Successful demonstration and operation of Vertical Jar hatchery CIFE Model at Govt. Fish Seed Farm, Badkhal (Haryana)

Dr. S. N. Dwivedi, Director CIFE during the training programme of one group of trainees of XIV th batch of RTC for IFO, Agra, examines the hatchery operations.

CIFE NEWSLETTER

REGIONAL TRAINING CENTRE FOR INLAND FISHERIES OPERATIVES, AGRA, of Central Institute of Fisheries, Education, Bombay.

(Indian Council of Agricultural Research)
SEMINAR
ON
ASPECT OF INLAND FISHERIES
VI ISSUE
FEBRUARY 27, 1981
EDITOR
M.R. PATIL, PRINCIPAL
ASSISTED BY
1. DR. U.K. MOHERMARI, SCIENTIST
2. DR. K.K. JAIN, SCIENTIST
CIFS NEWSLETTER
REGIONAL TRAINING CENTRE FOR INLAND FISHERIES OPERATIVES
AGRA - 282002
CENTRAL INSTITUTE OF FISHERIES EDUCATION, BOMBAY
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
FOREWORD

I am glad to release the VIth issue of the Annual Seminar on "Aspects of Inland Fisheries". The Annual Seminar on "Aspects of Inland Fisheries was started with the view to encourage staff members and trainees to record their experiences and field work observations in the form of publishable matter and the papers presented at these seminars are collectively brought together in the form of CIFS Newsletter. This tradition has been so far maintained for the sixth time.

I am sure those trainees who have contributed to this Seminar issue and in the proceedings of the Seminar shall be happy to take this issue as a souvenir to their sponsoring organisation in which their prized achievement is on the record now. I am also sure that my colleagues will be filled up with a sense of pride not only for their own contributions but also for their painstaking efforts in encouraging and guiding, suggesting and correcting the manuscripts of the papers prepared by the trainees. I also record my appreciation for their hearty cooperation and strenuous efforts in bringing this issue.

(N.R.PATHIL),
PRINCIPAL
RTC FOR IFO, MORA.
MESSAGE

During the last two decades fish production from inland waters registered a substantial increase from 2.77 lakh tons (1961) to 8.48 lakh tons (1979). This accounts for an annual growth of 11.6%. On average, with the implementation of extension programmes under Lab-to-land programmes, transfer of technology has become more vigourous and fresh water fish seed production has firmly established in many parts of the country as a viable industry. Fish seed which is basic to fish production is produced in the private fish seed farms and it is hoped that seed in adequate quantities will be made available for fish culture.

However, fish seed production and fish culture are highly skilled jobs and the help and assistance of skilled operators in developing the fish farming industry need not be emphasised.

The Regional Training Centre for Inland Fisheries Operatives, Agra has been imparting specialised training in various aspects of fish culture and the present volume contains seminars of the students discussing various aspects of fish culture based on their practical experience and observations. This volume is not meant for the expert but for those with some knowledge of the subject and who would like to learn more.

The emphasis has been made on the practical aspects of fish culture and this seminar is designed for operatives interested in practical aspects.

Shri M.R. Patil, Principal R.T.C. for I.F.O., Agra has been organising the Seminars for last few years. These provide an excellent experience to the operatives and also helps them in developing an overall view of the field of their study.

Shri Patil, his colleagues and the trainees have worked hard to organise this Seminar. I wish them success in their efforts.

Bombay

22nd February, 82

Sd/-

Dr. S.N. Dwivedi
Director
C.I.F.E.
Regional Training Centre for Inland Fisheries Operatives, Agro was established in March, 1967 under the administrative control of Central Institute of Fisheries Education, Bombay. The centre imports nine months training from June to February in various operational fields of inland fisheries to personnel of state fisheries and cooperatives. Since its inception, this centre has successfully trained 539 candidates by end of February, 1981. In the last XIVth (1980-81) batch out of 43 trainees, 35 were declared successful in the qualifying examinations, 14 securing 1st division, 11 second and 10 third. As the trained candidates of this centre are doing very good jobs in their parent departments/organisation, the demand for this training has increased by more than 50% during the last few years. The admissions to private candidates has totally stopped. This year also in spite of high demand, only 37 candidates were admitted for the current XVth (81-82) batch and eight candidates who came late were sent back.

The training schedule comprised of one month orientation course, 10 months of intensive field training at the fish farms, about four months class-room teaching coupled with practicals, local tours, tests, sessional works and film shows and about 20 days general study tour and lastly revision classes, preparatory leaves, seminar and examination.
PRODUCTION CUM TRAINING PROGRAMME

Due to lack of own fish farm, the trainees were divided into 3 batches and were taken to three Govt. Fish Seed Farms at Ranthambhore (Raj), Bedkhel (Haryana) and Bhadh bada, Bhopal (M.P.). These farms were selected on the basis of their agro climatic differences. Each batch was lead by two staff members and during the course of 45 days of stay, production oriented intensive field training in fish breeding, hatching and seed rearing was arranged. The main object of dividing the trainees into batches and taking them to different farms was to ensure individual attention and providing each of them sufficient number of breeder for breeding and more number of nurseries. The motto during the field training had been, “Learn by doing” by fixing targets, the personal involvement of trainees and having a sense of responsibility was possible. During the field programme, altogether 156.33 lakhs of spawn was produced by induced breeding and reared to 107.50 lakhs of fry giving nearly 70% survival. This indeed a remarkable achievement.

INSTALLATION, OPERATION AND DEMONSTRATION OF LOP HATCHERIES:

A set of 6, 12 and 18 bucket hatcheries as designed by Dr. S.N. Dwivedi, Director, CIFE, Bombay were installed at fish farms at Ranthambhore, Bedkhel and Bhadhada, Bhopal respectively. The operation was provided by air compressors at Bedkhel and Bhadhada, Bhopal but as envisaged in the integrated hatchery system, cooling arrangement could not be provided in any of the farm although these hatcheries were installed indoor. This system has given encouraging results at
all the places resulting up to 90% survival and 65% spawn recovery. It has its own cement cistern for brooding and hatching purposes with flowing waters and this system has also given excellent results. A note on competitive efficiency of their two systems is being published in this issue.

SEMINAR/SHORT TERM TRAINING PROGRAMME/REFRESHER COURSE:

i) Two weeks course in Management of Cold Water Fisheries was organised from 5th to 17th January, 1981 at Chandigarh under the auspices of Central Institute of Fisheries Education, Bombay. 26 participants belonging to state fisheries departments of northern and eastern region, Banks, Punjab University had undergone the training. The course was followed by seminar on Cold Water Fisheries management held at Chandigarh on 18th and 19th January, 1981 under joint auspices of CIFE and State Fisheries Departments of Punjab and Haryana. This was the first seminar of its kind in fisheries in this part of the country and had received considerable support and enthusiasm from the fisheries workers in the region.

ii) Three weeks refresher course on Management of Reservoirs, Swamps and Cage Culture was organised from 4th to 25th May, 1981 at this centre. In all 13 participants from different state fisheries departments were trained. A plastic folder containing course material and background information was issued during the training. The course comprised of specialised lectures including those of guest specialist, practicals and field work demonstration and training. The reservoir training was undertaken at Ahirwar and Kaokhan reservoirs and for swamps and cage culture at Bharatpur and Allahabad respectively.
iii) Sixty First Annual Seminar on Aspects of Inland Fisheries was arranged on 22nd February, 1981 at this centre. The seminar was inaugurated by Dr. S.N. Mebrotra, Vice Chancellor, Agra University, Agra and presided over by Dr. S.N. Srivastava, Principal, Agra College, Agra. The Key Note address was delivered by Dr. S.N. Dwivedi, Director, CIFE, Bombay. In all 13 papers were presented and they were collectively issued as Seminar V issue, released on this occasion.

VISITORS:

i) Dr. O.P. Gautam, Director General, Indian Council of Agricultural Research, New Delhi visited in June, 1981 along with Dr. Satish Dhirkhao, M.B.T. Director General, ICAR and Dr. Soni, Officer in Charge, Central Institute for Research on Goats, Makhdoom, Mathura.

ii) Shri Bhim Pratap Singh, M.P. and ex Union Minister for State for Irrigation and Cooperation visited this centre. He wanted his youth camp people also to be trained.

Ph.D. Awards:

It is heartening to state that two of Scientist's teachers of this centre, Dr. U.K. Maheshwari and Dr. K.K. Jain were awarded Ph.D. degree in the convention held in January, 1981 by Agra University, Agra.
Besides publishing the research and experiences papers of the staff members in the annual seminar issue, the following papers have been published in reputed national journals:


3. A. note on the study of Pseudonix Index (K) In Cirrhinus Mrigala (Hm.) By M.N. Naizada and S. Naizada. Accepted in the journal Goobios.
Seminar On Management of Cold Water Fisheries held on
18th—19th January, 1981 at Chandigarh.

At inaugural function, L to R. Shre M. R. Patil, Principal, Dr. O. K. Kaushik, Director Fisheries Haryana. Shree Hari Ram I.A.S. Secretary, Govt. of Haryana, Shree A. K. Kawatra, Director Fisheries Punjab. Dr. Khara Prof. and head, Zoology. Punjab University., Dr. Tandon. Zoology Deptt., Punjab University.

