilitate for registration of aqua farms through single –window approaches and simplified procedures.
- Support aqua farmers and entrepreneurs by providing services of expert consultants, facilitation for better interaction with domain experts on focused issues, arranging exposure visits etc. as detailed in DPR document.
- Positioning of exclusive consultancy cell, zonal wise nominated officers for motivation, facilitation and roping of interested farmers/ entrepreneurs into activity.
- Provide training / technical guidance on fisheries practices, handholding support for better technologies, by engaging the services of experts wherever necessary.
- As promotional activities, organize participatory demonstrations on wide range of technologies and aquaculture practices that are suitable for the zones in collaboration with professional institutions- KVK's, Universities, Central fisheries institutes, NFDB etc. and use them as platforms for technology dissemination in support of wider adoption.
- DOF should extend helping hand to new entrepreneurs and should go all out to promote aquaculture in private farms / ponds and extend financial support.
- Provide incentives for seed/feed inputs, also for maintaining water quality and health care, infra structure, market facilitation, institutional support for technology and consultancy, diagnostic services etc during the initial years as they are anticipated to take the segment growth forward in future years.
- Farming of both scampi and vannamei could be explored on a larger scale in land based and water based farming as new opportunities to explore export market.
- Vannamei farming needs to be promoted wherever feasible under inland saline water systems following the guidelines. Aspects of farm registration with DOF, compliance to resource and environmental norms in conversion of water logged wet lands, compliance to procurement of seed from CAA certified hatcheries, stocking density and size at stocking norms, record keeping and data sharing, periodic reporting to DOF, non use of banned drugs, bio-security measures, etc. need to be ensured.

Policy suggestions on aquaculture are given in **Annexure – 6.1.2**

6.1.3 Suggestions for cage and pen farming

- Cage farming in reservoirs and tanks with better depth could be explored initially on a pilot basis and latter expanded on a commercial scale.
- Cage and pen fish farming will be initially viable only with govt. support programs and need to be taken forward to demonstrate the techno- economical feasibility in support of further replication and scale up.
- Promote commercial cage fish farming of high value fish.
- Tilapia and pangasius fish farming offers better scope for feed based fish farming on a commercial scale.
- Considering the prevailing market preference for the tilapia, pangasius, scampi, vannamei etc, these new opportunities could be explored in a bigger way both under land based and water based farming. Integration of production activities with processing and value addition both to meet domestic and outside market needs special focus.
- Production through public-private- and community partnership mode need priority in policy approach.

Key strategies for promotion of pen* and cage fish farming

- Carry feasibility study for Pen and cage culture in reservoirs and large water bodies.
- Formulate and position integrated schemes for setting up of units with size, volume, costs, financing, marketing and other aspects, stipulating conditions for entrepreneurs to be able to avail incentives/subsidies.
- Avail services of expert /consultants where ever necessary for development of such documents.
- Since number of FCS are anxious and inclined to take up these ventures, the DOF should launch “ Mission Aquaculture”, take up a reconnaissance survey of potential followed by identification of high and moderate potential districts based on a number of criteria such as (i) availability of perennial water bodies (ii) willingness of entrepreneurs (iii) availability of minimum infrastructure and other aspects.
- Develop exclusive guidelines/provisions for Telangana state to develop aquaculture in suitable areas.

Policy suggestions on open area fish farming – pens are given in **Annexure – 6. 2**

6.2 Fish seed production**6.2.1 Fish seed production, rearing and supply**

Ensuring availability of fish seed of right choice and required quantities at right time at affordable cost is the responsibility of the state Govt. for sustained growth of fisheries in the state. The experience shows that the private sector always follows government. Hence, the state has to show the way to produce and supply at least a major portion if it's requirement through internal production and thus encourage private sector to take up seed production and rearing to meet its demand internally fully on the long run.

6.2.1.1 Brood stock management

Brood stock with better genetic makeup and health, farm rearing under better management practices and husbandry (hatchery and nursery) practices, seed movements and availability (transport, holding and distribution, trans-boundary movements) and diseases need more consideration than what is being presently practiced.

Unless decentralized quality fish seed production includes appropriate breeding strategies to maintain genetic quality of brood stock, the performance of the production stocks will decline. Hence appropriate interventions to improve management practices and regular replenishment of high quality seed for brood stock require concerted efforts through participatory approaches with farmers, government agencies and NGO stakeholders to develop institutionalized rural seed supply.

6.2.1.2 Quality seed production

- Upgrading existing govt. farms into integrated fish seed farms needs to be prioritized. Even though huge allocations have been made in the plans in the last three years, achievements and consequent improved performance of individual farms would serve as indicators and give a base for direction for future course of action required to fulfill the objectives.
- DOF would also be required to promote private seed hatcheries and rearing units in support of quality fish seed production. The IFDS and NCDC funded projects have schemes for seed production and as such, this augurs well for internal seed supply. Localizing seed rearing will generate full time employment to the fishermen and thus increase their engagement in fisheries activities for greater part of the year.
- The govt. should support private participation through workable buy back system (initially 100% and gradually tapering to <50% in about 3 -5 years or giving priority in procurement and facilitating link between seed producers, growers and fish culturists for proper growth of the sector and sustainability.
- Registration of seed producers and suppliers for supply of seed is expected to enthruse local farmers and entrepreneurs to take up seed rearing on more scientific way to achieve economy of scale. However, since the suppliers from Andhra are well established and have capacities to supply seed in bulk, the newly established local hatcheries may not be in a position to provide formidable competition. Till such time the local network of

seed producers is developed, some concessions/preferences would be required initially. This may be necessary to encourage local seed base in due course of time.

- In years to come when once the internal seed supply chain is established, government need to shift its role towards facilitative and regulatory activities with focus on genetic conservation in support of long term viability of the fish seed industry. Government hatcheries with some back-up by large scale private hatcheries should focus on maintaining genetic stocks and brood stock of species to support overcome the constraints related to genetic quality, such as inbreeding problems and difficulties in breeding some species faced by small-scale hatcheries due to lack of pond space and brood stock management capacity.
- Quality seed production of species other than IMC also need to be promoted by providing special incentive in the form of financial assistance for setting up of fish/prawn seed farms or fish hatchery.

6.2.1.3 Strategies to internalize spawn production

- Phased improvement of existing hatchery performance of both Govt. and private seed production units to their designed capacity through better management and infrastructure up gradation.
- Government hatcheries should be renovated and strengthened with all necessary infrastructure.
- Need for technological up-gradation of fish seed production units.
- Minimum man power should be ensured (positioning of FDOs exclusively for hatchery operations along with supportive staff of supervisor and fishermen in place of DFO getting involved in seed production operations).
- Financial support should be ensured for each of the hatchery.
- Responsibility should be fixed on the in-charge to ensure quality and quantity of fish.
- Performance of each hatchery should be monitored by the Division in charge (Inputs Division proposed at Headquarters).
- Supportive programs for the establishment of new hatcheries mainly under private sector.
- Outsourcing of part of spawn requirement from recognized hatcheries in support of seed rearing to meet requirement of fingerlings (50-60 mm, 80-100 mm) and advanced / stunted fingerlings of >10 cm size till internalization of spawn production is stabilized.

6.2.1.4 Strategies to internalize fingerlings production

- Development of data base of existing seed growers and extending needed handholding in support of the activities.
- Roping in of new seed growers and providing needed support to pursue seed rearing in diversifies resource types through existing schemes and positioning new schemes.
- Explore new fish seed rearing opportunities viz., feasibility of seed rearing in short seasonal tanks where water is retained only for 3-4 months and also in situ rearing in perennial tanks (in pools separated from main water body) and pen rearing in some of the reservoirs. This may be promoted with special drive programs and package of incentives.
- Most of the short seasonal tanks are rain fed and receive water in Aug.- Sep. and availability of spawn at that time may be difficult and hence could be used for rearing fry to fingerlings or production of advanced fingerlings.
- There are mandals in few districts which are canal fed that could be used for seed rearing activities on cluster approach and also for creation of seed hubs by positioning appropriate forward and back ward linkages.
- Societies and private participation need to be encouraged for such activities and DOF should act as facilitator to promote the activities wherever feasible.
- DOF needs to facilitate with concerned irrigation and revenue depts. for effecting system modifications without negatively affecting other user group's interest.
- Networking of seed producers (spawn), seed growers (fry and fingerling production) and fish farmers, formation of Producers Associations, technology handholding, diagnostic services and support of schemes and programs for sustainability of activities need attention.

6.2.1.5 Seed rearing in non conventional sources

State government at present is procuring fingerling from outside. Instead, besides encouraging private entrepreneurship, the possibilities of using non conventional resources like small seasonal tanks, peripheral tanks of reservoirs/ tanks, bays/pools/ coves in the peripheral regions of reservoirs/large perennial tanks for

installation of pens and rearing of fish seed could be effectively explored. The following suggestions need attention of DOF

- Identification of Mandals wherein canal fed irrigation is prominent (mandals in few districts viz., Bhadradri, Wanaparti, Jagtiyal, yadadri, Karimnagar to quote a few) where the tanks are canal connected that offer excellent opportunities for seed rearing.
- Establishment of seed hubs (villages) and linking resource stocking under various government programs.
- PFCS youth groups like that of Vinayaka group in Karimnagar for taking forward cage fish farming and Woman Matsya Mitras could be encouraged to take up such activities by intensely training them and supplying spawn/fry and other inputs on 100% free supply in the initial period and on sharing basis after 2-3 years of handholding, also providing marketing support and facilitation for the crop raised by them.

6.2.2 Seed production & supply

- Considering the prevailing market demand and consumer response for common carp, the hatcheries has scope to produce more seed of common carp exploring its prolific breeding throughout the year.
- There is a need for introduction and production of new varieties such as Amur common carp, Nile tilapia (mono sex tilapia-may be all male technology already available) and other medium and small carps and other local fish breeds of high market value and consumer demand which are suitable for short and long seasonal tanks.
- Thrust on seed production of murrel spp. (state fish) as it has huge demand because of its qualities as health, nutritive and medicinal value and the market demand is presently being met mainly by outsourcing from AP.
- State govt. may identify selected centre/s exclusively for murrel breeding and seed rearing / seed holding collected from wild with required infrastructure and well trained staff or support private participation by providing infrastructure and required incentives.

In the light of emerging demand for fish and consequently incremental requirement of seed for different resource types, the DOF should carry out a detailed study on

- Status of DOF hatcheries/seed farms in terms of infrastructure, man power, present level of capacity use, deficiencies to be addressed etc.
- Enumeration/Census of existing seed producers/growers in private sector, their infrastructure, present level of operations, including disposal of the seed both within and outside the state. Also the study should assess credibility/ reliability /dependability/financial strengths and weakness of the private seed growers.
- Carry out a quick reconnaissance survey of potential entrepreneurs, their present involvement in fisheries sector, experience, technical knowledge, financial standing and also their level of commitment to get into seed production/ rearing.

