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Farmer participatory fish disease surveillance and monitoring: Use of PRA tools

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ABSTRACT

At C.I.F.A. Kaüsalyaganga, Bhubaneswar, Orissa, Participatory Rapid Appraisal (PRA) approach and methods have been tried as part of the Institution-Village Linkage Programme (IVLP) to help the aquaculture farmers to do their own analysis on fish disease epidemiology, surveillance and monitoring, and make their own needs and priorities known to scientists. It was revealed that PRA satisfies the acute decision making needs of fish disease epidemiology, surveillance and monitoring. Participatory methods of "visualization", such as mapping, modelling, scoring matrices, linkages and causal diagramming are powerful, popular, valid and reliable when well facilitated and performed. PRA is a low cost diagnostic method, which can be very well applied to fish health surveillance and monitoring.

Key words: Diagnostic tools, fish disease epidemiology, participatory rapid appraisal

INTRODUCTION

Participatory Rapid Appraisal (PRA) is an approach in which emphasis is placed on empowering local people to assume an active role analyzing problems and drawing up plans with outsiders mainly acting as "facilitators". PRA methods are successful within the scope of programmes, that support participatory development co-operation, e.g. participatory technology development, farmer-experimenter network etc. (Townsley 1993).

NCAER, Govt. of India Report 1993 concluded that "It is perhaps conceivable that an appreciable increase in the number of PRA villages can provide a data set for generation of State/Regional level parameters with relatively smaller sample that normally required in the sample survey approach. Participatory mapping, modelling, seasonal calenders, trends and changes have also been facilitated to enable the farmers to conduct their own analysis. The rate of innovation has been rapid and much that takes place has probably remained unreported".

Scope

In Farming System Research (FSR), the interactions between the different types of components of the sub-systems must be identified and understood if the system as a whole is to be properly understood and managed (Lightfoot *et al.* 1990; Deomampo 1995). In the context of aquatic animal health, the system management approach implies an understanding of both environmental and non-environmental factors. This approach also puts disease control with in the hands of the farmers encouraging self reliance, sustainability and developing of farm level and appropriate solutions. One problem is the difficulty of making contact with large numbers of small scale farmers with existing manpower and resources. Aquaculture researchers are increasingly realizing the benefits of identifying research needs based on "System Approach" and through talking to farmers.

The multi billion aquaculture industry is based on a narrow scientific base and lack of basic knowledge on host pathogen / husbandry / environment interaction in almost all tropical aquaculture systems. Greater attention is needed in research to the on-farm situation and the environmental conditions which affect the fish health.

Knowledge on fish diseases in restricted to a very few species, less than 2% of the total number known to science (Kinne 1984). Virtually no information exists for the vast majority of aquatic organisms. Only when basic work on identification, biology, host specification, pathology and geographical distribution of pathogens occurring in the region have been accomplished, can meaningful lists of certifiable pathogens be compiled and reliable diagnostic techniques developed. Economic losses caused by fish pathogens are difficult to quantify, but are increasingly recognized to be substantial (Shariff 1995).

Another constraint presently encountered is that health records such as mortality and morbidity figures are often poorly kept by farmers. This makes assessment of mortality/morbidity pattern during disease out-break difficult. There is an urgent need for conducting fish health surveillance programme involving aquafarmers and using PRA tools. PRA can play an important role in networking and information sharing, working closely with grass-root groups via. extension agents who live in rural communities, speak the local languages and share the local concerns (Mascarenhas and Hildalgo 1992; Lightfoot and Noble 1993).

PRA approaches and methods have been used for appraisal, analysis and research in many subject areas. They include agroecosystem, fisheries, the environment, health and nutrition (Joseph 1992). Public health assessment and monitoring with application including disease problem ranking, identifying major illness, health care providers and costs (Welbourn 1992).

MATERIALS AND METHODS

At C.I.F.A., Kausalyaganga, Bhubaneswar PRA approach and methods have been tried as a part of the Institution Village Linkage Programme (IVLP) on Technology Assessment and Refinement to help the aquaculture farmers to do their own analysis on fish disease epidemiology, surveillance and monitoring and make their own needs and priorities known to scientists.