Dignitaries taken round the exhibition arranged at occasion of Annual Seminar on aspects of Inland Fisheries held on 22nd February, 1981 by R.T.C. for I.F.O. Agra

Left to right Dr. S. N. Srivastava, Principal, Agra College, Agra, Dr. S. N. Mehrotra, Vice Chancellor, Agra University, Agra. Dr. S. N. Dwivedi, Director, CIFE, Bombay and Shri M. R. Patil, Principal, RTC for IFO, Agra.
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PRUDENCE IN AGRICULTURAL, FISH CULTURE PRODUCTION AND DISTRIBUTION IN THE STATE

BY

M. T. PIYIL,
PRINCIPAL,
RTC POT IPO, JUGA.

INTRODUCTION

Prudence of fish seed has been never felt so much as that is present for intensifying fish culture in small water bodies. The advancement of composite fish culture with a phenomenal annual yield of 9 to 10 thousand kg/hectare in ponds and tanks of 5 hectares or less of water spread, has put up a very great stress on the requirements of quality fish seed of the desired fish species, viz. three major carps, Catla, Rohu and Mrigal and the exotic carps, Silver Carp, Grass Carp and Common Carp. Large bodies of water such as big tanks and reservoirs need also these fish species to a considerable extent in order to enhance their fish yields. The gap between the demand and supply as has been projected by the National Commission on Agriculture in its report of 1976 is very large, nearly 12 times the estimated production of fry of 500 million at the end of the 11th plan. This gap has widened still further despite of our best efforts and our advance technology in hatching, breeding, modern hatcheries and improvement in pond management techniques. The real problem is how to assure the production of the seed supply and its distribution to the interior ponds and water bodies. During the last decade or so, major thrust has been in constructing a large number
of small fish seed production units, where
hypophysial technique is being used to produce
the major carp and to some extent common carp
seed. The seed thus produced is distributed to
the neighboring water bodies of Govt./Semi-Govt.
organisations and also to the needs of the
private pisciculturists. However, the policy of
building up of smaller units at almost every
district of the state has not produced desired results.
The main drawbacks of the system can be summarised as:

1) While selecting the location of the fish seed
farms, adequate attention has not been paid to
find the suitability of the climatic factors.
The rainfall is erratic and the weather
remains almost dry and hot in long spells.
The breeding season of the major carp is
short, hardly lasting for two months.
During this season the rainfall may not
be adequate and coupled with the hot
hot and dry spell of the weather, the
breeder may lose their prime condition quickly
resulting in poor brooding and
hatching of eggs.

2) The farms do not have adequate supply of
water and the nurseries may not have any
water to pass the spell of
the period.

3) The funds provided to the farms are not
adequate to meet the heavy expenditure on
maintenance of the ponds as well as the
highly successive number of diesel or
electric water pumps, to ensure proper
supply of water to the ponds. The modern
hatchery systems need a large amount of
capital outlays, in terms of overhead tanks, cooling systems and aeration which are very much essential to supply a continuous water flow through this system to control the rising water temperatures, and to provide adequate aeration during the time of breeding and hatching. Inadequate aeration leads to a large mortality of the seed from eggs to spawn stage.

4) The manager of these farms are mostly drawn from the lower level of supervisory/technical staff. They are either inexperienced and not properly trained. Besides, they have to undertake the breeding of the fish by hypophysisation and rearing of the spawn together with the result that they are unable to cope up with the dual responsibilities, which needs lots of attention and pre-care. In addition, they are burdened with the supply and distribution of the fish seed, management of the farm and various administrative responsibilities.

These are some of the major constraints experienced in assured seed production which in the process results in erratic distribution of the seed. In view of the above it is felt that the present strategy of creating a very large number of small fish seed units for fish breeding and seed rearing, scattered all over the state at every place without relevance to location, adequate manpower and inadequacy of funds would not yield desired results. Instead the emphasis should be laid on creating large units for seed production specially
that of fish spawn and distributing the same to various smaller units for rearing and distribution. The present world bank scheme to create such large units is a step forward in right direction to meet the objective of desired fish seed production. The author suggest a few more improvements in the scheme in order to achieve better production and distribution of fish seed and extension of modern fish cultural practices to private pisciculturist and other actual users.

REGIONAL FISH SEED HATCHERIES FOR SPawning PRODUCTION

The strategy emphasizes the need of establishment of regional fish seed hatcheries for large scale spawn production for distributing the same to various districts and Taluka fish seed rearing units to raise fry and fingerlings for distribution to private pisciculturist and non governmental organisations and for stocking in departmental tanks. The strategy underlies a clear cut demarcation between the functions and objectives of the regional fish seed hatchery and that of small rearing units under its jurisdiction.

The object of the regional fish seed hatchery is to produce mainly spawn of the desired fish species, nearly double the quantity of fry required for piscicultural activities in the region so that the quantity of spawn required for the rearing units can be assured. This will also overall reduce the burden of rearing units from undertaking fish breeding many times under adverse climatic and other conditions. These units than could concentrate on rearing of fry and fingerlings alone to ensure their fish seed distribution schedule. Similarly, the regional fish
seed hatchery will be free from undertaken large scale rearing of fry or fingerlings and their subsequent distribution. The hatchery may require only a small number of fingerlings to replenish their depleted brooder stock utilised during the fish breeding operations and marketing of fish.

In order to achieve the desired objective a fish seed hatchery has to be located at a suitable site, preferably a Kilometer also down below the reservoir from draw down level. This water is comparatively cooler. At Rawatbhata fish farm (Raj.) situated below Rana Pratap Sagar reservoir water is taken at the farm in a similar manner. The water is taken at the farm in a similar manner. The water temperature is almost remain around 25-27°C, before it is pumped to overhead tank used for supply of running water to breeding and hatching cement cisterns to maintain the temperatures around 27-29°C. This not only ensure all the water needed to the farm but also maintains uniform water temperatures suitable for successful breeding and hatching operations. In case the hatchery can not be established near the reservoir than it could possibly be located in an area which receives assured rains or else, tubewell water supply is ensured.

The modern hatcheries as developed by Shirgur and Dwivedi, as well cemented cisterns with inlets and outlets as in Rawatbhata fish farm, needs a continuous flow of water through the system; to some extent cooler water can drawn from the reservoirs or tubewells. Dwivedi has developed
a integrated hatchery system wherein water temperature can be controlled and well aeration is maintained. Thus the technique has removed one of the major constraints i.e. dependances on rains and weather for successful breeding and hatching.

Since this hatchery shall be mainly required to produce very large quantities of spawn, it should have a very large stock of fish brooders. The brooders may be required not only for the breeding operation but also for collection of the pituitary glands if the needs be. This will also ensure the quality of pituitary gland. This way one more constraint in successful induced breeding will be removed. A hatchery of an area of 10 to 12 hectares having nearly 5 hectares of large ponds used for the stock of the brooders as well for marketing purposes. This will be able to maintain five times of the stock of the brooder required to produce 100 millions spawn. One hectare area can be utilised for rearing of fry and fingerlings and also to include indoor or covered hatcheries, overhead tanks etc.

Since this system ensures continuous spawn production they can maintain a regular distribution schedule of the spawn also. Perhaps the requirement of the rearing units may be in advance and on the basis they can chalk out the distribution schedule. Another advantage being in deciding the start of induced breeding operations, since controlled breeding and hatching environment is available. The state departments or fish seed corporation controlling the regional fish seed hatchery will also be able to keep well trained and experienced staff members...
specialising in breeding and hatching techniques. Required amount of large funds for ensuring all arrangements could also be provided since there shall be only a few regional fish seed hatcheries in the state.

**SMALL REARING UNIT FOR DISTRIBUTION AND SUPPLY**

The establishment of small rearing units at district or taluka levels shall depend upon the available water areas neighbouring those units. Thus it would be possible to arrive at required quantity of fry and fingerlings needed for those waters. The function of the rearing unit will be to obtain the required quantity of the spawn of the desired species from the regional fish seed hatcheries and to rear them to fry or fingerlings as the case may be for distribution or stocking. Since the incharge of the unit is assured of the spawn and he could phase out its supply when his ponds are ready, he could be made responsible for the fry or fingerling production. He also cannot put the blame on the vagaries of nature for unsuccessful breeding also. He has ample time and perhaps resources (which are few) for taking care of the rearing of the seed and its phased out distribution and sales.

The technical manpower of the smaller units could be further utilised for the demonstration and extension of fishculture techniques, on the spot advice, assistance and guidance to private pisciculturist for their problems. The farm unit can also undertake demonstration of composite fish culture in the suitable ponds of these units and also take a fish crop from the same, so that he can lure the
Although Karnataka is a maritime state it has also a vast inland fisheries resource. During the year 1979-80 the annual marine fish production was estimated at 1.91 lakh metric tonnes and that of inland fisheries at 0.40 lakh metric tonnes.

The state has a coast line of 300 km with a marine fish exploitable area of about 5000 sq. km, at a maximum operative depth of 40 m available for indigenous crafts and small mechanised boats. This region harbours a very rich marine resource giving 1/6 of the total marine fish landings of the country.

The inland fresh water resource of 4 lakh hectares, comprising of 28 reservoirs, 2700 major tanks, 30000 minor tanks, apart from innumerable small ponds and three major river systems, the Krishna, the Tungabhadra, and the Cauvery with their tributaries having a total length 6000 km, and that of irrigational channels, 3000 km long. Besides, the state has 4000 hectares of brackish water regime with a suitable tidal range and salinity for adopting culture of commercial prawns and other fish species.