It may be a tall order to assume that the state can produce/meet 00% seed demand besides being not feasible at this stage. Hence, the DOF should determine the share of supply of seed from all the three sources and the extent of outsourcing required, at least in the initial years. The suggested Seeds Division with the DOF should take full control of projecting demand, sourcing and delivery of seed by respective sources in a coordinated manner.

6.2.3 Seed grower's network

- Promote accredited and certified seed growers linked with DOF seed production and rearing farms.
- Position buyback mechanism with differentiation in price for quality seed.
- Facilitate centralized seed holding facilities at zonal/district level.
- Enhance supportive and facilitative roles by DOF, Federation, DFCS & FCS.

6.2.4 Fish seed demand

The projected fish production would have to be backed up with supply of required quantities of seed of different sizes (as discussed in the earlier chapter). Dependence on outsourced seed needs to be reduced gradually and corresponding increase in local production will have to be ensured. It is neither desirable nor

feasible to replace entire quantity of outsourced seed with local seed since the present contribution of state hatcheries and rearing farms to total production is meager.

The estimated requirement of fish seeds during the projected period would range from 56.58 crores in the base year to 85.74 crores as per stocking norms/densities provided. However, it is necessary to have an extra provision of around 10% to make good the loss on account of mortality/damages etc.

The present level of internal supply as fingerlings of 35-40 mm is about 26% and the suggested level of supply from internal sources could be enhanced to around 70-75% through various approaches and schemes and the remaining 25-30% could be procured from other state/s.

The present share of the Government farms in fingerling production is estimated at 8% and this needs to be enhanced to at least 30-40% during the projected period. Similarly, the share of private sector farms has to be increased from the existing <20% to 50-60% over the same period. This will result in fingerling production of nearly 20 crores from Govt. farms and about 28 crores from private farms (total share of 56%). With the addition of new seed growers over the period well supported under the DOF schemes and programs, it is anticipated to produce additional 20-30 % seed in support of fish production activities.

6.2.4 Ensuring seed supply

For ensuring seed supply at competitive and reasonable costs, it is proposed to have a three-pronged policy ie:

- Improving the productivity of existing functional govt. hatcheries, rejuvenate the defunct/ underperforming hatcheries and also seed rearing farms through set of focused interventions addressing both meeting the infrastructural gaps, technical man power, supporting staff and required financial support to meet the operational expenses etc.
- Tap local sources i.e., existing private hatcheries and fish seed farms with sustainable arrangement with them to supply seed in support of implementation of govt. Programs on a regular basis for a agreed terms of reference.
- Till seed production is strengthened for internalization, continue outsourcing of fish seed from neighbouring.

6.2.6 Fish Seed plan

The seed demand can be met from the above three sources with annual adjustments between production within the state and outsourcing. It is desirable that the outsourced seed could reduce from almost 75% in the base year to around 25% in about 5 years during the projected period.

6.2.7 Support system for seed production

6.2.7.1 Training and capacity building

The breeding and seed rearing is a skilled work and need to have sound knowledge on hatchery management and is a full time job.

- There is an immediate need for capacity building of the staff and also the farmers on different aspects of seed quality-brood stock management (Genetic aspects as well as husbandry practices) breeding techniques, hatching and rearing practices to bring in confidence in them.
- Need for skill development at all levels of the fish seed chain.
- Position incentive scheme for seed producers/growers who have developed good management practices and achieved economy of scale and use them as motivators and resource persons in training programs.
- Use of successful farmers who have the indigenous knowledge as resources persons for capacity building programmes need to be promoted.
- Prepare a directory of hatchery/nursery operators practicing good management practices to make their services available at village/commune level and also for development programmes.

6.2.7.2 Other approaches

- The govt. may take a lesson from Jalapuspha farm, Jagtial and need to encourage more private participation through workable buy back system or give priority in procurement and facilitating link between seed producers, growers and fish culturists for proper growth of the sector and sustainability.
- Need for development of technical standards that are standardized, validated and agreed upon by the hatchery operators, both by large-scale and small-scale producers.
- Promote entrepreneurship development in the chain for profitability and sustainability of activities.

6.2.7.3 Fish seed marketing

- Federation could be further encouraged to generate income through seed production activities.
- Some government hatcheries can focus on selling fry/fingerlings directly to farmers creating a competitive environment between public hatcheries and private hatcheries and nurseries.
- A competitive environment can make producers of quality conscious of their product.
- FCS/ seed producers organizations / SHGs/ WMM's / DFCS/ NGOs could also have a role in marketing of seed by procuring from production centres and since they are all community based organisations and without any skill, proper training, hand holding and net working is necessary and DOF/Federation has to play a major role in facilitation of this network.

6.2.7.4 Infrastructure strengthening

- Need to foster capacity utilization and modernization of Govt. seed production and rearing units.
- Strengthening of state owned hatcheries and seed rearing farms by renovating them for utilization to their potential.
- Power supply and access of canal water to private farmers as per the provisions made for agricultural activities.

6.2.7.5 DOF free seed supply program

- Free fish seed supply and fish seed stocking need to be based on scientific principles and ground realities of resources and practices.
- Selective/collective responsibility of FCS members in development of resources allocated to FCS – need for stimulus package of DOF/Govt.
- There is a need to focus on stocking fish seed of varieties that grow well in a particular resource type and regional consumer preference and meet market demand.
- Ensure timely supply, better seed quality –varieties, size, species ratio, density, seed health etc.
- Increase participation of FCS in planning seed requirements, procurement process, stocking and beyond.
- Capacity building of fishers on seed quality, seed rearing and marketing.
- Focus on modification to existing procurement process with major role play by FCS - linking them to certified panel of approved hatcheries/seed suppliers for direct procurement based on supply indent of DOF, payment made directly to hatcheries/FCS account.

Box: 24 Strategies on fish seed supply program

- The GOTS should work out a sustainable strategy for inculcating capital build up with in FCS through sharing by members, depositing part/full amount of present savings made on fish seed purchase in FCS account etc., technical strengthening through diversifying activities of fish seed rearing both to meet internal requirement and for business, financial strengthening of FCS. This will empower FCS to come of the merchants nexus over the time.
- Registering of FCS who wish to avail benefits of the initiative with application, mentioning WSA, EWSA, water usage, water depth during different seasons, previous stocking details and fish production, stocking by merchants / FCS.
- Undertaking on commitments expected under the program.
- Ensure regular monitoring mechanism to minimize initial issues related to distorted perceptions and associated conflicts among the resource users.

Overall

- Strengthening of sector through increased focus on seed chain which is one of the key pillars of sector growth in the state - Resource management and productivity enhancement.
- Achieving quality fish seed adequacy is expected to enhance resource use efficiency.
- Emphasis on quality seed production by making fisheries sectors a destination for commercial endeavours.
- Addressing segment related challenges through cutting edge technologies of BMP.
- Promoting stocking of advance fingerlings variety wise to major water bodies on weight basis to minimize negative perception of fishers on fish seed size and number stocked.
- Empowering FCS members; capacity building on multiple activities viz, seed rearing, fish culture etc. in tanks, cage and pen farming in reservoirs.
- Positioning of aquaculture zones and seed zones.

6.2.8 Action plan for augmenting seed production

Administering of set of schemes would be the responsibility of the DOF. Through

- Formulation of annual plans for production in the hatcheries.
- Annual Agreements with the identified local hatcheries.
- Advance planning for outsourcing through the present tendering method which may continue in future also.
- Focused programs for rejuvenation and upgrading of existing govt. hatcheries.
- Support to private hatcheries.
- Exclusive DPR could be developed for the state on quality fish seed production and internalizing the activity through roping in of PFCS members, private seed growers and entrepreneurs in support of establishing commercial seed production units

6.2.9 Perspective plan and strategies

The state at present does not have required infrastructure to meet the huge demand and has no option other than look elsewhere to meet the demand on a short term. The state needs to have strategies of its own to achieve self sufficiency in meeting the demand in the long term.

The state need to examine production of quality seed from two perspectives, i.e. improving the existing seed production systems and positioning of new integrated seed production systems addressing comprehensive quality aspects. The issue of quality comes to the attention of producers only after a certain period of time. Performance indicators (e.g. growth, production, survival, disease) consistently point a finger towards seed quality.

In this backdrop, there is need to refocus attention by the DOF to stream line the prevailing seed supply chain. Seed producers and suppliers have a major responsibility to ensure production and delivery of quality seed to farmers. Further, farmers also should make attempt to understand the concept of seed quality, select the right kind of seed and follow better management practices to provide the stocked fish ideal conditions to express themselves. Only strong commitments and co ordination from all the stake holders involved is expected to ensure both production and supply of quality seed in support of sector growth.

Suggested Short term Strategies are

- Govt. fish seed supply -improvement in procurement process to ensure supply of quality seed to farmers.
- Strengthening of existing seed production and rearing facilities - Seed production (spawn); Seed production and rearing.
- Increasing share of Private farms.
- Seed rearing in non conventional sources.
- Establishment of Fish/Prawn/Shrimp Farm or Fish Seed Farm or Fish Hatchery.

Medium term strategies

- Strengthening and improve existing infrastructure in Govt. farms.
- Positioning of species specific breeding centers.
- Up grading existing hatchery cum seed rearing farms on integrated farm models.
- Accreditation of hatcheries- Private sector hatcheries will be primary seed producers and become multipliers for improved seeds/strains.
- Production of quality seed and dissemination of improved breeds.

Long term strategies

- Govt. should only play the role of facilitator of seed production and supply chain.
- Encourage private participation through developmental schemes.
- Regulate and monitor the segment related activities.
- Facilitate access to farmers for high quality fish seed.
- Ensure availability of products and services along the entire aquaculture value chain.

Policy suggestions for fish seed production and rearing are given in **Annexure – 6.1.1**

6.3 Strengthening the Co-operatives

6.3.1 Primary Fishermen Co-operative Societies

6.3.1.1 Strengthening of FCS

- Collective mobilization of FCS members for better participation in all the activities of resource management is the key and DOF need to make efforts in this direction.
- Considering the present functioning and the role play by FCS in development of resources for enhanced fish production and productivity, there is need to change their mindset, build capacity through training programs and awareness generation activities.
- Effective measures are to be initiated to effect change in present style of functioning of FCS.
- Facilitation for better participatory process in decision making and encouraging participation of members in societal activities.
- Promoting fishermen cooperative entrepreneurial movement will be the new path for activating FCS making them responsible as partners of state fisheries development goals.
- Mobilizing and promoting interested members of society towards entrepreneurship needs focus.
- Empowerment for efficient leadership in support of better overall performance of society.
- Positioning of exclusively designed sensitization / motivation / leadership / capacity building /activities and programs/skill and technology focused training programs.
- Better transparency in sharing of benefits among members.
- Maintenance of records and transparency in communication need emphasis.
- Roping in NGO for mobilization and facilitation of training the members where ever required and more so in bringing tribal fishers under the folds of PFCS

Initiating measures by DOF for disciplining the FCS through stronger actions, motivation and educating members will be the key.