Project area

The project area covering 1104 families from 8 villages around CIFA was considered. PRA exercises were undertaken involving 15 villagers (male and females) as key informants from each village through a much open ended, semi-structured interviewing by a multi-disciplinary team.

The sequence followed was that of introducing the topics using examples on types of studies that could be made. The group worked on a specific topic and conducted the field exercises. Presentation of farmers observations were made at the common gathering. Multidisciplinary team while carrying out the exercise made efforts to carry out "triangulation" of the information locally.

A continuous flow of linked activities were conducted from agroecosystem analysis through systems diagnosis. The sequences were four fold:

(a) Commitment of participants increased, making further action move in a spontaneous and sustainable manner.

(b) Triangulate and reveal errors and omissions in earlier presentation.

(c) Interacting cumulatively with different activities.

Information which could be obtained from farmers were the following:

1. What are the endemic diseases of fish?
2. How do you take preventive measures?
3. How do you ensure availability of medicine?
4. What are the causes of pond water quality deterioration?
5. What are the causes of water shortage?
6. Inventory of villages Indigenous Technical Knowledge

Fish farmers in consultation with extension workers were an essential source of information. They provide information on occurrence of (a) Easily recognized specific diseases (e.g. white spot, red spot, tail rot, fin rot, dropsy etc.) (b) One easily recognized syndromes (e.g. cutaneous ulcers, skeletal deformities) and (c) One poorly defined syndromes (e.g. sub-optimal growth rates, non-specific mortalities, new diseases). Laboratory diagnosis were required for accurate identification and characterization of diseases in the latter two categories (b & c). For each disease, information indicating its relative importance as a demand-led production constraint could be accumulated over time from above sources and through close consultation with farmers representatives, industry bodies and epidemiologist. Diseases were ranked using economic, environmental and sociological criteria. Frequency ranking of fish diseases, categorization of diseases according to spread, target and economic loss etc. were made. Diagnostic and research efforts were demand-led and focused on diseases causing major production constraints.

From the farmers information it was difficult to calculate the damage, but it is manifested by decrease in nourishment and market qualities. This damage was revealed as a result of special investigation and it was not always possible to express it in quantitative indices.

PRA tools

1. Time line, historical profile and time trend:

Time line and historical profiles were used as simple means of visualizing historical events and major perceived changes.

2. Participatory resources mapping:

Participatory resources map led to planning transect works. The transect in turn led to identification and discussion of problems and opportunities, led to listing of ranking options or "best bets" and leads to peoples' decisions about the properties of the problem.

3. Seasonal calenders:

These are compiled on the basis of interviews and group discussion using locally available material e.g. sticks, stones, seeds etc. to visualize and create the calender together.

4. Matrix ranking/scoring:

This was used to elicit farmers criteria of value of a class of items which leads into discussion of preferences and action.

Relatively complex interactions and relationships between seasonal cycles (e.g. rainfall, water table, temperature etc.) and their impact on fishery activities were depicted in simple graphics arranged one under the other. In this way connection between climate, frequency of diseases affecting the fishes, cropping sequences, demand and supply of the commodity etc. could be visualized. Interrelationship between all the parameters were used in the diagnosis and monitoring of the diseases. The statements made in interviews with available statistical sources were compared and any discrepancies discovered with in the community were discussed until a consensus emerges.

Table 1. Timeline

1600-1700	- Establishment of villages around CIFA
1937	- Flood Havoc
1940	- Famine
1941	- Flood Havoc
1950	- Drought
1951	- Cholera epidemic
1955	- Flood Havoc
1958	- Kanas Canal Work started
1960	- Livestock Aid Centres
1961	- Induced breeding of fish started
1968	- Canal irrigation started
1968	- Vaccination of children
1970	- Dhauli minor canal work started
1977	- FARTC (Presently CIFA) inaugurated
1978	- IDRC Project on Pisciculture
1979	- Low intensity flood
1980	- Composite fish culture started
1980	- Composite fish culture started
1981	- Fish seed rearing
1982	- High flood
1983	- Improved fish farming and co-operative farming on lease ponds
1985	- Diesel and kerosine
1987	- CIFA inaugurated by Late P.M. Indira Gandhi
1989	- EUS was first reported
1990	- Lime application against EUS
1991	- Lime + turmeric application against EUS
1992	- CIFAX was released
1992-1997	- Fish disease investigation as a thrust area

RESULTS AND DISCUSSION

Small scale aquaculture has a long history in India. However, the drive to produce more fish and shellfish to meet the growing demand has led the fish farmers to intensify their operations. In many cases, the complex balances between fish, shellfish, and the environment is not well understood.