The 300 km. coast is covered by two coastal districts, the North Karnataka and the South Karnataka having 16 and 12 fish landing centres, respectively.
During the year 1978-79 and 1979-80, the quantity of fish landed in North Kanara was 0.40 lakhs and 0.46 lakhs metric tonnes against 1.36 lakhs and 1.45 lakhs metric tonnes in South Kanara for the respective years. Thus, it can be seen that fish catch in the South Kanara district is nearly three times than that of the North Kanara district and therefore, it appears to be much more productive than North Kanara. There are 12 landing centres in South Kanara Dist. among which the most important are, Mangalore, Gangolli and Malpe which together contribute 95% of the total fish landed in the hole of the district, similarly, there are 16 fish landing centres in the North Kanara district important ones being Kavoor, Bhatkal, Hanover and Tadri together contributing 50% catch of the district.

Fishing is almost carried out throughout the year. The best season starts soon after monsoon and extends to April or May with the peak in September to December/January. In the recent years the mechanised boats with purse seiners are able to exploit the much wider areas and the catches even during the monsoon months June to August appears to have significantly improved upon, especially along North Kanara coasts.

There are about 28 of commercial fish species occurring along the coast of Karnataka the most important ones are:
1. Sharks
2. Rays and Skates
3. Gill and other Sarilines
4. Mackerels
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Karnataka coast was earlier known as the ‘Mackerel Coast’. However, the present trend indicates that oil sardines together with other sardines almost exceeds the total catch of mackerel and these two fishes together form about 50 to 60% of the total marine landings of the state.

**PRODUCTION AND DISPOSAL:**

The total fish production during the year 1978-79 and 1979-80 was 1.67 lakhs and 1.91 lakhs m. tonnes, respectively out of which 30% was marketed in fresh condition, 30% used for curing, 20% for freezing and 10% for canning the rest was utilised as manure and for reduction products. During the year 1978-79 3860 m. tonnes of fish was exported earning foreign exchange of Rs.1415-24 lakhs and in the year 1979-80 the fish exported was 4435.7 m. tonnes earning Rs.1742.5 lakhs. The major items of export was frozen and canned prawns, frozen lobsters, frozen quality fish, fish meat, dried fish, shark fin and fish meal. Almost 80% of this export consisted of frozen prawns.
At the end of March, 1979, the entire fishing fleet of the Karnataka state stood at 14,901 crafts consisting of 1819 mechanised boats, 12475 non-mechanised boats and 610 coracles, and it is interesting to note that almost all the boats (mechanised and non-mechanised) together are operating in the sea along the coastal districts North Kannur and South Kannur with the exception of a few 1...6 mechanised and 3 non-mechanised boats working in inland waters. Coracles remains the main fishing craft of inland waters.

PURSE SEINEING:

Prior to introduction of purse seineing during 1975-76 the marine fish catches were dependent only on the traditional fishing with choos, plink built boats and pumped nets, but thereafter the pattern of catch changed largely due to the efforts of purse-seiners operations.

Mackerel and Sardine schools are mostly observed along the coast between 20 and 50 km of shore. The Mampani operations were ship based and could fish in limited areas and the availability of schools of these fishes near to the coasts, the choos erratic and the fishing season lasting after 3-4 months only. Now, the fishing season extends almost 8 months in year, and the fishing has become consistent regular. The import species, mackerel and oil sardine together account for almost 50-60% of the total landings of the state and their fluctuations can make a very great difference in the total catch landing. Other species also caught in appreciable
quantities by purse seineing are :-(1) Cat fishes
2) Tuna 3) scadida, 4) horse mackerel and 5) anchovies. The Govt. induced the fisherman by providing financial assistance by way of subsidy to venture into purse seineing in the State. As a result, by 1976-77 the Purse-seine units rose from 30 to 52 in numbers and by 1978-79 to about 100. Purse seineing has found to be commercially viable involving sometimes very huge catches.

BRACKISH WATER FISH FARMING

A brackish water fish farm centre was opened in Karwar in North Kanara. Commercial farming in the back water of Kali river estuary was taken up, the species taken up for brackish water fish farming in the North Kanara were : 1. Pampus indicus 2. P. monodon 3. Heteropneustus dianoni 4. Mullota 5. Euphilus auritensis 6. Miscellaneous. with that in South Kanara were Village shirna, malleta Chances and nagilaps, besides prawns.

A large brackish water fish farm of more than 50 ha. is being started near Karwar with central assistance for demonstration and supply of seed to private fish culturists.

KARNATAKA FISHERIES DEVELOPMENT CORPORATION

In the year 1971 the Fisheries Development Corporation was set up at Mangalore in South Kanara district. The Govt. of Karnataka has transferred all the commercial units of fisheries department like ice plants, freezing plants, cold storage, boat building-yards valued at about Rs. 11 millions, to the Corporation.
The important activities of Corporation are as follows:
1. Commercial fishing
2. Ice production and sale of ice for fishing industry
3. Fish processing and export
4. Freezing of fish and marketing in inland areas
5. Hiring space on rental bases for freezing and storage to private processing.
6. Diversification of fish products for marketing.

**INLAND FISHERIES**

The state has about 4 lakhs hectares of inland water resources. Out of the above resources, only 25% of the are may be said to have been brought under fish culture at present.

**FISH SEED PRODUCTION**

The state requires about 400 million fish seed to take up fish culture in a systematic manner. The main difficulty in meeting this demand is the lack of sufficient fish seed on account of which it has not been possible to bring all the water sheets under fish culture. In the earlier year fish seed was being imported from West Bengal, reared and stocked in suitable water sheets.

In order to overcome this problem, the fish seed farms are being constructed. At present there are 42 fish farms in all the 19 districts of the state with a total land area of 252.65 ha. and that of water spread area of 35.63 ha. In addition, there are 101 taluk level nurseries to rear the fish spawn received from the production centres.

The total fish seed produced during 1979-80 was major carps 371.80 lakhs and Common carp 716.62 lakhs.
Fisheries Development:

The state having a total stretch of about 600 Kms long riverine system is a very important source for inland fisheries. With a view to develop this resource, survey work was conducted side by side with systematic stocking of fish seed in suitable river portions, and now it appears to have improved inland fisheries in these rivers.

Reservoir Fisheries Development:

Intensive development of reservoir fisheries has been initiated in the five reservoirs of the state, viz. Vindhya Sagar, Gayatri, Naga, Shanti Sagar and Boranav Kandla with a total water spread area of 16000 ha. This is expected to raise fish production. During 1979-80 itself, Shanti Sagar and Naga reservoirs have a total fish production of 30 kg and 25 kg/ha/year which is substantially much higher than the abysmally low rate of production from the other Indian reservoirs which is 10-12 kg/ha/year.

Applied Nutrition Programme:

Under this scheme during the period of operation 20% of the total fish catches, will be given free of cost to pregnant and nursing women, pre-school and school going children and the remaining fish will be sold to the public and the revenue will be credited to the village Panchayats by which both village panchayats and villagers shall benefit.
FISH FARMERS DEVELOPMENT AGENCY

This scheme was implemented by the Govt. during the year 1973 and the agency in Mysore district started functioning from December, 1973. The main intention is to co-ordinate various agencies connected with fish culture giving modern techniques of fish farming and to enable fish farmers to improve their water sheets through bank loans, etc. Till now the agency has trained 100 persons, 70 of whom have been allotted with water sheets. Inputs like fish food and feed will be given on loan cum subsidy basis. During 1977-78 136 village Panchayats and individuals have been benefited by this scheme.

ACKNOWLEDGEMENT

The author is thankful to Shri M.J. Patil for his encouragement and necessary suggestions and to the Directorate of Fisheries Karnataka State for making available data and permission for publication of the text. Last but not the least the author expresses his thanks to Shri G.A. Naqvi, Scientist 5-0 for his guidance in preparation of the text.
PADDY CUM FISH PRODUCTION IN MANIPUR

By

R.K. ISOMCHA
(Manipur Teacher)

INTRODUCTION

In the past, Paddy cum fish culture was practiced in a few localised areas in the state of Manipur. Only recently, it has been taken up on scientific basis in an organized manner and on an extensive scale. The total potential of paddy pans in the state is about 1.79 lakh hectares against the country's 57.5 lakh ha. paddy lands. The water spread area to be used for fish culture is very limited in this state. It is, therefore, necessary to exploit more and more paddy fields under the paddy cum fish yield programme.

CLASS OF INTEGRATED CULTURE

The fish culture in paddy fields categorically undertaken in these ways, viz. as a secondary crop, as a supplementary crop along with the paddy and thirdly as continuous fish culture during and after paddy cultivation.

The paddy fields with sufficient supply of water from irrigation channel may be used to raise the fish as a secondary crop during the intervening period from harvest to next plantation of paddy.

In raising fish along with paddy, duration of cultivation prolongs according to the variety of paddy to be grown and the prevailing temperatures. It is necessary for the ripening of paddy to drain out the water twice during the cultivation to harvest, hence the deeper tanks are excavated adjacent to the paddy fields to shelter the growing fish there for some time.

A continuous fish culture in paddy fields is undertaken where the perennial types of water bodies are lying adjacent to the field. The stocking tanks are constructed to facilitate the paddy field with assured water supply and to stock the fish produced from these paddy fields into the stocking tanks.
PREPARATION OF PADDY FIELDS FOR FISH CULTURE

All types of paddy fields are not suitable for the fish culture. Only the fields with proper drainage system and assured water supply are used for the purpose. To prevent over flooding and excess drainage small ponds are constructed in the centre. The fields are connected with a main channel, 5 m. wide and 1.5 m. deep. Smaller channels around the field are also constructed to redistribute the water from main channel.