6.3.1.2 Suggested strategies for FCS strengthening

- Making special provisions for strengthening better performing PFCS's with exclusive financial provisions for incentivizing their activities need active consideration.
- Rewarding the responsibility and better managed PFCS; grading of PFCS based on set of developed indicators; categorization and ranking, working towards improving the functioning of PFCS need attention.
- Incentivize FCS based on performance by way of
 - Providing higher benefits of welfare schemes viz. share capital, fishing inputs.
 - Awards and recognitions.
 - Managerial subsidies.
 - Monitory/sector related infra support.
 - Other amenities viz., drinking water facilities, community halls etc.
- Provide needed institutional and policy support.
- Positioning of new initiatives viz., weather based crop insurance in support of addressing the negative impact of climate change in fisheries.

6.3.1.3 Suggested parameters for performance evaluation

- Prescribing performance evaluation parameters, conditional support for extending of scheme benefits, monitoring and transparency mechanisms in place in order to bring needed discipline in resource management for enhanced production and productivity, and system sustainability. The suggested performance evaluation indicators are
 - Member's cohesiveness.
 - Percentage of active members.
 - Participatory process in adoption.
 - Involvement of members in decision making process on all key issues including conflict resolution among members
 - Transparency in governance – conduct of meetings, proceedings, elections, audit etc.
 - Maintenance of financial dealings-bank accounts, transaction exclusively through bank, maintaining reserve funds from the savings/contribution of the members etc.
 - Established Collaboration/ networks with other FCS, DFSCs, Federation and other welfare & non welfare institutions
 - Equity in sharing of benefits.
 - Use of performance monitoring and evaluation matrix in regular accessing of FCS.
 - An indicative Performance Evaluation format developed can be used with modifications/ improvements wherever necessary.

6.3.1.4 Positioning specific guidelines

- Specific guidelines for roping in of best management approaches in FCS functioning and participatory development of resources.
- Bringing in accountability by clearly defining the roles of PFCS in resource development on lines of scientific management and practices, and obligations for enhancement of fish production by adopting technologies of resource management in order to harness biological potentials/capacity.

6.3.1.5 Providing Policy support aiming at:

- Guaranteed access and control related rights of small scale and indigenous fishing communities for their life and livelihood- more applicable to fishers and their societies involved in fishing in rivers and canals and also in non conventional water bodies.
- Recognizing, promotion and protecting of diversified livelihood base of fishing communities.
- Seeking prior and informed consent of small scale fishing communities and indigenous peoples of natural water bodies before proposing for private / Public – private partnership development and well before undertaking such activities that may affect their lives and livelihoods (required in commercial promoting cage / pen farming in natural water bodies under private participation).
- Providing support for capacity building of fishing and indigenous communities to participate in governance of fisheries resources.

FCS performance, monitoring and evaluation matrix is given under **Annexure 6.4**

6.3.2 Women Fishermen Cooperative Societies

- Creation of supportive environment in each of the district through organizing more gender sensitization activities.
- Strengthening of Women participation in the sector related activities to
 - Improve access to resources and activities.
 - Facilitation for institutional credits, funds and such other facilities including joint rights wherever feasible.
- Empowerment of Women FCS members through continued hand holding support by way of training, exposure visit, skill up gradation on value addition, product development, branding and marketing.
- Mainstreaming WMM's by bringing them under the folds of SHGs institutional framework both in rural and urban areas.
- Facilitation for institutional financing – availing the benefits of bank credit system to augment their activities, facilitate them to avail credit of up to 3 lakhs at 7% interest rate / annum, under the National Rural and livelihoods Mission (DAY-NRLM).
- Stepping up funding support for their sector related activities - WMMS need additional hand holding and revolving fund as one time support for improving their market infrastructure.
- Positioning supportive programs /initiatives to mainstream them for pursuing opted activities.
- Need to provide new opportunities under self employment schemes.

6.3.2.1 Strengthening role of Women MMs

Since women are playing dominant role in fish trade through their MMs network, there is need to improve their lot through supporting them with financial assistance in the form of Revolving Fund to meet their working capital needs.

Other support

- Providing/facilitating for institutional financial assistance and supplies in the form of marketing kits, vehicles, ice boxes, cleaning gadgets, grading equipments and also dress code with a set of UNIFORM to distinguish them from other salesmen/women.
- Supporting for transparency in transactions, display of rates, post sale services etc.
- Wherever they have their own market buildings/shelters, renovation/improvement of existing units should be supported with financial or non-monetary (in kind) support.
- Specialised Training in fish handling, grading, preservation, value addition, techniques so as to minimise the loss / deterioration.
- In respect of the Licensee fishermen also, similar support for value addition may be necessary.

6.3.3 Federation

- Networking of FCS-DFCS- Federation will be necessary to minimize exclusive dominance of merchants in the entire production, supply and marketing system.
- Federation to extend supportive and facilitative role in marketing of fish produced by FCS.
- Federation need to play active role and lead schemes/ programs of externally funded agencies viz., NFDB, RKVY, FISHCOFED and such others related to FCS.
- In the interest of FCS, Federation need to facilitate members of primary and district level societies for better access of quality inputs viz., nets, boat, feed, accessories, life jacket etc.
- There is need to organize training programs on varied aspects of value addition including fish dressing, use of fish waste generated during cutting operation for preparation of manure on a continued basis.
- Kiosks construction and positioning them in strategic locations through identified members of PFCS both at resource level and in existing markets by the Federation need attention.
- Similarly, value addition could also be focused on a large scale especially for fish species viz., pangasius, tilapia etc. through capacity building of fishers, promoting EDP activities among fisherwomen.
- Federation could also facilitate social business start-ups with an aim to create woman entrepreneurs in rural and urban parts and support them with market linkages. Selected persons could be given advanced training and provide them confidence to move forward in the sector related activities.
- Federation has to facilitate extending benefits of DOF welfare schemes like housing, community hall etc. to FCS members.
- There is need to encourage thrift, self-help and cooperation amongst members of its affiliated societies and promote development of cooperative ideas and enterprises among its members. Federation could play a major role in this.
- The Federation need to get into business mode and perform so has to make its presence felt both at PFCS level and beyond.

6.3.3.1 Proposed strategies for enhancing activities of Federation

The role of Federation under the proposed strategies is envisaged to be two-dimensional namely (i) complement Government efforts in fisheries sector growth and (ii) provide technical, managerial, financial, marketing and other supportive, facilitative/advisory services to the Fishermen Cooperative Societies for the holistic development of its members.

The Federation need to develop plans and programs in support of assisting the DOF in accelerating fisheries sector growth through promoting and facilitating optimum productive use of available water bodies,

developing and demonstrating the exploitable potential of limited resources on a sustainable basis, ensuring vertical growth to achieve higher productivity levels so as to add to the production of fish, facilitating DOF in reaching out to the larger fishermen communities.

Review of Federation activities shows that entire Federation system and functionality should be restructured in support of its defined objectives and goals; enhance role play for the development of FCS at resource level and meeting their expectations of increased institutional handholding support. In view of this

- Existing bye-laws need to be revisited and suitably amended to bring relevance of institution to both community and sector development supporting the efforts of DOF in achieving targeted growth.
- Strengthening of needed manpower to carryout both direct activities and also addressing key issues of FCS in accordance to the objectives of promoting, aiding and assisting fisheries activities, enhancing resource use efficiency, utilization of available water bodies suitable for the activities including human resources.
- Carryout intensive sensitization and mobilization programs both at district and mandal levels so that the presence and objectives of Federation is realized by the existing PFCS and others in the sector.
- Facilitate more FCS to get enrol themselves under the state organizational frame.
- Establish effective communication with member FCS and also with various line departments and others through e-platform for increasing awareness about the institutions and its activities both within state and beyond.
- Support/Facilitate FCS activities to bring sense of income security by way of effectively linking them to the benefits of technologies, handholding to make fishers realize the perceived output a reality.

The Federation need to develop **Road Map document** in support of implementation of its defined programs and activities as per the objectives and goals viz.,

- Carrying out Direct activities of fish marketing, selling of fisheries inputs to primary and district level societies, fish processing etc.
- Strengthening of Fishery Co-operatives to perform its man dated activities.
- Enabling FCS and their members to gradually switchover from the traditional present practices in fisheries to more scientific technology led farming systems and also to commercial aquaculture activities Fisher community development.
- Providing wide ranging services to the FCS including technical, Financial, Marketing, and social aspects so as to ensure holistic development of fishermen households in general and the FCS in particular.
- Assisting FCS in wide ranging management aspects with particular reference to fulfill statutory requirements.
- Extending advisory support services by linking them to designated expert groups/subject experts etc.
- Complementing the DOF programs of trainings, orientation, demonstration and other similar interventions.

6.4 Fish marketing and consumption

6.4.1 Revamping of Fish marketing arrangements

- There is need to revamp fish marketing arrangements in the state through sharpen regional approaches.
- Provision for amenities like hygienic stalls and platforms for trading, potable water, ice facility, proper civil structure, roofing and flooring, moving space for smooth trading, facility for display of products, suitable equipment for washing, weighing, communication, toilet facilities, etc. need priority in the proposed market expansion initiatives of the govt.
- Positioning balanced systems of distribution to make fish available in the distant and interior areas at reasonable rates to enhance revenue of fishermen and prevent distress sale.

Box: 25 Handholding support women vendors

- Organizing women vendors under the frame work of local institution/group.
- Providing training/capacity building.
- Empowering them on both on technical and marketing.
- Inculcating institutional mechanism for internal savings and micro financing, and facilitating through revolving fund.
- Supporting for establishment of common storage facilities/cold storage.
- Establishment ice plant etc under private system with better operational system (OPS) facilitating access for subsidized services on reasonable payment and also support self sustenance of new systems with marginal profits.

6.4.2 Marketing support and promotion

- Strengthening of marketing channels, facilitating organized networks of fishers and market intermediaries.
- Promotion of direct marketing- on site fish marketing, marketing by fishers through integrated KIOSKS.
- Minimizing role of merchant aggregators with empowered youths of societies for the activity.
- Provide infrastructure for hygienic fish handling and Marketing.
- Need for support to harness better market price prevailing for live fish in the domestic market.
- Need to increase domestic fish consumption in towns and cities in Telangana State through organizing awareness program
- Promote use of vending items required for retailing of fish at subsidized costs in support of hygienic handling and better service to consumers.
- Need to promote the sale of fish in hygienic domestic markets at various levels. This will facilitate supply of fish to consumers in hygienic, and fresh conditions, fetch higher returns to the fishers and save them from incurring economic loss caused by 'distress sales'.
- Enabling an improved access to domestic markets will create incentives for producers. Possible opportunities with regard to the development of (cold) chain management will arise only when significant fish production takes over.