The fish varieties which could withstand a fairly high turbidity, a moderate temperature range, a shallow water depth and low oxygen content are used for culture. Common carp fulfills the above requirements. Tilapia is also used for culture. Manuring of these paddy fields is done in a similar manner as is done for a normal paddy field and the same fertilizer combinations in similar proportions are used. Only the stocking ponds, smaller ponds and feeding channels are manured differentially, that is with compost at the rate of 5,000 to 10,000 kg/ha in order to produce enough plankton crop for fish food. A mild artificial feeding may be resorted to supplement the natural food.

CONCLUDING REMARKS

Integration of fish farming with paddy is resorted only to suit the requirement of the paddy to be produced. Since this technique of aquaculture is subsidiary to the main paddy crops the income received from fish culture is not only supplementary to the paddy production but is also complementary since it increases the paddy yield by 15%. It also helps the farmer in other ways. The fish in the paddy fields helps in checking the larval and insect population and an
excessive growth of weeds since it devours them as food.

The fish excreta and residual material serve to fertilize the paddy fields and by keeping considerable water depths in paddy fields for fish culture, the rodents are unable to invade the farm.

ACKNOWLEDGEMENT

The author wishes to extend his gratitude to Shri. M.R. Patil, Principal RTC For IPO, Agra for his encouragement and to Shri. S.S.H. Razvi, Scientist for his guidance and suggestions in preparation of the above text.
EXTENSION, THE NEED OF THE DAY
FOR UPLIFTING YOUR INCOME

by
K. -
Mr. Instruc-
NRC for ITM

Extension is based on certain principles
envisaged in the saying:
"What we hear we remember,
What we see we believe,
What we'll see we learn"

Thus extension is a continuous learning by doing.

Extension is education of the people at
their doors or places of work. It is a two way
channel:
1. Taking the scientific developments
from lab to farm!
2. Taking the field problems to the lab-
   oratory finding solutions.

NEED OF PHYSICAL EXTENSION:
The credit of rapid agricultural development
and bringing of Green Revolution in India is self
sufficiency in food gains to extension workers next to
the Agricultural Scientists. They have prepared
useful literature and materials for the farmers
benefits in countrywide. They have held demonstrations
at various levels, organised Kisan Mela, Farmer's
Day, Exhibitions etc. and also radio talks thus giving
a massive boost of extension to reap the fruits of
research laboratories everywhere. But in the field of
fisheries this facility was limited, that is why the
production of fish could not increase in the
manner as agricultural crops. The fishermen are
illiterate, the fish farmers live in remote far off places away from research centres and Dist. Fisheries offices thus their education remained unheard with at various levels. With the establishment of extension in fisheries some spheres showed tremendous progress. The per hectare fish yield is of 8000 kg. opened the eyes of pond owners and they realised the hidden treasures in their dirty ponds, aerobic waters and untapped resources. The demand for fish and importance of fisheries departments was felt by the planners of our country on one side and the fisher folk on the other. A liaison between them was necessary and that could be accomplished by fisheries extension officers.

**HISTORY OF FISHERIES EXTENSION IN INDIA**

In India the idea of extension was started in the early fifties when National Extension Service was started for Agricultural Development. It was followed by extension services in industry on small/cottage scale. Extension work in fisheries was started very late. There had been no suitable govt. machinery to undertake the work and educate the fishermen and fish cultivators during the first and second "FIVE YEAR PLANS". The overwhelming need of fisheries extension was felt all and the Government of India, in response to recommendations of the state ministers conference held in December, 1958 established Central Fisheries Extension Units at Allahabad, Calcutta, Guwahati, Raipur, Bhopal, Hyderabad, Bangalore, Mysore, Karnal, and Patna during the year.
1957 to 58. Technical cooperation mission (TCM) of U.S.A. also gave financial assistance and equipments for the purpose and one expert was sent to give advice to Govt. of India. The following work was undertaken by these extension units:

1) Participation in exhibitions at state, district, block levels
2) Organising film shows in villages
3) Importing fish farming training to state department and CD/NSS block personal
4) Demonstration of fish brooding and fish culture techniques at state fish farms/ private fish farms and production of quality fish seed.
5) Technical guidance to private fish culturists.

The Central Board of Fisheries, however, decided that fisheries extension work was a state subject and thus it was decided to hand over the Central Fisheries Extension Units to state Fisheries Departments in 1960.

Only three states namely Tamil Nadu and Karnataka agreed to take over the units along with equipments and staff. The remaining seven Fisheries Extension Units were dismantled during January, 1967.

Some state Govts. created their own agencies at state H.Q. or C.D. Blocks and appointed extension officers in some selected Blocks.
ROLE OF EXTENSION WORKERS:

i) An extension worker sells ideas not material, he puts scientific ideas before the pisciculturists and fishermen.

ii) He keeps liaison between fish culturists and fisheries Deptt. and Research Centres

iii) He advances modern techniques of fish culture in the field

iv) He gives up-to-date scientific knowledge to the people

v) He teaches people what they want and gives solutions to their problems

vi) He takes fishery science to the people.

FISHCULTURE EXTENSION METHODS

The Extension methods or techniques employed in fisheries field are the same as those of agriculture extension, but the choice of methods or methods in any particular sphere rests with extension worker. They change with fish species, people to be dealt with, if the people are illiterate the methods should be simple, impressive and easy to follow. The methods may be:

a) For mass media (Mass Media):

   i) Visual - visual - shows - films

   ii) Radio - talks/TV programmes

   iii) Public address system

b) For groups (Group Media):

   i) Exhibitions

   ii) Distribution of leaflets

   iii) Leaders training
c. For individuals (Individuals only):

1. Visits to pastures
2. Descriptions of pastures
3. Fish seed supply
4. Study tours
5. Exchange of views with other farmers
KARNATAKA'S FIRST FISHERWOMEN CO-OPERATIVE SOCIETY,

ST MALPE

By

M. RANGANATH
(Karnataka Trained)

INTRODUCTION

By tradition, fisherwomen are engaged in the fishing trade. They sell fish, mend or weave nets, dry or cure the fish and thus carry out almost every chore once their menfolk bring fish to the shore. In fact, they form the backbone of the Fishing Industry but they are almost neglected and totally ignored in the co-operative field. Although, a few of them have enrolled in the fishery co-operative societies they are easily side tracked in this men dominated societies having practically no say in the running of these societies. In the sphere of management their men are supreme. In order to erase this imbalance between the sexes, to restore their confidence in their own selves and to give them their rightful place in the co-operative sector, it was necessary to organise fisheries society exclusively for fisherwomen. The Fisheries Department of Karnataka state took a lead in the matter and helped to establish the first fisherwomen co-operative society in the state in February, 1977 at Malpe, one of the biggest fishing centres of the Karnataka state.

General guidelines provides for establishing the co-operative societies are:

1) Open membership to all the fisherwomen of the area.
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ii) Proportional contribution to the capital
iii) To look after the welfare of fisherwomen
iv) To render assistance to the members at critical juncture, with the following aims and objectives:

1) To promote self help, thrift and mutual aid among members
2) To borrow an advance loan to the members for their needs
3) Purchase and sales of fishing requisites
4) Providing transport facilities to the members or others for marketing their fish catch on hire basis.
5) To improve fishing industry for the benefit of members.

In this way the Govt. was determined to ensure the success of the co-operative society in particular and to make an impact on the fishing industry by over all improvements, in general.

The area of operation of the society members was confined to nine places viz. Malpe, Thoppe, Kola, Kalmady, Thalapady, Kidiyor, Kadakar, Podukara and Udayawara. These villages are within a radius of 20 Kms. covering about 3000 to 3500 fisherwomen engaged in the fish marketing.

MEMBERSHIP, SHARE CAPITAL, LOANS AND RESERVE:

The membership of the society increased from 278 in 1978-79 to 375 in 1980-81, the share capital rising to Rs. 28,480/-.
The fish is mostly sold by the fisherwomen, they carry fish loads on their heads to the market and dispose it off through retail sale. In interior localities, they do not find any suitable transport nor they can afford to pay for quick transport. The quality of the fish goes down and so the price due to increased time lag in catching and selling. Since fisherwomen are unable to carry the fish load to market quickly, the same has to be sold cheaply. The society therefore, got a loan cum subsidy of Rs.51,300/- from the National Co-operative Development Corporation through the fisheries department in 1979-80 for the purchase of a pick-up van on the terms that Rs.26,600/- was payable by the society in ten years with an annual interest rate of 9.5%. The remaining amount of Rs.26,700/- was to be borne by the government as subsidy. By April 1981, society was able to keep aside Rs.22,990/- after meeting all expenditures, for repayment of its loan for purchase of the pick-up van to N.C.D.C., out of the amount realised towards hire charges of the van. Thus society achieved in clearing 80% of its loan within a span of two years only.

The society has taken up the purchase and sale of the salt required for fish preservation. This has earned a gross profit of Rs.54,286/-60 during the last three years. In addition to this, the fisherwomen society is running the sales of asares at controlled rates among the members. The society has an amount of Rs.56,225/- as deposits in various financial institutions as on 30-6-1981. Society has also
encouraged its members to open individual saving bank accounts and it is heartening to note that deposits totalling Rs.14,044/- were lying in 188 accounts.

The managing committee consists of nine members of which two are nominated, one from fisheries departments and the other from co-operative department the rest seven are elected by the members. The establishment of the society to run its office and other activities has the paid staff comprising of one secretary, one sales assistant and one driver.

CONCLUDING REMARKS

The fisherwomen co-operative society Malpe was organised exclusively for women members and their contribution and joint ventures are commendable. Ever since its inception the society has been working viable and profitably and proved that fisherwomen have a very high degree of co-operative spirit and they can run a co-operative society effectively. Encouraged by the success of fisherwomen co-operative Society, Malpe, a number of fisherwomen societies are being organised in Karnataka state. It is equally possible to organise fisherwomen co-operative societies in other parts of the country also, so as to enable them to take active part in building the welfare of the fisherfolks without interfering the men in their affairs. The fact that autonomous organisations like, National Co-operative Development Corporation (N.C.D.C.), Small Farmers Development Agency (S.F.D.A.) etc. are welcoming forward to render necessary assistance in building fisherwomen co-operative societies is a tribute to the success of the first fisherwomen co-operative society at Malpe of Karnataka State.
ACKNOWLEDGEMENT

The author is thankful to Shri M.R. Patil, Principal, RTC for IFO, Agro for going through the writeup and making necessary corrections and to Shri S.S.H. Rasvi, Scientist S-O for valuable suggestions and help in preparation of the article. The author also wishes to express his gratitude to Shri P. Prabhuram, Asstt. Director of Fisheries, Mangalore for providing the data and granting permission for the publication.
OBSErvATIONS ON NATURAL BREEDING OF SCHIZOTHORAX ESOCINUS (HM.)

By

R.K. MOIZ AND SULAIM HANAN
(Kashmir Trainees)

INTRODUCTION

Schizothorax esocinus is an indigenous sub tropical fish occurring in cold water lakes, reservoirs and snow fed streams of Kashmir. There are five species of genus, Schizothorax which are common, but Schizothorax esocinus has commercial value due to its large size and faster growth. In six years, it grows to 60 cms., attaining a weight of about 10 kgs.

Before the introduction of trouts it was the only commercial fish in the Kashmir waters and there after also it has retained its prime place in the commercial fisheries of Kashmir because of its low market price of Rs. 7 to 11 per kg. and of the preference of the local people. The trouts grow very slow as compared to Schizothorax and the price of Rs. 25/- to 30/- per kg. is beyond the reach of common Kashmiris.

BREEDING OF SCHIZOTHORAX ESOCINUS

This fish has been observed to breed during the period from March to May when temperature ranges in between 13 and 17°C. During this season the males can be easily identified from females, the latter by their bulging abdomen and the former by their oozing milt when a slight pressure is applied on their bellies and also by the roughness of their pectoral fins. The
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Fecundity has been observed to vary in between 15,000 and 20,000 per kg body weight of the fish.

**Breeding Habitat and Habitat**

Both the males and females, during the season migrate down stream, selecting the shallow quieter waters with submerged weeds for their breeding. The male chases female and the sex play starts. Spawning occurs during the mid night hours or just before the sun rise. Breeding seems to be largely influenced by the lunar periodicity, a few days before and after the full moon day.

For the first time, artificial fecundation of the fish was undertaken during March/April, 1980. The brooders were caught from Talbel nullah and stocked at Harwan hatchery. The fishes weight in between 500 and 800 gms. Stripping was undertaken, which resulted in 90-95% fertilisation. Fertilised eggs were kept in wooden trays and hatching was undertaken in a tray house, in a similar manner as that for trout.

**Characteristics of Eggs, Hatching and Fry**

The fertilized eggs are spherical, translucent, demersal, adhesive and creamy yellow in colour. The size ranges from 2.5 to 3.5 mm. The eggs get swollen and hard within 15 to 20 minutes after fertilization. The incubation period last from fifteen to ten days within the water temperature range from 18°C to 12°C. The hatchlings are 7.0 to 8.0 mm long having a large yolk sac extending half the body length, the fin fold is prominent on dorsal side and mouth primitive and folded.
Within 7 to 10 days of hatching the yolk sac is completely absorbed and early fry appears, having a body length of 9 to 10 mm. At this stage mouth opening becomes prominent and pectoral and caudal fin rudiments appear. The fry then feeds on the ammocetes and an artificial food of rice bran and oil-cake given in equal proportion. Soyabean seed powder mixed in small quantities improves the quality of artificial food.

Acknowledgement

The authors have pleasure to extend their thanks and gratitude to Shri M.R.Patil, Principal, RTC for IPO, Agre for encouragement and going through the manuscript and Shri K.C.Malhotra, Dr. Instructor and Dr. U.K.Mohoshwari, Scientist S-D for necessary suggestions and help in the preparation of the paper.
OBSERVATIONS ON REMARKABLE GROWTH OF FRY OF LAKE ROHITTL (HUM.)

By

U.K. MISHRA & K.K. JAIN
(Scientist, R & D for IFFCO, JNAR)

INTRODUCTION

The factors suitable for growth of fish fry are, availability of ample amount of food organisms, suitability of water regime particularly its temperature, oxygen content and almost absence of harmful bacterial and parasitic populations. Large nurseries also provide enough space for free movement of the fry and may result in higher growth. Therefore, utilisation of bigger nurseries, taking adequate care in their preparations, periodic checking for health and growth of fry and monitoring the water quality for its temperature, oxygen and carbon dioxide, goes a long way to ensure faster growth of fry. These measures have given phenomenal success in the rearing of the Lake Rohit Messenger fry for a period of 20 days, at Government Fish Seed Farm, Backal, Haryana during the seed production demonstration programs undertaken by this centre for one of the three groups of X1Vth (1980-81) batch during July - August, 1980.
MATERIAL AND METHOD

Seven nurseries, each of 0.03 ha., were used for rearing of L. rohita spawn produced by induced breeding. All these nurseries were completely drained and irrigated. Lime treatment was given @ 250 Kg/ha. on the basis of soil pH. The nurseries were filled up with tubewell water having high carbonate and bicarbonate contents. Nuture in the form of raw cow dung only was applied @ 15,000 kg/ha. in a periodic manner. The first heavy dose administered prior a week earlier to the stocking of the ponds with spawn. Only L. rohita spawn was produced and all the nurseries were stocked @ 10 million spawn/ha. The water quality was tested from time to time with respect to temperature, pH, dissolved oxygen, carbon dioxide, alkalinity etc. prior and during the period of rearing at an interval of two days. Similarly, plankton assessment was carried out to check the quality and quantity of food organisms available periodically. Supplementary feed was given and periodic checks on the health and growth of fish fry was recorded and tubewell water was supplied to maintain the water level at 3 feet as well to reduce the water temperatures, increase in oxygen content and to reduce the ill effects of metabolites including that of carbon dioxide contents. Since insect population remained very low, control measures to eradicate them was felt unnecessary. Netting operation during sampling of the fry or for giving them exercises did not reveal the presence of either competitors or predators.
All the nurseries were stocked uniformly @ 10 million spawn/ha. In all 21 lakhs L. rohita spawn was stocked. During the period of growth of 20 days, the spawn stocked at 7-8 mm, size grew to 63-65 mm size in one of the nurseries of which periodic sampling results are given in the following table:

Table: Showing growth of L. rohita fry

<table>
<thead>
<tr>
<th>Period of growth</th>
<th>Growth in mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the 6th day</td>
<td>13-20</td>
</tr>
<tr>
<td>On the 9th day</td>
<td>30-32</td>
</tr>
<tr>
<td>On the 12th day</td>
<td>40-41</td>
</tr>
<tr>
<td>On the 15th day</td>
<td>48-50</td>
</tr>
<tr>
<td>On the 18th day</td>
<td>55-57</td>
</tr>
<tr>
<td>On the 20th day</td>
<td>63-65</td>
</tr>
</tbody>
</table>

The net harvest resulted in 11.55 lakhs of fry of average growth of 40 mm, together in all the seven nurseries giving 55% of survival in general. The maximum size of 63-65 mm was attained in one of the nurseries, wherein percentage of survival had been dropped down to 45% during the period of 20 days nearing. During the same period, the temperature of water in all the seven nurseries ranged between 28 to 34°C although the air temperature shot up to 36°C. The dissolved oxygen ranged from 8-10 ppm, of CO₂ from 0 to 6 ppm, and pH from 7.6 to 8.4, alkalinity from 90 - 120 ppm. The plankton was predominantly zooplankton (about 80%) consisting mainly of Cladocera and Copepods (about 80% of zooplankton) and the quantity of plankton measured ranged between
1.5 and 2.0 ml. per 50 litre of water screened. Supplementary feeding was resorted in 1:2 ratio of dry weight for the first five days, then 1:3 ratio in the next 5 days, and thereafter at 1:4 ratio. The feed consisted of rice bran and mustard oil cake in 1:1 ratio. Only finely powdered feed used for feeding.

**DISCUSSION**

It can be seen that maximum growth attained in one of the nurseries of 63-65 mm. with 45% survival rate has been quite unusual. Coupled with the facts that there was an overall good growth in other nurseries too, growing to an average size of 48 mm. within a span of 20 days only. The spawn has almost reached early fingerling size within this short period. The success of these experiments are due to various combined factors as listed in the preamble. The fish food organisms were found in abundance and maintained at a high level uniformly due to phased manuring and probably due to decomposition of unused food of rice bran and altocake, the zooplankton species were amongst the smallest of L. white fry and was due to the inoculation of their culture from time to time, the water conditions remained favourable and within narrow limits of change, particularly due to additions of tubewell water whenever such need was felt.