6.4.3 Marketing in support of new farmed fish species**Multi-market fish model**

Considering the new focus of state on cage fish farming of introduced fish species viz., pangasius, tilapia etc. where in production in volume may out beat the market demand; it is anticipated to pose threat for the profitability and sustainability of such farming activities of great future from the point of enhancing state overall fish production. In this backdrop **Multi-market fish model** with well net worked producers, consumer and trade cores is proposed. The model could be piloted initially with cage grown pangasius and tilapia. Time series data on fish production, sources and market destinations, information on volume of trade, demand-supply gaps, and farm survey data on fish farming at regional level could be used to estimate producer core. Based on fish demand analysis using consumer survey data, projections could be made for fish price, supply, domestic demand, and also export. Accordingly the produce are linked to various multi markets with clear MOU's at various levels for the ease of business and win-win for all the players in the integrated network.

6.4.4 Value addition

- Development of processing units with appropriate technical Know-how under the private / PPP platform deserve attention of the Government.
- The product diversification, venturing into the preparation of ready-to-eat food and networking with innovative marketing centers is key and the future to promote the segment growth.
- Linking with fast food centres, hospitals, schools, army canteens, railway stations, airports, etc. are possible outlets that could also be explored.

6.4.5 Institutional arrangement in support of marketing

- Except for greater involvement and participation of FCS, DFCs and the Federation, the DOF may not get into direct marketing ventures. At best the present system of "spontaneous / voluntary and flexible" marketing arrangement and the age-old system can be monitored and monitored through an exclusive "Marketing Division"(either in addition to the Federation or in association with the Federation).

- DOF should focus on curtailing / discouraging monopolistic tendencies and exploitative tactics of middlemen with stringent rules and stricter executing mechanism rather than getting involved in direct participation in fish trade. Since stocking is a first step in this direction, FCS are expected to “change” their outlook and may, gradually, if not quickly, dissociate themselves from the Merchants (though this can be possible only partially and not fully).
- The NFDB and State Govt programmes/schemes are under way for expansion and strengthening of market infrastructure, it is felt that for the present, no direct intervention is necessary since the market forces are self-adjusting in nature.

6.4.6 Positioning of Hygienic Market Points

- Irrespective of the size, all fish markets (barring exceptions), are operating in unhygienic conditions. There is urgent need to direct the DOF focus on transforming these markets into Hygienic Market Points (in addition to and independent of the NFDB programmes) and undertake renovation of existing market infrastructure. Once, this is achieved, close monitoring of their operations can be feasible and this could lead to protection of interests of the producers/small time aggregators majority among whom are women).
- Mere construction of buildings and provision of utilities would not ensure hygienic condition and competitive prices for producers and consumers alike. Therefore, the DOF should bring out Detailed Manual/ Guidelines on the functioning of these markets.
- In respect of on-site sale and disposal of fish by FCS, also the DOF should bring out transparency in trading of fish between the aggregators and FCS or between Aggregators and individual fishermen.

6.4.7 Market related policies

- In order to curtail/contain the nexus between merchants and FCS or merchants and Aggregators, there is need to formulate policies under which all the market players involved in organized marketing business with identity of marketing place need to register with DOF and are to be made accountable.
- Each of the Wholesaler/ merchant is required to provide information on his transactions of fish trade and level of his involvement. This would include a Declaration to be provided by each Wholesaler to the effect of his role in
 - Seed supply and stocking either directly or through his agents.
 - Watch and ward and harvest either directly or through his workers.
 - Transportation of fish, either directly or through some intermediary.
 - Details of Advances / financial assistance provided to the FCS/ Members and terms of such assistance.
 - Whether Forward Deals are struck between the producers and merchants and if so, terms of such deals to be declared including negotiated price if any.
 - Similar such conditions that may become necessary to ensure transparency in transactions.

DOF also should explore feasibility of determining ‘MINIMUM FLOOR PRICE’ for fish of different types below which the aggregators or wholesalers should not purchase the fish stock and this should be on a year to year basis.

6.5 Promotion of fish consumption

- The fish consumption projections both under low- intensity path based on the growth seen in rural parts and high- intensity track based on urban parts need attention.
- Domestic market is generally supportive of low value fishes in rural parts and mainly restrict to IMC.
- Fish varieties like murrel, wallago, pabda etc. are meeting the needs of high end buyers (small section of high-income people) who are emerging with improved buying powers.
- In bigger wholesale markets, value addition by way of de-skinning, fish meat cubes, fillets etc of Tilapia, murels, IMC etc is emerging to support high-value fish products.
- Increase in fish production with support under various development projects/initiatives without corresponding efforts in domestic market promotion, awareness on fish eating, increasing consumer base are expected to result in low price and less profitability (eg. Pangasius farming).
- Development of fish products diversity keeping in mind the changed food styles of youths, semi urban and urban markets and consumers will result in better price, higher profitability and good technology adoption.
- Need to position institutions to facilitate collective action in support of new initiatives of product development, timely supply of products and supplies etc. on business models and marketing. This could be an exclusive activity of Federation to pursue in collaboration and networking with PFCS, DFCS, WPFCS and MM’s functioning at different levels on a market-oriented framework.

6.6 Accountability & data base

- In respect of sale outside the state as also outsourcing of fish from outside during the peak season, the DOF/ Federation should introduce a system under which all the traders irrespective of volume of operation or location of their operation, should necessarily provide data on volume, value and per unit price of procurement or sale outside. This should be used only to assess the demand-supply situation and should not be used for any other purpose and no punitive steps should be taken against the traders of fish.
- The DOFs/ representative of Federation in respective Districts should ensure that they collect information /data on trade in fish and other products on a weekly or monthly basis and build up data base for reporting to the Commissioners' office.
- The DFCS should be involved in this process since they have better access to the production clusters/ centres and also proximity to FCS/ fishermen and Federation

6.7 Reorganization of DOF

6.7.1 Departmental set up is largely carried over from the erstwhile undivided AP with small adjustments and transfers. It is necessary to strengthen the departmental set up to cope up with new challenges of sector growth in time bound manner. The need for sector change is felt across the cadre and key stakeholder with whom the experts interacted. The present set up has "loose and flexible" arrangement in respect of a number functions and this needs to be replaced by creating task -specific sections/divisions within the Department to ensure exclusive focus on identified areas. Broadly, there is need to re-organize the department in the following manner (with minor changes wherever necessary, under the overall guidance and supervision of the Commissioner).

6.7.2 It is suggested that the Department shall have five technical divisions/units apart from Admin and finance Division viz., i) Resources Management Division, ii) Production Systems Division, iii) Inputs, infra and services Division, iv) HR Division and v) Planning and Monitoring Division.

Suggested staffing

Each division should be headed by a Deputy Director assisted by an officer of the level of Fisheries Development officer with ministerial staff (computer operator/programmer) - This staff could also be drawn from the pool.

■ Resources Management Division (RMD)

The in - charge of this division would have full responsibility of overseeing all activities relating to

- Comprehensive development of reservoirs, tanks and other resources (including rivers & canals, non conventional water bodies etc).
- All actions/decisions relating to leasing/licensing/ auction of resources viz., reservoirs and tanks, including renewal and suggesting improvements and amendments to the terms of access rights; Conflict resolving; Multi-institutional collaboration and networking; organizing supportive welfare related programs.
- Exploring new water bodies hitherto not brought under fisheries activities (private as well as governmental water bodies such as Water shed structures, Water logged areas, coal pits, quarry pits and ponds coming up in other sectors), mapping, characterization, potential assessment, development of strategies, approaches, process and implementation guidance.
- Rivers and canal fishing areas, their assessment of availability / suitability for fishing and pursuing fisheries activities.
- Formulation of Action plans for each of the existing and potential water bodies.
- Coordination and support/assistance in program of improvement such as de-weeding, de-silting, encroachment, pollution, removal of stumps, screening of spill way, issues related crest gates, resource related conflicts and social problems and improvements of other types.
- Positioning of appropriate hand holding welfare schemes.
- All other tasks as may be required and suggested by the Commissioner.

■ **Production Systems Division (PSD)**

- This division would mainly be concerned with all Techno-economic aspects relating to resource productivity and production enhancement, low input based fish culture in natural water bodies and small scale fish culture and seed rearing in seasonal water bodies etc.
- Organizing ,nurturing and developing aquaculture activities in farmers own water bodies and water based aquaculture – pen/cage fish culture & seed rearing in reservoirs, Sewage fed farming, closed system farming RAS, Sewage fed farming, cage culture, input based aquaculture and similar other systems.
- Exploring introduction / adoption of new technologies and practices as may become available from time to time and providing guidance and support to the private entrepreneurs on adopting of new technologies.
- Management and monitoring the activities of hatcheries and seed farms, providing technical guidance to Govt. hatchery and seed rearing farms; guiding the in charges of hatcheries on technical management issues, brood stock development and management, advisory services to private hatchery and seed growers.
- Identification of training needs for mainstreaming new technologies and practices, arranging transfer of technology to the fishers, farmers, entrepreneurs and providing all technical handholding, guidance and support.
- Providing guidance (technical and Managerial) to the FCS and entrepreneurs on all aspects of fish production, value addition, post-harvest handling and management.

■ **Inputs, infra and Services Division**

The main tasks /responsibilities of the in - charge would include: addressing issues of supply and services of quality inputs, infra strengthening and restructuring and services in support of activities- seed, feed, accessories, landing centers, markets, processing and value addition etc.

- Assessment and facilitation of inputs, infrastructure and services related to seed, feed, other production enhancing inputs requirement on a year to year basis, planning for supply management.
- Arranging needed infrastructure support, providing financial assistance for renovation/ construction of new establishment, input procurement, man-power deployment and all other facilities required in production of seed in government hatcheries and seed rearing farms.
- Determining the seed procurement strategies from private seed growers within and beyond the state.
- Identification and short listing of existing private hatcheries and seed growers, development of data base, working out arrangements, entering into short and long term arrangements/agreements with them, determination of procurement price, quality parameters, delivery schedules and all conditions relating to internal seed procurement from private sector.
- Determining the extent of outsourcing of seed on an year to year basis, preparation of indents, identification of suppliers, negotiations on terms of supply, delivery, price and time scheduling of supply, tendering procedures and Quality standards to be maintained.
- Overall responsibility of meeting the seed, feed and other input demand of the state.
- Apart from seed, the division will also have the responsibility of assessment of feed requirement of the govt. and private operators, determination of qualities, sources, volumes, price negotiations, delivery terms and others. The Division would establish contacts with the suppliers both within and outside the state for ensuring feed supplies.
- Promoting private seed units within the state, as also units by FCS, registration of farms, licensing procedures, providing financial assistance and monitoring their operations.
- Identification of scope for establishment State-of-art Training centre at HQ and training units at district places with infrastructure for residential programs and instructional farms, net making units, boats, post harvest infra viz., landing centres, ice production units, cold storage and cold chain, markets, kiosks, processing and value addition units, setting up advisory on various technical and supply chain aspects; similarly facilitation for establishment of fish feed plants.
- Identifying units /agencies for production/ supply of crafts and gears, ensuring quality standards, facilitating FCS and others in setting up their own units and providing guidelines and support.
- Other aspects as may be required viz., facilitation for registration, certification, and quality control of inputs, products and services.