The somewhat acidic nature of the soil was rectified by lime application. It was possible to neutralise the effect of organic carbon imposed earlier in the pond, completely and also to destroy the harmful
bacterial and parasitic populations. Long drying of the pond bottoms and raking it before liming application ensured better soil reaction and killing of the harmful biota.

It is therefore, concluded that with careful planning and management it is possible to succeed to get a good sustained growth of fry and also a high rate of their survival if steps are correctly taken on the lines discussed in the text.

ACKNOWLEDGMENT

We are grateful to Shri M.R. Patil, Principal, RTC for IFO, Agra for critically going through the manuscript, making corrections and guidance.
Traditional fish culture has been practiced in Jaunpur district of Eastern Uttar Pradesh since a long time. However, the impact of the present technological development of intensive and composite fish culture was not felt for want of technical guidance and financial support as well as transfer of technology programmes. The co-ordination between the various Govt./non Govt. departments was also lacking and there was a dearth of trained fish farmers. In order to defuse the above constraints and to generate enough interest in the local population, Fish Farmers Development Agency was established in Jaunpur district in May, 1976.

The main objectives of the agency is to introduce and popularise the improved techniques of fish culture and fish seed production, through demonstrations, arranging suitable short term training programmes and various extension techniques and also to step up the fish production by leasing out suitable tanks on long term basis to trained fish farmers and securing for them adequate financial assistance through banks and agency itself.

Before establishment of the agency, tanks were leased out for fish culture for a period ranging
from 1 to 3 years. This policy had failed in securing maximum productions from these water areas due to the fact that necessary inputs for development of these tanks would have meant more expenses and comparatively lesser incomes in the limited period of the lease and an entrepreneur would come forward for such development. It was, therefore, thought of to arrange for long duration leases say for 10 years so that this long ownership of the tanks would bestow on the owner a sense of possessiveness. Since he is sure to reap the benefits of his troubles and money during the long period lease, sufficient incentive is provided to him for undertaking intensive developmental measures.

LEASE OF TANKS AND RISK INSURANCE

During the first three year of its establishment, the agency has been able to arrange the lease for long periods for 298 tanks covering an area 195.35 hectares against their target of 100 hectares. The details of year-wise lease of tanks is given in Table I.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Tanks</th>
<th>Area (Hect.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976-77</td>
<td>78</td>
<td>58.87</td>
</tr>
<tr>
<td>1977-78</td>
<td>126</td>
<td>89.97</td>
</tr>
<tr>
<td>1978-79</td>
<td>94</td>
<td>46.51</td>
</tr>
<tr>
<td>Total</td>
<td>298</td>
<td>195.35</td>
</tr>
</tbody>
</table>
During the period from 1976-79, the agency submitted proposals for 115 tanks covering an area of 111.70 hectares for obtaining loans, assistance amounting to Rs.6.57 lakhs for undertaking improvement measures as given in Table 2:

**TABLE 2: YEARWISE NUMBER OF TANKS WITH AREA AND LOAN ASSISTANCE.**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of tanks proposed for improvement</th>
<th>Area (Hect.)</th>
<th>Loan proposed in Rs.(Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976-77</td>
<td>21</td>
<td>19.61</td>
<td>0.91</td>
</tr>
<tr>
<td>1977-78</td>
<td>83</td>
<td>84.66</td>
<td>5.46</td>
</tr>
<tr>
<td>1978-79</td>
<td>11</td>
<td>7.43</td>
<td>0.50</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>111.70</td>
<td>6.67</td>
</tr>
</tbody>
</table>

However, by the end of 1978-79, amount of Rs.5.65 lakhs only was sanctioned by the bank to meet the improvement cost of 92 tanks covering an area of 83.98 hectares. Out of the above amount sanctioned, Rs.4.24 lakhs will be given as loan to the individual fish farmers and Rs.1.41 lakhs as subsidy by the agency. The financial limit for extending loan to individual farmers has been fixed at Rs.5000/- by the bank for which two guarantors will be needed.

**PROVISION OF INPUTS FOR PISCICULTURE**

In the first year of lease, agency provides loan and subsidy for meeting the cost of fish seed, feed and fertilizer etc. of Rs.1500/- per hectare in improved tanks.
The trained fish farmers are being provided with a handy field kit of size 25x30x25 cm containing essential equipments such as plankton net, thermometer, pH paper, turbidity meter, formalin, scale and stationary. They are thoroughly familiarised with these instruments, their uses, maintenance and applications.

**FISH CULTURE IN AGENCY DATA**

Adequate supply of quality fish seed has been recognized as a main constraint for undertaking intensive fish cultural developments and so was the case in the district of Jaunpur also. Before the advent of the agency the maximum utilization and supply of fingerlings never exceeded the figure of 2.0 lakhs. The impact of the agency was felt during the first year of its establishment and during the same year 1976-77, 3.66 lakhs of fingerlings of major carps were distributed for stocking. In the next year 1977-78 the number almost doubled and 6.48 lakhs fingerlings were procured and stocked in 220 tanks occupying a total area of 107.95 hectares. Since then the fingerlings demand is shooting up and besides major carps, exotic carps also are in great demand. The fish culturists now have become conscious of the need of multispecies culture of compatible fast growing fishes for maximising production.

In order to evaluate the success of multispecies culture in the various tanks leased by the agency, a survey of 20 tanks selected at random was undertaken. This has revealed that the fish production in these tanks will remain somewhere in between 2000 and 3000 kg. per hectare per annum.
This is against the target of 1500 kg. per hectare per annum set by the agency. This success appears quite phenomenal, enticing to the new enterpreneurs.

**SEED PRODUCTION PROGRAMME:**

In order to ensure availability of quality seed to the pisciculturist in the agency area, the agency itself has undertaken fish seed production at Ujjain fish farm. The Government of Uttar Pradesh handed over this farm to the agency along with a large brooder stock of Indian and exotic corps. Induced breeding was undertaken of these species, during the year 1978-79 and a total of 70.50 lakhs spawn was produced, besides 39.03 lakhs of spawn collected from river Somati. The spawn has been reared to the fingerlings stage and later on distributed in the agency tanks.

**EXTENSION AND TRAINING:**

In order to educate the people in general fish culture and to make them realise the importance of fish as a highly nutritious food and also the impact of modern technology of fish culture and its economic viability and to lure them to this profitable vocation, a massive extension programme was launched by this agency which included a display of cinema, slides in cinema halls, exhibitions arranged in Kisan Molas and public places, preparation and distribution of popular articles, personal and mass contact in rural and urban areas, radio talks and demonstrations in the
private and Government tanks.

A 15 days training was also arranged at Gujrat fish farm in a number of small batches and about 82 fish farmers have undergone to this training by March, 1979.

ACKNOWLEDGEMENT

The authors have please to express their thanks to Shri M.R. Patil, Principal, RTC for IPF, for critically going through the manuscript and to Dr. K.K. Jain, Scientist S-O, for assistance.
हरियाणा बाजार ने प्रदेश में केवल तीन स्थान विभाग विभाग एन्क्लेव की है। जिसी शेष दो रेतक (हरियाणा) में बारे 1978 में दोनों पर राष्ट्र अन्वय ने 50% एवं 50% के अनुसार के हुए की गई। जिसके अनुसार तत्कालीन समय के अनुसार वीडियो जरूर आयोजित सकनी है अनुसार का उपयोग करते हुए स्थान राजन के लिए स्थान के लोगों के 10 वर्ष के एक टेक्निकल जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए तत्कालीन वीडियो राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई।

हालांकि यह देश उपयोग के बारे समय के नाम
अनुसार और जरूर तत्कालीन जो रोजगार के लिए और अनुसार उपयोग के नाम अर्जित कर देने के लिए तत्कालीन वीडियो राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई। अतः यह अनुसार वीडियो जरूर तत्कालीन समय राजन के लिए मोटर एक्ट की गई।
मर्यादा नियोजन अनुरोध है। बुन मिट की भूली तस्करी के पत्रों की अवधि पर निर्देश उपलब्ध है। अपने तस्करी की वर्ष के पत्र जमा करने के पत्र रद्द करने के लिए बुन की भूली नहीं की जाती है। अगर वह नहीं तो उपलब्ध पत्र द्वारा निर्देशन किया जाता है। इसी प्रकार का इम्पुट की भूली शीर्षे पत्रों के नए की गई वर्ष के पत्र बाकी रहे हैं तो ही कारक निर्देश के बुन शास्त्री जी का जन्म है।

तकालीन के पुराने एवं इम्पुट के रूप में ही वर्ष पत्रकलंक का विषय तकनीक नहीं। पर्यावरण के शील है।

तकनीक 300-01। - समान के पुराने हेल पत्रकलंक के अनुसार एवं बुन -

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तकनीक 300-02। - इम्पुट के रूप में पत्रकलंक के अनुसार पत्रकलंक -

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उपरोक्त तालिका नं. 3 एवं 4 से हिन्दी होता है इस क्षेत्र 1978-79 से 1981-82 तक 79-87 तक संग्रहण प्रणालियों उपरोक्त संक्षेपों से उपलब्ध की गई। इन संग्रहणों का उपभोक्ता रेखा कला के 129 सालों में (150 पेस्टेंट) प्रवर्तित किया गया।
एकेदी योजना के अन्तर्गत यह 1978-79 से 1981-82 तक 140 मक्ख घाटों के मद्देन्दु वैज्ञानिक अहंकार वाले मक्ख घाट के विचय में शामिल दिया गया (सालाब 3 व 3-5 ) मक्ख घाट के विभाग मुख्यों के , विज्ञान, सशीलता प्रधान, एवं प्रशासनी व्यवस्था शाम-सचर वे प्रशासन रिक्षा बना है जिसे क्षेत्रीय पौधार्थ प्रशासन बना - प्रशासन दृष्टि से रहता है।