■ **HR Division (Training and Capacity Building)**

- The present set up does not have exclusive section for this purpose. It is necessary that fishermen are exposed to new concepts and technologies and practices to enhance productivity and efficient use of available water resources. This section would have the following tasks.
- Identify training needs of stake holders such as FCS members, Licensee fishermen, individual entrepreneurs, seed growers, hatchery workers, Aquaculturists, Feed producers, and others directly involved.
- Develop training programs/schedules for the stakeholders and prepare calendar of operations.
- Develop training modules/capsules and curriculum for different categories/classes of trainees in consultation with experts.
- Identify and work out arrangements with HR institutions and resource persons, determine their terms of retention etc.
- Identify and enter into agreement/arrangement with agencies to access training venues/premises, determine rentals and other terms.
- Develop exclusive programs to bring in needed attitudinal changes, changed perspective on sector, skill based thematic programs.
- Arrange for receiving feed-back from the trainees from time to time.
- Develop extension publications and tools (print and AV aids, electronic versions, videos etc in support for various field functionaries, admin etc.
- Organise and manage exposure visits for trainees as may be necessary.
- Facilitate and lead pre monsoon campaigns for sensitizing fishers/ FCS and others in the sector related activities.
- Development of schemes/ programs – exclusively for state plan and for complementing national policies /programs also outside institutional funding of developmental programs related to fisheries sector.

■ **Planning and Program Monitoring (PMU)**

- This division could function as transformative cell, perceive sector growth driven by technology and management, develop appropriate transformation documents and process, and serve as counters of change for inclusive sector growth.
- The division would be responsible for development of all supportive services at HQ & Division level coordination.
- Increase use of digital data base and bringing relevance to ground realities.
- Coordination and monitoring of programs, data, projects, schemes assisted by DOF and others.
- Development of technical inputs for strengthening DOF.
- Preparation of annual / periodical plans for development of different segments of fisheries sector.
- Determine physical and financial targets to be set and achieved by respective units / fields.
- Prepare manuals and guidelines for implementation of plans.
- Develop MIS formats for data collection and reporting.
- Keep constant touch/ contact with executing agencies, for getting feedback on the progress, problems and identify scope for midcourse correction of the plans/revision of programme.
- Develop set of indicators for monitoring.
- Carry out periodical evaluation of the programmes with the help of expert agencies and outsource the services, develop vision and policies documents, DPRs, studies in collaboration/outsourcing to professionals and technical institutions/groups.
- Organize capacity building of faculty on M&E, qualitative assessment, impacts etc.
- Prepare periodical reports for the Government as may be necessary.
- Render other services as may be determined by the Commissioner.

6.7.3 HR strengthening at District level

In view of adoption of new strategy for fisheries sector growth and enhancing fish production through diversified efforts like low input based fish culture, aquaculture, cage and pen culture etc, there would be need to ensure constant presence of the DOF staff at field level. Hence, the present staff pattern at District level should be reviewed on the following basis:

- Total water spread area/ number of water bodies existing and likely to get added.
- Number of schemes being implemented and also envisaged in the short run.
- Present staff strength i.e. sanctioned *vis a vis* positioned posts.
- Need for increased availability of technical services by the dept.

Keeping this in view it is suggested that:

- Each District should be invariably headed by a District Fisheries Officer.
- Each Revenue Mandal should have minimum one Fisheries Development Officer.
- Each hatchery and seed rearing should be managed exclusively by an officer of the rank of FDO.
- In case of exclusive seed rearing farms, each farm should be managed by an Asst. Fisheries Inspector.

While these would be full time personnel, each hatchery unit should be supported with field level/support personnel, additional staff of supervisor (1or 2) and fishermen (4-6) depending on the capacity of hatchery. Similarly, supervisor and fishermen (2-4) depending on the capacity of seed rearing farm.

Any one or more of the following methods could be used:

i) Fill up all vacant positions in phases and within 2-3 years, ii) engage scheme/program based contractual personnel, iii) outsource the services from recognized / reputed agencies. This can be done in phases and corresponding to the annual plans. The DOF can avail financial support under any of the GOI/GOTS schemes / programmes without having any long term commitment on staff.

6.7.3.1 Promotion of Mastya Mitra Groups within FCS by roping in of active, interested youths with good attitude and educational background, selected through a set of criteria could be explored. These focused groups would serve as an extended arm of the DOF in each mandals of the district, facilitate implementation of DOF activities- sensitization and awareness on DOF programs, convey messages of DOF to all the user groups in their jurisdiction of operations, mobilize fishers for the trainings and extension programs/ activities, extend field level facilitation to DOF in implementation, perform special tasks of DOF viz., data collection related to resources, activities, markets, status of progress, feed backs of user groups etc.

There was openness with FCS members in terms of extending total participation, involvement in sector growth by joining hands with department, also share the responsibilities and are optimistic of positive outcomes.

6.7.3.2 Empowerment of stakeholders

The policies and programs of DOF on **empowerment of DOF field personal**, fishing communities and other stakeholders on a continuous basis both at mandal and district level need focused attention. The district staff though being provided with hand holding support and clear guidelines on implementation of programs, feedback and observations of study team indicated the need for additional man power support and technical hand holding for effective implementation.

Training of fishermen who account for huge number across the districts, may call for formulation of long term / permanent strategy of the DOF under which round the year training programs are to be organized to accommodate large number of fishers and other stakeholders. Similarly, for the planned activities on extension methods/ approaches in position for dissemination of technologies, information, diagnostic services, interactive workshops, seminars, field visits, exhibitions, talent recognition and honoring, setting up diagnostic labs and providing water testing kits to all districts etc.

Strategies for Training and skill development

The focus of state need to be towards bringing structural changes in skilling and training programmes, regulation of trainings and catalyzing the efforts of DOF in training space dedicated for sector holistic growth. In this regard the following need attention.

- Development of institutional level Trainers through organizing specific Training of trainers programs with a major focus on imparting of improved technologies, institutional reforms and improving of quality, market relevance of training programs.
- Setting up State and district level HR units and networking.
- Development of exclusive training frameworks, modules/ capsules.
- Innovativeness in imparting process and post training handholding.
- Standardization of skill delivery and content.
- Training quality assessment based on feedback and prioritization on rescheduling of activities in accordance to need response.
- Assessment of Training output.

6.7.3.3 Capacity building of stakeholders

DOF officers – Deputy Director and District Fisheries Officers to serve as policy arm of DOF on matter related to fisheries sector development and welfare of stakeholders involved in it. Training focus need to be on strengthening capabilities related to

- Providing better access of resources to fishers with minimal conflicts.
- Better use of resources and technology lead development.
- Targeting better production, profitability and environmental sustainability.
- Positioning technology hand holding support at all levels – soil and water quality, BMP, inputs, diagnostics, and harvest and post harvest.

Providing platform for scientific interaction-workshops, seminars etc. at different levels to deliberate on issues confronting sector development, facilitation for policy decision process.

Other stakeholders

- Organizing exclusive training programs for different levels on stakeholders.
- Networking of institutions interested in involving as training partners.
- Assessment of incremental human resource requirement both for major segment and general segment of the sector.
- Estimation of incremental skill requirements across priority segment of the sector.
- Organizing multiple capacity building programs in order to empower them for sector ready approach.
- Prioritizing of re-skilling programs in order to mainstream unemployed / underemployed youths of FCS towards sector development.
- Emphasis of trainings needs to be beyond imparting technologies, with focus on process, management, monitoring related issues.
- Organizing intensive awareness programs / campaigns to fishers at mandal levels / cluster of GPs during Feb- April months on resource development
 - Sensitizing on approaches for enhancing fish production through technology adoption.
 - Creating awareness on the ongoing supportive schemes/ programs.
 - Awareness on policies and priorities of the state/central governments and others.
- Positioning Advocacy systems and organizing related advocacy campaigns, working towards multipronged approaches, strategies, developing hybrid solutions.

6.7.3.4 Specific programs that need focus are

- Organizing front line demos, field trials, participatory extension approaches in creating awareness, involving fishers as partners in the process of development.
- Use of social media in the development of Telangana Fisheries and aquaculture- anticipated to have a unprecedented effect – What's app groups, link to technologies, schemes, sharing of success stories, case studies, marketing info., input

availability info., bringing together and linking different stakeholders of the sector, sharing views and opinions, prospective, opportunities, way forward etc.

- Extending information and technical support through **Call free HELP LINES**.

Model skill development

Model skill development with focus on age group of 18-35 years in skill training

- Interested to register on DOF Web site.
- Inviting selected once for counselling to ascertain whether their aspiration for a particular course matches his or her aptitude and interest before actually starting training programs.
- Record training needs and anticipated expectations.

Linking to skilling mission

For the sector development, technology is regarded as enablers of development. There is a need to link training of fishers and other stakeholders to the ongoing skilling mission programs with loan schemes to give trainees the benefit of institutional credit and linked to market chain. They also need to be provided with extensive hand holding support in order to improve their talent to sector activities.

6.8 Thrust on institutional arrangements

Ensure network of institutes under different organizations to support /conduct trainings and capacity building of all stakeholders of sector. The KVKs in the region with fisheries specialists are to be identified as resource institutions and knowledge partners on the zonal service area basis and extending/ facilitating funding support to these institutions under the programs of NFDB/IFDS. The DOF should tap KVK sources for accelerated implementation of programmes like i) Demonstrations, ii) Trainings and capacity building, iii) Awareness creation, iv) Transfer of technology and v) Technology support etc.

The DOF should shortlist KVKs and NGOs with good standing and experience and work out arrangements for implementing any one or more of the above since the DOF itself cannot take the task on its own due to staff crunch.

6.8.1 Institutional collaborations

- Collaborations with academia viz., SAU's, other Universities and Colleges; ATMA, Central Fisheries Institutes and others involved need focus.
- Services of Fisheries related R&D institutions could be used for solving field problems through sponsoring/funding small grant programs of shorter duration. They also could be used for knowledge sharing. Jointly create a favourable environment at the sector related stakeholders level.
- The better participation will also ensure greater understanding of field context and help in developing solutions that are user centric.

6.8.2 Strategies for better Institutional arrangements

- **Team up approach'** to address
 - Existing limited staff in both government and academic institutions and to make fisheries and Aquaculture sector sustainable level.
 - Complement each other in the development process.
 - Strengthen sector by way of mutually sharing responsibilities and functionalities.

Working in collaborative mode to demonstrate comprehensive support for the sector growth need attention and this could be achieved through

- Encouraging and facilitating more participation of local institutions and private entrepreneurs who are into activity to play pro active as partners in the process.
- Positioning of professional institutions/experts for evaluation and status assessment for making evidence based decisions.

- Exploring institutional convergence and scope for networking in support of better collective actions, common decision making process and mechanisms supporting integrated and comprehensive development with minimal user conflicts and efficient use of resources for multiple activities and harnessing better overall resource productivity.

6.8.3 Support of insurance and financial Institutions

- Need for financial support/ facilitation to fishers in getting institutional finance for supporting the sector related activities. This will facilitate them for facing the emerging market forces and harnessing the benefits of technological developments; enhance the flow of credit to the fisheries sector.
- The National Bank for Agriculture and Rural Development (NABARD), a refinance agency for commercial banks, co-operative banks and regional rural banks, has been the major facilitator of credit to the fisheries sector. This could be explored in support of the fishers and other stakeholders of sector.
- Many financial institutions like National Co-operative Development Corporation (NCDC) have also entered into credit support. Institutional is available for almost all the activities of fisheries and for creation of infrastructure.
- Positioning of comprehensive crop insurance policy for covering risk of diseases, weather aberrations leading to large scale mortality / crops in the interest of sector growth.

6.9 Infrastructure and logistics

There is a need for an increase in production of ice, cold storage facilities - at landing centres, more distribution centres, and effect improvement of refrigerated transportation methods and facilities at retail market. The specific suggestions and strategies for hatcheries, seed rearing, fish production systems including cages and pens, aquaculture, FCS and marketing are given in the respective write up on each of these segments and for others it is detailed as below.

6.9.1 Fish Feed Mills

Except under aquaculture activities, input based fisheries is totally absent in the State. Since the allottees of tanks –both Govt. and Panchayat are not permitted to use any input there is no demand for feed of any kind. As such no feed mill has been established in any part of the state. However, it was understood that two feed mills are proposed in Khammam District.

The details of feed market potential within and beyond district, proposed business plan viz., ownership, production capacities, marketing arrangements and services planned, proposed potential markets etc. need to be studied.

In view of emerging aquaculture activities/low Input aquaculture, demand for feed would rise though gradually. Hence, the DOF (inputs Division) should formulate strategies for meeting feed demand and introduce guidelines to the feed suppliers.

6.9.2 Fish landing centers

It is suggested to carry out survey of fish landing centers in collaboration with the FCS to locate such spots where landing centers could be developed with minimum facilities for fishermen and consumers alike. Landing centers at reservoirs and large tanks shall be established to avoid post harvest losses. It may be necessary to draw up resource wise program/plan for rejuvenation/renovation of such spots and their conversion into landing centers where ever required based on the set criterions.

6.9.3 Ice plants

Programs and initiatives are required in support of better utilization of designed capacity of existing ice plants from the present 60% to 80-90%. This is anticipated to meet nearly 72% of the existing internal demand). Considering the growing demand and the prevailing deficit in availability of quality ice, there is a need for further emphasis on the activity.

The proposed support of DOF for expansion of 50 and add ice plant units targeting additional production of about 500 tons/day is good initiative in this direction (for minimizing post-harvest losses) to address the deficit and the growing need anticipated with doubling of fish production in the state in about 5 years period.

In years to come, it is anticipated to have major requirement for cold chain system development in order to reduce the steps in the supply chain, decrease transport costs, decrease food losses and increase food safety and provide better market access. The programs of Central Ministry could be roped in for strengthening this segment.

6.10 Processing and value addition

- Establishment of commercial fish processing units for IMC in the state is currently not very relevant, due to the high demand and barely matching supply.
- Considering the present practices of fish production, dependence on natural resources for production and supply, prevailing market demand and consumer preference for fresh fish processing and value addition has limited scope.
- Possible opportunities with regard to the processing and value addition will arise when aquaculture and significant fish production takes over.

Considering the new focus of state on cage fish farming of introduced fish species viz., pangasius, tilapia etc. where in production in volume may out beat the market demand; it is anticipated to pose threat for the profitability and sustainability of such farming activities of great future in enhancing state overall fish production.

In this backdrop, development of processing and value addition units with appropriate technical Know-how under the private / PPP platform deserve attention of the Government. The product diversification, venturing into the preparation of ready-to-eat food and networking with innovative marketing centers is key and the future to promote the segment growth. Linking with fast food centers, hospitals, schools, army canteens, railway stations, airports, etc. are necessary in promotion of marketing value added products.

6.11 Suggestions on Department initiatives, schemes and programs

Studies on impacts of schemes, problems encountered in implementations, gaps related to process, targets v/s achievements, beneficiary's feedback and learning's are very much lacking and need further focus. The following need focused attention

- Creating awareness on schemes, efforts made to mainstream stakeholders and Identification of schemes that have maximum impact factors are the key.
- Carrying out performance rating of Govt. hatcheries, fish seed farms, FCS, federation other infra of GOT in support of sector development through developed indicators. Evaluation studies could be outsourced to professional consultants/ institutions on regular basis to get the ground level assessment and modify the future programs accordingly. This will support effective implementation at the ground level and provide lead for revisit/ revive schemes/ programs accordingly.
- Budget provision for capacity building, outreach activities, and technology dissemination in various format need to be increased significantly in order to address many issues related to adoption of BMP and better governance.
- Annual provisions need to be made in the budget for undertaking effective monitoring and evaluation of ongoing schemes (third party progress monitoring and suggestions for midterm corrections), carry out concurrent, midterm and annual review of progress and achievements against the planned targets, identify constraints for progress and propose suggestions- positioning M&E system are the key for success.
- Implementing team need to collect feedback on regular basis from the field functionaries involved in implementation, DOF officers in-charge of the activity implementation in the district and also of the officers coordinating at HQ level), constantly identify the weak links / gaps to address on 'then and there basis' and also document major bottle necks in implementation, feedback for possible solutions/suggestions at the ground level within the limitations and scope of the problem- mechanisms for creating regular feedback is the key.

6.12 Overall strategies for enhancing sector growth

In order to ensure positive growth trends in the sector, the existing fisheries development programs have to become more responsive and need to be organized to push sector growth forward. The following suggested strategies need considerations

- There is need to study the aspects responsible for decline in production that are attributed to one or more of the following viz. i) deficient rainfall, ii) under-stocking/non-stocking of seed, iii) under reporting of production by the FCS for various reasons, iv) lack of effective monitoring by the DOF. While the first probability cannot be wished away, the remaining three need to be addressed.
- Accelerated growth of fisheries and enhancement of fish production calls for holistic approach that should include closer presence, supervision and monitoring of the operations of the Lessees/License holders. Apart from this, the other measure required are to
 - Revisit seed stocking policy and bring about changes in size and time of stocking so as to get best outputs from the stocking programme.
 - Revise the present resource development methods/approaches with promotion of low external input usage for enhancing production and profitability.
 - Create conducive environment that allow youths of PFCS to remain in fisheries and aqua activities.
 - Since the WSA areas are shrinking due to siltation and weeds, there is loss of area and potential to a significant level. The horizontal development as suggested under “Water resources development “ needs to be taken up by the DOF in association with the FCS/ concerned departments.
 - Identify successful youths in each of the PFCS, organize them into Focused Activity Groups (FAGs).
 - Enhance knowledge and efficiencies of the fishermen on various aspects of fisheries and aquaculture through training programmes and communication of “Dos and Don’ts.
 - Create business opportunities that are both crop based viz., fish seed rearing, fish culture etc and non- crop based – direct marketing, post harvest, grading value addition, including training in input production such as crafts and gears, ice production.
 - Promote cottage scale feed units to meet demands of aquaculture activities proposed such as low-input aquaculture, input based commercial aquaculture, cage and pen culture, and others leading to entrepreneurship development and overall system productivity.
 - In addition, roping in of other important programmes like low input based fish culture, land based commercial aquaculture, cage and pen culture in reservoirs and large water bodies should receive priority in planning and allocation of funds.
 - Build sustainable growth, by providing better scheme support, market linkages and value- addition.
 - Implement development programs through technological innovations and handholding – help them to establish direct linkages with the consumers, providing sustained income.
 - Facilitation for institutional finance in support of their activities through Cooperative Banking channel (under NABARD Refinance schemes) etc.
 - Fish Production estimates being worked out by the DOF need revisit as the FCS/Licensees are not operating in transparent manner and no details on harvesting and volume are shared by majority of them.
 - Though the DOF cannot physically supervise and monitor the operations, a mechanism of reporting by the FCS should be put in place and this should give least scope for any FCS to conceal facts about the output.
 - One way of estimating the production could be to ascertain survival percentage of seed of different sizes which could be used for estimating the fish production independent of FCS. This should be cross-checked with the FCS records/reports and gaps could be identified.
 - Since lease agreement is renewed every year this gives best opportunity to the DOF to impose certain discipline and conditions on the FCS.
 - Minimising mortalities through preventive measures as also use of suitable crafts and gears should also be ensured to enhance productivity.

6.13 Suggestions on Pointers for action

There is need for directional target to mobilize DOF focus on-ground. The DOF is targeting fish production of over four lakh ton by 2024-25. It could be driven only by right policies and approaches both to address horizontal expansion and vertical integration in support of area expansion under fish production activities, and right use of technologies, production enhancing inputs, management, monitoring, capacity building at all levels and appropriate institutional arrangement to address and hand hold backward and forward support services. The following action points need attention of policy makers.

6.13.1 Resource access, enhancement of fish production and conservation

In respect of licensing system followed as of now, the present policy is in tune with the need but the number of license seekers has not shown any encouraging trend. This needs to be studied in detail to identify reasons for such lukewarm response. Wherever feasible, promotion of FCS could be ventured. In fact, this system is in favour of fishermen since it affords full time activity and much higher income in comparison with lease system given to the FCS members who do not have full time employment and their income is much less since it is shared among larger number of members. The state is benefitted because the aggregate amount of money collected is directly linked with number of licensee and is generally higher than lease amount paid by FCS. Additionally the following issues need consideration

- Issue of number of license to a particular reservoir need to be on the basis of EWSA rather than TWSA in the context of climate aberrations, frequent rainfall failures and such other weather related issues. Most reservoirs of different categories of late are not receiving adequate water flow to its designed FRL.
- Consideration for gender equity in access right to CPR, extending eligibility for Fisher women to avail resource access on license/lease basis while addressing issues of gender mainstreaming in forefront of development agenda.
- Sharing of actual fish catch data by license fisher/FCS need to be made mandatory in accordance to terms of licensing and similarly for the leased resources.
- Conditional issue/renewal of license/ lease of resources and monitoring compliance with exclusive mechanisms need focus.
- Inter institutional convergence, coordination and collective actions for integrated development of resource in support of fisheries and aquaculture -need permissions, scheme supports and additional handholding of concerned institutions.