तालिका 20 व 5 - एकेदी योजना के अन्तर्गत प्रशासन वस्तुकाशि का विचय

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मक्ख बिल्डिंग बिल्डिंग एकेदी, मक्ख रिश्ता रोजगार के अभिकल्प तथ्यों के निर्देशमित वस्तुकाशि 1978-79 से 1981-82 तक 185.35 टन मात्री का उपयोग दिया गया। (तालिका 20 व 6) इस योजना के अन्तर्गत कुल 184 अन्य छापाकार उपक्रम दृष्टि (सालाब 3 व 3-7)

तालिका 20 व 6 - पर्यावरण मक्ख उपयोग का विचय

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वन तरह उपरोक्त पिघलने के लाभ हेतु हैं। यद्यपि प्रयास विहीन हैं, रोड्स व्यापर तथा उपाय करने के लिए 1978-79 के तेजस 1981-82 तक आयोजित हैं। 8 टन के 80 टन तक की सालों के लिए 3 टन के 30 टन तक पुरुषों को नेवार दे, यानी दर कुछ उपाय बढ़ावा गया है।

आधार - प्रयास

लेखक श्री एन॰ ए॰ पार्टन (प्रस्ताव) का पहलू आधार है। जिन्होंने काफी अनुमान शीख गए हैं वे आप लेखक उपरोक्त पेपर की बहुतों के निषेधार्मिक क्षेत्र - विभिन्न प्रयोग प्रकाशित किये, एक ड्राफ्ट यथार्थ क्षेत्र, (चाँदीकुफ) जिसके अपने दस्तावेज दे नुके इस पेपर के तत्वों में प्रेरित है।
OBSERVATIONS ON THE WORKING OF THE VERTICAL EGG AND HATCHED HATCHERY - AN ANSWER TO INCREASED FISH SEED PRODUCTION

By
S.S.H.Ranvi & A.J.Hitra,
(Scientists,RTC for IPO,GR)

INTRODUCTION

In a conventional hapa carp fish eggs take as long as 22-26 hrs. for hatching and another 48-72 hrs. for hatchlings to become spawn before they could be released in nursery ponds for rearing. During the span of these 70-98 hrs. the hapa fixed in small or bigger ponds with direct openness to sky, the eggs or hatchlings have to face weather wise changes in the temperature, the dissolved oxygen, CO₂ content of water. Dry weather and no rains may further worsen the situation, leading on most occasions, to total mortality. In order to avoid this wasteful expenditure of human attention and money and failure in getting the required fish seed, several attempts have been made to improve upon the system like fixing of hapa in flowing waters innovations of glass jar and other hatcheries etc. During the last decade a spate of bucket hatcheries made of plastic or galvanised iron sheets or aluminium have been introduced by Thirpur, Diva etc and they have been found much more efficient than the conventional hapa system. The success of the system depend upon a continuous flow of water through it, which prevents sudden and wide thermal changes and continually replenish the oxygen content and remove away the toxic metabolites.
including carbon dioxide. Additionally the composite system provided of cooling, air blowing etc. into the system as developed by Dwivedi, ensures a remarkable control over the brooding, hatching and rearing environment.

During the seed production cum intensive training programme undertaken by one group of 14-15 trainees during the period of 37 days from 3-7-81 to 9-6-81 at the Rajasthan Govt. Fish Seed Farm at Rawthbasta under the guidance of the authors, it was possible to undertake large scale brooding, hatching and rearing.

**MATERIALS AND METHODS**

Rawthbasta Fish Farm has cemented cisterns in series into which, water drawn from the adjacent reservoir of Rana Pratap Sagar by an open channel is lifted by pump into the overhead tank of 4500 L. capacity and then to these cisterns by means of galvanised pipe. Each cement cistern is an independent unit for receiving water from the top from above and to discharge water from the draining outlet near the bottom. This outlet is connected by another pipe which is moveable and by rotating it from vertical to horizontal plane water levels in the cement cisterns could be adjusted. The cisterns are covered by self-supporting roofing of asbestos on the iron frame erected for prevention of direct heating. A pipeline from overhead tank is also taken across the ceiling of the above frame and is interspersed with showering arrangements so that shower could be arranged during the brooding or hatching activity. These cisterns are used for both brooding as well hatching operations.
In addition to the above breeding and hatching system available at the farm, 4 LDPE hatchery bucket units designed by Dr. S.N. Dwivedi, Director, CIFE, Bombay was also taken to this farm and kept under the roof of the adjacent laboratory building. The water was taken from the overhead tank through a tap. A steady flow running of water at the 3-5 lts. per minute in each of the hatchery bucket was maintained by regulatory valves. Two circular plastic pools of 4 x 3 feet with water draining outlet and pipe were used for receiving the hatchings from the bucket hatchery. Aeration by compressed air was maintained in the plastic pool.

RESULTS

During the period of production cum training at the farm, induced breeding by hypophysiation technique of major carps as Catla, Rohu and Mrigal was undertaken on a large scale. The breeders and major share of pituitary glands were made available by the State Fisheries Deptt. In all 109.98 lakhs of eggs were produced, out of which 34.7 lakhs were used in the LDPE bucket hatchery system giving rise to 21.94 lakhs of spawn and 155.28 lakhs eggs used in concrete hatcheries (with only outer hatching hapa and no inner hatching hapa) giving rise to 99.28 lakhs spawn.

In both the hatchery systems continuous water flow was maintained since, the hatching cisterns had comparative wide open surface and the water level being maintained by regulating water intake and height of outlet pipe a further attempt was made.
Periodic observations on egg development
water temperatures, oxygen and carbon dioxide content
during the period of hatching and hatching rearing
were made in order to monitor the suitability of water
regime. The temperatures ranged from 21 to 29°C,
O₂ from 5.5 to 14.5 ppm and CO₂ from nil to 3 ppm
during the entire period of observations. The
climate remained mostly dry and hot with occasional
showers of local air. The result of induced brooding
had been also encouraging, averaging 85-95% fertiliation. Result of spawn recovery of 63.9% in
LOPE bucket hatcheries, are comparably efficient
and encouraging. Both systems have worked
satisfactorily under the prevailing conditions of
water regime and high percentage of fertiliation.
The effect of dry and hot weather spells have not
affected the environment of egg or hatching since
direct heating was prevented by reeds as cover above.
The most pertinent fact was however, the inflowing
water running into the system which remained cool
and well oxygenated. The temperature range of
25-29°C was ideally suited both for incubation of
eggs and rearing of hatching and was possible because
the canal water at the intake point from the
reservoir had a temperature around 23°C and changed
2-5 km only even a distance of about 1.5 km when it is drawn to the fish farm. This indicates that under controlled and suitable water regimes, spawnings, hatching and spawn recovery could lead to better results ensuring production.

The LDPP hatchery system no doubt has other advantages too:

1. It has reduced the incubation period from 10-18 in case of cement cisterns to that of 13-14 hours.
2. It can have better control over the temperature and oxygen content if cooling and pressurised air could be blown into. This however, needs larger inputs of equipment and trained manpower.
3. It can be easily transported and fitted with in a short period.

ACKNOWLEDGEMENT

The authors have the pleasure to express their thanks to the Director, CIFE, Bombay, Shri M.R. Patil, Principal, MTC for IFO, Agra and Shri R.S. Bharwaj, Dy. Director of Fisheries, Rejhestan for providing infra structural facilities and guidance from time to time.
FISHERIES EXTENSION ACTIVITIES IN GANJAM DISTRICT

By
S.C. RODDA & P.K. PANDA
(Orissa Trainees)

Ganjam, the south-eastern district of Orissa state, is situated along Karamandal coast with about 100 kms of coast line. This district has rich fishery potential in all the three resources of marine, brackish and inland waters. The development in the past has not been upto the mark especially with regard to inland fish culture. Although, there had been considerable break through in induced breeding by hypophysation technique and intensive and composite fish farming, the transfer of this technology needed a good extension network. In view of the above, extension wing of the fisheries directorate was organised during the year 1978-79.

The fishery extension activities in the Ganjam district are related scheme wise, technology based schemes and service based schemes.

EXTENSION ACTIVITY IN SERVICE BASED SCHEME

Fish Farmers Development Agency (FFDA) in the Ganjam district with head-quarters at Berhampur was established in the year 1976 with the following objectives:

i) Survey of suitable water area and leasing them on long term basis to enterprising pisciculturist.

ii) To arrange institutional assistance through bank finance and subsidy from the department.
iii) Supply of inputs
iv) Training for pisciculture
v) Extension and demonstration

Survey and development of tanks and assistance from Banks

Under the scheme the tank development programme was undertaken in 1) private tanks and
2) Gram panchayat tanks.

In the former category 698 beneficiaries were identified, majority having old tanks and a few for excavation of new tanks, leading up to the total water area coverage of 355.72 ha. out of this 659 projects, covering an area of 253.12 ha. were selected for improvement and necessary proposals were submitted to the bank for loan. Out of which 225 projects not sanctioned for about Rs.8.56 lakh during 1980-81 work was completed by the March, 1981 in 135 tanks.

In case of grampanchayat tanks 1485 tanks were approved for 10 yrs. lease and out of which 54 tanks were leased to individuals and Fishery Co-operative societies, and 150 cases of loans got sanctioned from Banks.