■ **Transfer of Panchayat tanks to the Department**

The DOF proposal for transfer of the Panchayat tanks to the Department could be resisted by the Panchayat Raj Institutions since the Panchayats earn revenue from these water bodies in addition to control and management. Since the DOF has included Panchayats tanks also under seed stocking scheme, it is possible for the DOF to get clearance of the Govt./Panchayats in respect of monitoring of fisheries operations. Hence, the DOF may focus on development of fisheries activities initially and wait for a National policy on this issue. The issues of concern that need additional considerations and strict measures are

- i) Curtailing ongoing practices of drawing of water from tanks through mechanical means like use of motor engines etc.
- ii) Digging bore wells in tank shore area.
- iii) Dumping of municipal waste etc.(Shamsadabad tanks in Rangareddy district).

Allotment of tanks

First preference in allotment of tank water bodies is given to genuine FCS in consultation with the Dept. of Fisheries and the lease period is for 3 years with an optional clause for extension by two years to those FCS satisfy GP with rentals that may be revised from time to time. The viability norms based on the productivity, seasonality and nature of tanks prevailing in newly formed Telangana State has been developed to fix up the unit economics of the tanks in support of lease / rent cost. There is need to revisit this aspect in order to ensure transparency and objectivity in assessment of the production potential of the tanks.

The lease / auction revenue receipts shared by three agencies There is need to review the sharing proportion and end use of the revenue generated. The water Users Associations (WUAs) has virtually become defunct in majority of cases and hence providing them with huge funds may not be advantageous to fisheries growth. Instead, the share of the DOF should be enhanced by proportionate reduction in respect of WUAs. Additional measures are required on the following

- Implementation of clause on sub-lease or assigning the leased water body to any third party including right for fishing either full or part of the leased water body without prior and explicit permission of the Lesser need consideration for positioning mechanisms to curtail the ongoing practices in order to make PFC responsible and join hands with DOF as partners in the technology led development of sector.

- Modifications/amendments to the present stipulated conditions of irrigation/PWD/Forest departments etc. so as to transfer fishing/fisheries management rights- removing of stumps, aquatic weeds, etc. to the Departments of Fisheries, allow traditional non-destructive fishing activities including cage culture, take up related construction/ erection/ effect minor structural changes to resources in support of fisheries and aquaculture activities-cage and pen farming, *in situ* seed rearing etc.

■ **Lease tenure**

The present policy allows lease period up to five years, but in practice it is beyond for indefinite period. As a result, wide diversity in participation of PFCS exists at present in most instances there is great deal of compromise and negligence in involvement by the members persist. Unless some modifications are incorporated in blanket renewal of licenses annually, the situation may not improve much in terms of management led growth, enhanced production and profitability in the activities.

6.13.2 Enhancement of fish production

Positioning of specific policy measures for resource productivity and fish production enhancement in support of **Horizontal expansion of resources**

- Reclaiming available resources to enhance effective water spread area for productivity functions through Mission Kakatiya, positioning of supportive schemes, one time grant support, and collective actions of FCS.
- Positioning of utilization strategies for non conventional water bodies that have come up under various activities viz., mining, quarrying etc and programs viz., water sheds, MNERGA, NPMS, NHM etc for fisheries activity.
- Developing data base on resource characteristics and resource use status, utilization strategies in support of sector related activities and implementation of resource integration modules.

Vertical integration approaches

Specific policy approaches are required for

- Promoting low input technologies using locally available agricultural by-products viz., brans and oil cakes as feed ingredients.
- Fish seed stocking manipulations viz., varieties, size, density and ratio etc in accordance to resource typology and fishers past experience and local wisdom for enhancement of resource productivity and fish production in natural water bodies where ever feasible.
- Promotion of better management practices and participatory approaches in resource management.
- Better governance.

The intervention of free seed supply is timely and be continued. However, administering the scheme needs to be revisited keeping in view the reactions/response/ suggestions of the FCS and other stake holders. There is need for modification in case of size of the seed, timing and involvement of FCS in stocking.

On crafts and Nets to Fishermen, the DOF has come out with Operational Guidelines for implementation of components of Fisheries Development Scheme. The net material purchased by the beneficiaries is paid through eLaabh (Online DBT system).

- Use of FRP Coracles, Aluminium boats designed by CIFT, Cochin and such other improved crafts need to be promoted in place of Theppam. Trainings and capacity building need focus to change the prevailing mind set and develop acceptance for improved crafts.
- Use of safety measures – life jackets while fishing needs to be promoted with appropriate scheme support. Similarly measures to be taken for positioning light indicators to show shore locations for the benefit of fishers in large and medium reservoirs.

6.13.3 Policy thrust on resource development

- Stock enhancement programs of economically important species and regular stocking with cultivable carps in medium and large reservoirs.
- Promotion of culture-based fisheries regime supplemented with low input based fish culture wherever feasible.

- Extensive promotion enclosure fish farming and seed rearing in marginal areas of open water bodies especially pens for raising in situ seed raising and production of table fish as well, cage fish farming in selected reservoirs.
- Establishment of dedicated hatcheries using the genetic stock of specific native brood stock for stocking natural water bodies.
 - *in situ* and farm based rearing of quality seed.
 - promotion of hatcheries and seed rearing farms at strategic locations.
 - renovation and activation of existing non-functional farms through public-private partnership arrangement.
 - *In situ* rearing of seed of desired size in cages or pens wherever feasible.

These developments could be well supported with basic infrastructure of roads, hatcheries, seed farms, landing centres, markets, ice plants etc.

6.13.4 Aquaculture and cage fish farming

Need for sector reform approaches to address various factors of aquaculture growth and bring better sector growth. The trajectory remains central to the eventual level of growth in aquaculture segment initially and later the entire supply and value chain of the sector. Focus on factors of production which are essential for private investment in aquaculture segment to pick up to levels that have been witnessed in the neighboring state AP need attention to make the state as one of the significant part of country's sector growth outlook. This requires

- Need for promotion of knowledge based aquaculture activities in the sector which enables a more efficient production.
- Promotion of aquaculture, water base farming activities viz., cage and pen fish farming ; intensive farming under private system with all care and protection of both resource sustainability, environmental concerns and biodiversity conservation.
- Similarly promotion of closed system farming viz., RAS etc.
- Promotion of 'Cluster Farming' and development of Aquaculture Hubs in different districts of state where potential saline and waterlogged areas and canal fed water facilities exist.
- Positioning dedicate platform for quality and timely services to entrepreneurs.
- Single window clearances for starting sector related activities by private investors. Includes simplified procedures for registration and hand holding support, modification to existing guidelines to hasten up registration/regularization of ongoing farms.
- Positioning of proactive new initiatives related to business friendly policies and operational system for improving ease of doing activities in aquaculture.
- Positioning of supportive programs/ incentives that benefits and facilitate private investment for expanding aquaculture activities viz. commercial seed rearing & fish culture, prawn farming, cage farming in selected reservoirs, pen culture in both reservoirs and perennial tanks, ornamental fish farming etc.
- The subsidies have to be targeted towards promoting both traditional and small-scale aquaculture units and commercial aquaculture units with private participation for which the state has huge potential.
- Need for speeding up of reformative initiatives - short term pains of aqua culturists but will result in long term gain to sector.
- Positioning set of regulators viz., cheaper land, tax exemptions for import of equipment & accessories, facilitation for institutional credit support, declaring tax holidays etc. in support of promotion.

6.13.4.1 Policy on promotion of activities

- Initial focus shall be given to promote farming of fish species preferred by the consumers and have high market demand/absorption viz., carps (composite/ integrated fish farming system), murrel and prawns (under mono/poly culture systems).
- Infra and Input subsidy support on water spread area basis, farming system and species farmed.
- Govt .may consider aquaculture activities including seed production and seed rearing on par with agriculture and provide free power to aquaculture sector also.

On registration of new aquaculture units in freshwater lands, regularization of existing freshwater aquaculture units in operation, promotion of cage and pen culture in inland open water bodies viz., reservoirs and large perennial tanks of Telangana, Tilapia fish farming etc. the state need to take a new and proactive stand in support of taking these activities forward on a sustainable basis. Since these activities are being promoted afresh in the state, adoption of Rules and Regulations from other State/Centre may not be prudent. Locally suitable and pro-entrepreneurial policies would be appropriate and necessary in the initial phase of development.

■ **Cage fish farming**

The proposed policy on cage fish farming with priority in support to irrigation project affected families, followed by fishermen and also provision made for the participation of private entrepreneurs is an encouraging move towards enhancing reservoir productivity.

- Policy considerations are required to preferentially promote commercial cage fish farming of high value fish through **public-private- and community partnership mode**. Focus on demonstrations convincing techno- economical feasibility in support of further replication and scale up both for cage and pen fish farming need increased focus and effort.
- As the activity is more commercial in nature, feed based, and technology focused warrants for high capital cost to start with and also operational cost mainly to purchase fish feed, the proposed policy need modification viz.,
 - Community focused cage farming need to have better financial support of up to 90% subsidy on capital cost and also on operational expenses.
 - Handholding support need to be extended for minimum Three years period till they develop confidence and achieve financial stability.
 - Participation of private entrepreneurs could be encouraged by providing attractive sops in the initial phase till they get established with proven success.
 - DOF also need to have exclusive focused extension and promotional activities in support of this new farming system.
 - Approaches of contract/partnership farming between members of FCS, private entrepreneurs/corporate and facilitations of DOF need policy emphasis.
 - As the present activity of cage fish farming is mainly cantered on pangasius and to some extent on tilapia, where in, both the species have limited market demand and volume absorption compared to most preferred carp fish in domestic market. The focus in policy need to be on processing and value addition, product development, ready - to -eat and ready- to -cook products and variants for the present farmed fish species in cages.
 - Period of support including technology hand holding etc. to the segment could be for a minimum period of 3-4 years to attain desired stability.
 - Considering the present market preferences for fish species, integration of production activities of pangasius/tilapia with processing and value addition both to meet domestic and outside market needs special policy focus.

6.13.5 Fish seed policy

Free fish seed supply scheme needs to be pursued with some changes in respect of timely supply, size and species including involvement of FCS in the process of procurement. The other points that need consideration are

- Policy support for promotion of integrated fish seed production clusters.
- Facilitation for conversion of wetlands for construction of fish seed rearing farms where ever demand arises from private entrepreneurs.
- Positioning exclusive support for promotion of fish seed rearing in feasible non conventional water bodies for better returns at the expenses of livelihood loss due to wetland degradation.
- Promotion of active participation by PFCS and private farmers/entrepreneurs in seed rearing and supply.
- Registration of existing private seed farms with DOF and extending technical handholding, scheme benefits, and facilitative services to bring them into the state seed production network.
- Level playing role by GOTS extending support and facilitation to the new seed production start ups.
- Preference first approach in tender/bidding for seed supply to consortia of local seed growers involved in the start up activity within mandal /district level.

- Liberal consideration under pre qualification criteria in terms of value supply, farm size and infrastructure.
- Encouragement for Gender participation in the segment activities.
- Positioning of fish seed certification guide lines in place for the seeds produced by the Govt. agency or those procured and sold or supplied by private seed growers in order to discipline the ongoing process of seed supply.
- Monitoring of seed inflow from various channels and sources.
- Positioning of comprehensive Legal action with stringent provisions to punish the errant suppliers and ensure compensations to fishers in the event of activity failures and fish production loss.

6.13.6 FCS Governance

- FCS across the state have been admitting “non Members” in large number. Streamline of FCS denying membership to genuine fishermen by positioning exclusive committee for conducting skill-test, identify the genuine fishermen from time to time is a good initiative. This should be pursued more vigorously to weed out absentee members of FCS without any contribution. This policy would ensure equal opportunities to the fishermen community youth and would discourage concentration of control of multiple water bodies by single FCS. Since fisheries is no more a subsistence oriented activity and has become a commercial occupation, the scope and eligibility of membership should be broadened to afford opportunities to the young aspirants.
- Amendment to the existing government orders enabling the department to organize Fishermen Cooperative Societies for those people engaged in fishing activity but hailing from fishermen castes in scheduled areas so that the resources in these areas hitherto not used for activities of fisheries and aquaculture could be brought into organizational fold. This is a fishermen-friendly policy and opportunity should be provided to each interested and deserving fisherman. This will also provide justice to all affected families.
- Economic viability of enhancing membership needs consideration from the view point of financial sustainability and retaining members actively in the sector.

6.13.7 Fish Marketing

Under IFDS program of DOF, multiple components are positioned for supporting the fishermen and fisherwomen in marketing. The DOF/GOTS should supplement the efforts of NFDB in renovating upgrading of rural and semi urban markets in addition to metro markets since all of them are working under unhygienic conditions. The traders are willing to share the cost and also pay higher rentals/fees for better services.

- Organizing awareness programs to fishers on market dynamics, changed scenarios, expectations, consumer behavior, market functionaries etc. through periodic buyer- seller meets.
- Priority on establishment of hygienic markets, promotion on hygiene in existing markets, facilitation and support for upgrading market infra in support of better fish handling, dress code to retailers and post sale service providers, display and storage of fish, marketing and post sale services.
- Better supportive and facilitative role play by Federation and DFCS in assisting PFCS at all levels of activities and in marketing of their produce for better price.

6.13.8 HR and DOF reorganization

- The focus of state need to be towards bringing structural changes in skilling and training programmes, regulation of trainings and catalyzing the efforts of DOF in training space dedicated for sector holistic growth.
- The present staff strength at the district level fisheries office is inadequate in the context of expanding fisheries sector activities, introduction and implementation of new schemes that call for close links/contacts and effective monitoring and follow up, keeping track of the same and documentation and data management etc.
- Suggestions are made for the structural and functional reorganization of the DOF proposing the divisions and also strengthening DOF staff at districts levels.

6.13.9 Conservation of fishery resources and fish biodiversity

In order to limit the harvest of small size fish from the natural eco-systems, use of nets with mesh size below 25 mm from knot to knot is banned. Further each individual fisher is restricted to use gill nets not more than 450

feet length. Similarly, ban is imposed on use of drag nets (shore seine) without the permission of concerned Fisheries officer. No fishing in specified river stretch within 30. 48 mts. lower down of masonry construction of river are being adopted as per erst while G.O.Ms.No.1012 dated 29/05/1967. The suggested measures are

- Strict enforcement of existing regulation on closed season and mesh size regulations for conserving local fish bio diversity.
- Limiting the close season ban only to large and medium reservoirs where in scope for auto stocking is high.
- Instead of total ban on shore seine net, use of these nets could be relaxed for a period of one month before the onset of monsoon and prior to start of the stocking programme to limit the population of forage fish in the water bodies.
- Regulating the introduction of exotic fish species to conserve the indigenous fish species standardization of captive breeding and seed production of endangered and critically endangered fish species as furnished the guidelines of the Government needs policy attention.
- Promotion of conservation measures to protect brood fish and juveniles from being caught for allowing regeneration of fish stocks.

6.13.10 Sector reforms

Focus on factors of production which are essential for production and productivity enhancement and profitability in case of all the input based aquaculture to bring in cost competitiveness is the key. Private investment in aquaculture segment to pick up to levels that have been witnessed in the neighboring state AP need attention to make the state as one of the significant part of country's sector growth outlook.

6.14 Suggestions on State Draft Policy

- Consideration for determining number of license holder to a particular reservoir on EWSA basis rather than TWSA in the context of climate aberrations, frequent rainfall failures and such other weather related issues. Most reservoirs of different categories of late are not receiving adequate water flow to its designed FRL.
- Extending eligibility for Fisher women to avail resource access on license/lease basis while considering gender mainstreaming in forefront of development agenda.
- Emphasis on viability norms based on productivity, seasonality and nature of tanks while fixing up the unit economics of the tanks in support of lease / rent cost fixation.
- Inter institutional convergence, coordination and collective actions for integrated development of resource in support of fisheries and aquaculture need emphasis- removal of stumps, weeds, de-siltation under Mission Kakatiya, clearance from encroachment, spill way management to minimize escapement of fish, pollution and sewage management, development of access road to resources, development of peripheral tanks in support of fish seed rearing, pursuing cage and pen culture, use of drinking water resources for fisheries development etc need permissions, scheme supports and additional handholding.
- Focused attention of DOF to develop mechanisms to curtail the ongoing practices of sub-lease or assigning the leased water body to any third party including right for fishing either full or part of the leased water body without prior and explicit permission of the GOF/GP as per provisions made in the lease document. Similarly there is need for bringing similar mandatory obligations and accountability for data sharing of actual catch data, handing over of fish catch to DFSC / Apex bodies/authorized agency at the rates fixed by the DOF etc, as per the terms of licensing/lease and has to be monitored appropriately with exclusive mechanisms.
- Efforts of DOF are needed to curtail ongoing practices of drawing of water from tanks through mechanical means like use of motor engines etc digging bore wells in tank shore area, dumping of municipal waste etc (Shamsadabad tanks in Rangareddy district).
- Efforts of DOF are needed for changing the present stipulated conditions of irrigation department and PWD related to construction/ erection/ effect minor structural changes to resources in support of fisheries and aquaculture activities- cage and pen farming, in situ seed rearing.
- Strict measures of DOF to curtail use of illegal fishing methods - electric fishing (Haldivagu) are needed.
- Since cage farming has been successfully experimented with encouraging results there would be good demand from private investors/entrepreneurs. In this context, Karnataka, Jharkhand and Chhattisgarh experience may help GOTs in taking suitable measures so that incidences of failures could be minimized.

- Since this is high investment high return activity, the Govt. will have to take some bold steps to open up cage and aquaculture activities to entrepreneurs willing to take up this activity.
- There could be need for special trainings and exposure visits of prospective beneficiaries and pursuing activity on a business model- scope for contract farming and vertically integrated model farming with linking of inputs, markets, processing and value addition to make the activity more viable and successful.
- Brood stock development, breeding and rearing, sustained supply of quality seed across the state to promote stocking need focus in the draft policy.
- Strategies to meet quality seed requirement of proposed fish species; positioning of exclusive commercial hatcheries in support of breeding and rearing farms both under govt. and private set up; mapping of water bodies where natural breeding of murrel is taking place and means and ways of protecting them need special mention in proposed draft policy
- Convergence of Welfare schemes of different institutions would be necessary to avoid duplicity in spending and efficiency in implementation for better output.

Suggestions on the state draft policy are highlighted in **Annexure 6.3**

6.15 Planning priorities

Top down planning verses bottom up approach

Need “systems view” in sector planning and policy positioning to connect different segments of the sector with added support of pro-policies. The sector analysis carried out under the study indicated the following

- The level of entrepreneurship in the sector is low, but is regarded as one of the macroeconomic indicators of growth.
- At present the entrepreneurship scenario is low as most of the activities are being perceived on traditional concept with low inputs and investments. The focus of the activities are mainly addressing livelihood support to the fishers depending exclusively on the natural water bodies viz., rivers, reservoirs etc. as complimentary activities in tanks to supplement additional income/meeting nutritional requirement of the families.
- Socialistic welfare mode of resource development verses market driven concept by leaning resources to the market dynamics and market forces facilitating freedom to invest, roping scientific technologies and management for enhancing resource productivity and production that can support growth of more jobs, gainful employment and new livelihood opportunities needs balanced decision.
- There is lack of Participatory planning in accordance to realities of resources usage pattern and prevailing support services.
- Deficiencies prevails in allocation of resources – leasing, licensing in support of fish production; promotional support for aquaculture; infrastructure and institutional arrangements to facilitate activities; schemes and pro policies for ease of doing business.
- Inadequacy in close monitoring of input – output management of the sector.
- Acquiring capabilities to produce more, pursuing activity for higher income and profitability needs added skills, managerial tools and entrepreneurial abilities which is lacking at present in the sector.

What needs priority?

- The government needs to facilitate / create favourable conditions and appropriate platforms with relevant institutional arrangement for hand holding and nurturing fishers and entrepreneurs until they grow strong enough to move forward in sector related activities.
- Increase application of technologies and process management tolls are the key for enhancing resource use efficiency and profitability and are lacking in the sector. In this back drop, entrepreneurship development in the sector, focused training and capacity building assumes importance.
- Promotion of private investment into sector related activities new start ups, supportive infrastructure along with institutional backups will enable desired change in the fisheries and aquaculture sector of the state.

■ **Integrated system approach - the key**

- Roping in of combination of many interventions as suggested in the present study report in the right perspective and proportions on a time bound manner for the sustainable growth of sector.
- Strengthening of DOF at all levels with additional man power to address existing inadequacy in monitoring and quantifying of outputs at the state, district and on ground at mandal / village levels.
- Strengthen existing coordination in implementation, process and delivery mechanism for better efficiencies and anticipated outputs.
- Develop Resource, activity and performance data base for the state; quantify non-performing and under-performing assets, facilities and services. The government hatcheries, seed rearing farms, training centres and other infrastructure including markets need focused attention for renovation, capacity up gradation and vertical integration.

■ **Growth strategies that deserves policy considerations**

- Planning for sector growth by creating enabling environment for various stake holders to perform to their best. This can be done by adopting proactive and short, medium and long term policies by the State. Any ad hoc measures would only lead to an air of uncertainty among the participating individuals and agencies, more so, where community participation is anticipated and also required. This would also have far-reaching impact and consequences. Since Fisheries sector growth is intensely linked to the welfare and economic well being of fishermen communities, such a policy becomes necessary to achieve desired objectives.
- Promoting private investment to drive aquaculture segment growth in the state by providing right environment, offering appropriate incentives, bringing under the umbrella of right institutional framework, BMPs/GMPs, norms of guidelines /policy frameworks for better governance.
- Initiatives to help nudge into activities, parallel thrust on policy to stimulate demand side.
- Need for a better regulatory environment to drive rapid growth- of sector and mechanisms to monitor and quantify whether they are faring as designed and yielding anticipated results and also re calibrate the measures undertaken.