FISH PRODUCTION AND TRAINING

Technical guidance by the agency was provided to pisciculturists of 264 tanks during the year 1980-81. The production of the fish in these tanks ranged from 1100 to 4200 kg/ha/yr. was possible by using four species viz. Catla, Rohu, Mriga and Common Carp in composite fish farming. In all 600 persons were trained in pisciculture and fish seed was provided to each of them per their requirements.
INTEGRATED RURAL DEVELOPMENT (IRD)

Integrated Rural Development programme was introduced in 29 blocks of the district. Under the scheme, loan applications are forwarded to the bank by D.O. against the loan amount sanctioned by the bank. Subsidy of 25% to fish farmers, that of 33.33% to marginal fish farmers and 50% in case of Cooperative Society for inputs and renovation of the funds is provided by the department. An amount of Rs.2.20 lakhs was disbursed to 425 persons during the year 1979-80 and provision of Rs.16.7 lakhs was made under the scheme during the year 1980-81.

INTEGRATED TRIBAL DEVELOPMENT (I.T.D.)

This scheme was started in the tribal area of this district. The subsidy in ranging from 50% to 100% to tribal fish farmers. Under the scheme the departments grants Rs.25,000 towards 50% of the cost of inputs for a 0.8 ha. tank and Rs.12,000/- towards full costs for excavation of the ponds and purchase of inputs to the tribal fish farmer. During the year 1979-80 4 tribals were given Rs.25,000 as subsidy for excavation of the tanks of total water area of 1.8 ha.

APPLIED NUTRITION PROGRAMME (ANP)

As an extension activity to fishery deptt., has taken fishery work to propagate and popularise fish consumption as food for nutrition in 2 NFP blocks. The aim of the scheme is orientation in favour of better balanced diet, production of food which will yield more balanced diet and promoting consumption of fish which is rich in protein and
vitamins. Fish is raised locally and supplied for feeding to selected members of Ahli casts.

**Economic Rehabilitation to Rural Poor (EERP)**

Govt. has decided to help 5 lakh poorest of the poor families through this scheme. The programme also envisages to help such families through pisciculture. In each village 10 such families shall be identified whose annual income does not exceed Rs.1000/- per annum. The derelict and semi-derelict tanks of the Gram Panchayats and arranged to give them on 10 years lease, 0.20 ha. water area is lease to each family. Govt. has sanctioned Rs.5000/- as full grant for renovation in the existing tanks for inputs. It is estimated that by adopting this measure each beneficiary will get Rs.1500/- or more per annum.

Under this scheme during the year 1980-81, 135 beneficiaries in 15 blocks have been identified and arrangement have been made to lease 27.00 ha. of water areas to them. This scheme is also helping the fishermen to catch fish from reservoirs. For this purpose seven poor fishermen together forms a unit in order to receive Rs.10,000/- towards the cost of boat and nets. So far, 126 beneficiaries have been selected for this purpose.

**Extension Activity Through Technology Based Scheme**

1) **Demonstration of Intensive Fish Production (DIFF)**

Technology of composite fish culture has been a major breakthrough in intensifying fish productivity. This scheme envisages transfer of technology to the ponds. Demonstrations are arranged and inputs are supplied free of cost to beneficiaries. During the
Years 1979-80 and 1980-81 2.0 and 8.0 ha. of water areas having 8 and 23 beneficiaries were selected for this purpose. The annual fish yield per hectare had ranged between 1800 and 2500 kg. The sampling and harvesting is demonstrated to the villagers and it is heartening to note that the number of fish farmer is increasing by and large in this district.

4) PRODUCTION OF QUALITY SPAWN

The district needs about 23 million of fry every year. To cope up with such demand the departments of fisheries has raised brood fish in departmental farms and adopted induced breeding techniques to produce quality seed (spawn) of Indian Major carps and exotic carps. During the years 1979-80 and 1980-81, 127 and 133 lakhs of spawn were produced. A glass fish hatchery of 20 jr capacity was used in Digspanhadi fish farm. Besides this Grampanchayat nurseries are used. A number of private fish seed farms are located in this district. They are selling quality fry to fish farmers.

EXTENSION IN MARINE AND BRACKISH WATER FISH FARMING

The department has undertaken survey of the brackishwater resources and possible brackishwater fish farming areas. So far 64.4 ha. suitable areas have been found and arrangements are being made to lease them to private pisciculturists by availing institutional finance. The fishermen population survey of 4 coastal blocks in this district has been now completed and under the scheme, assistance to Traditional Marine Fishermen (TMF) is provided in the form of loan to needy fishermen for purchase of boats and nets. This
scheme aims in improving the socio-economic conditions of marine fishermen. There are in all twelve marine fisheries co-operative societies operating in the district.

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A BRIEF NOTE ON FISHING EXTENSION OF A TRIBAL TALUK IN MYSORE DIST.

By

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(Karnataka Trainee)

Heggal Doysankote taluk of Mysore Dist. (Karnataka) is having a community development block which comprises of 52 village panchayats a number of youth clubs, Mahila and Bal Mandalas and about 80 co-operative societies. This is a tribal area having a total population of 25,000, 70% of which are tribals and scheduled castes. This taluk is famous for rhodes operations catching of wild elephants this taluk is rich in fisheries resources in the form of 3 reservoirs, Kabini Dam, Nugu Dam, and Tiraka, ten major tanks and a number of minor tanks. The stretch of river Kabini extends nearly to 50 kms through this taluk.

In order to develop the fisheries resource of this taluk and also to attract the tribals and backward people to lucrative profession of pisciculture. The Department of fisheries of Karnataka decided to establish fisheries extension unit at block headquarters. The author was appointed as first Fisheries Extension Officer in 1972 and was associated with the activity of the unit along with other officers.

A brief account of the fisheries extension activity and the achievement is as below:

1) Village seminars were held for demonstration of fish culture techniques and also to explain how the fish culture can earn good incomes.
ii) All the village Panchayat meetings were regularly attended. The board members were convinced of the economic viability of fish culture and made the Panchayat to allocate funds for undertaking fish culture in their tanks. Advise and guidance was rendered from time to time.

iii) Meetings of the youth club were attended and pep talks were given to attract the young men to take up the profession of fish farming.

iv) Almost every Fisheries cooperative society was visited a number of times in order to provide guidance and assistance in their fish culture activity as well as in the functioning of the societies. Some of the societies which were not working satisfactorily started functioning well.

v) Under the applied nutrition programme fish was freely supplied to pregnant women and school children.

In addition to above the following departmental activity was undertaken in the block.

1. Establishment of Fish Seed Farm:

   One fish seed farm was established for the seed production. The seed was sold to Panchayats and also to private fish farmers, and supplied freely to tribals and also stocked in the departmental tanks. It is very heartening to note one private pisciculturist in the block has started making many good incomes from his tanks and more than 50% village panchayats are earning good revenues.

2. Stocking and Leasing of Departmental Tanks:

   All the departmental tanks were stocked with quality fish seed thereby raising the fish production. These tanks were auctioned every year to fisheries cooperative societies or private persons, thereby earning good revenues. The river stretches were also licensed.
induced breeding was undertaken at one departmental tank and 13 lakh of fish fry was produced during the year 1978-79. The departmental revenue increased from Rs. 500/per annum to Rs. 24000 during the year 78-79.

3. Financial Assistance and Technical Guidance:

Department arranged loans and subsidy on nylon yarn to fish farmers in order to encourage them. Even concessional bank loans were arranged. Twelve fishermen boys were selected for undergoing training under the scheme of fish farmers development agency (F.P.D.A.). They were latter on provided with long term leased tanks, free supply of fish seed and technical guidance and assistance as and when needed. Under small farmers development Agency (S.F.D.A) scheme two fishermen were selected and nylon nets and coracles were provided on 50% loan cum subsidy basis at 3% interest rate.

Thus it can be seen that fisheries extension activity at Heggada-Devan Kote taluk has introduced fish culture as a profession in an economically and socially backward people. Many people have become conscious of the rewarding nature of fish culture. A number of youth clubs are profitably ploughing the harvest and even the taluka development board has come forward to take up fish culture by leasing out two departmental tanks and earning from them very good revenues. Even the private fish culturists, where there was none now there are many, amongst which 4 are prominent.

However the efforts carried in this direction are not totally adequate and further strengthening of the extension activity is very much needed by publicity, and demonstrations, training and short term training programmes for the entrepreneurs are very much lacking. The lease of tanks also is at present for a period of
of one to three years. It is suggested that long time lease, say for a period of 10 years is very much likely whereby the owners of the lease will come forward and spend more for tank improvement and other measures and thereby enhance their production many times.

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EXTENSION ACTIVITY

RTC Exhibits Fisheries Activity at Kisan Mela Exhibition arranged at Central Institute for Research on Goats, Makhdoom, Mathura.

Production Oriented Field Work Training

A view of cisterns for breeding and hatching at Govt. Fish Farm, Rawatbhata, (Raj.)
Group A trainees of 14th batch with instructors Shri K. C. Malhotra and Dr. U. K. Meheshwari demonstrates the success of modern nursery management techniques by reaping a good harvest. Dr. S. N. Dwivedi, Director CIFE examines the fry growth. Dr. V. O. Singh, Dy. Commissioner (Fisheries), Ministry of Agriculture, Govt. of India, Shri D. V. Khanna, Dy. Director Fisheries, Haryana, Shri M. R. Paik, Principal, RTC for IFO, Agra, with trainees and instructors are looking with interest.