In the case study, the contributions made by participatory aquaculturists elucidated the needs

Table 2. Village transect of natural resource in project area.

Resource System	Canal	Canal bank	Up land	Residential area	Medium land	Pond	Low land	River
Soil type			Sandy loam		Loam		Clay	
Water source			Rainfall, handpumps, well		Irrigation, Rainfall, Handpump, wells	Spring		
Crops			Rainfed, Paddy, Groundnut, Mung	Paddy, Mustard	Paddy, Groundnuts, Mung, Kulthi		Paddy	
Vegetables			Brinjal, Ladyfinger, pointed gourd	Tomato, Cauliflower, Cabbage, Green, leafy Vegetables	Brinjal Tomato, Ladyfinger, Cabbage			
Forage		Grass	Grass	Grass	Grass	Water hyacinth, Azolla		
Tree		Coconut, Arecanut, Neem, Banyan	Tamarind, Jackfruit, Mango, Papaya, Banana	Guava, Banana	Mango Tamarind, Jackfruit		Eucalyptus	
Animals	Catfish, weedfish, prawn, snail, molluscs, crabs	Cattle, buffaloe, goat, sheep	Cattle, buffaloe, goat sheep	Cattle, buffabloe, goat, sheep	Cattle, buffaloe, goat, sheep	Duck, Indian Major Carps, Exotic Carps, Prawn, Catfish, Snall, Molluscs, Crabs	Duck	Riverine fishes

Table 3. Criteria and ranking for freshwater fish species.

Sl. No.	Fish species	Eating quality	Availability	Importance	Market demand	Nutritive value	Income fetching	Rank	Relative ranking
1	Catla	4	3	4	5	1	5	22	II
2	Rohi	5	3	4	5	1	5	23	I
3	Mrigal	5	2	4	2	1	3	21	III
4	Silver carp	3	1	1	3	1	3	12	IX
5	Grass carp	3	2	2	3	1	2	13	VIII
6	Common carp	2	2	1	2	1	2	10	XI
7	Murrel	1	1	1	1	1	1	6	XII
8	Prawn	4	2	4	4	1	4	19	IV
9	Clarias	3	2	3	3	3	3	17	V
10	Heteropn eustis	1	3	3	2	3	2	14	VII
11	Anabas	3	3	2	2	3	2	15	VI
12	Weed fish	1	3	1	1	4	1	11	X

1 = Least score, 5 = Highest score

based on their experience with farmer designed and managed trials.

Agroecosystem transect

Agroecosystem transect of the project area showed four land types. All the four land types are potential sources of fish. Of these, unused homestead ditch, homestead pond, nallahs, medium and low lands are used for fish culture (Time line and transect has been presented in Tables 1 and 2).

Pond for aquaculture

Farmers have used both the under-used and community water bodies for freshwater aquaculture. Major problems during pond culture are as follows: (a) Disease incidence is more in ponds infested with weeds (both floating and submerged) (b) Predatory fish like magur (Clarias), singhi (Heteropneustis), balia (Walago) etc. are the major cause of spawn, fry and fingerling losses. Constraints for eradication of predatory fish are (i) complete dewatering is not possible because of canal water supply during summer season (ii) Unavailability and cost factors of chemicals (c) Shading effect of perennial trees such as coconut blocking direct sunlight. However, the farmers trim the branches of the trees like mango, guava, jack fruit, etc. to accommodate sunlight. (d) Some farmers use lime at the rate of 100 kg ha^{-1} (0.010 kg m^2). The recommended practices for the region is 250 kg ha^{-1} (0.25 kg m^2). (e) Further research needs to be undertaken to address some of the problems reported by farmers such as unnotified mortality of spawn, fry and fingerling.

Fish seed quality

The main problems of the farmer is to get quality seed at the door step. The seeds of riverine collection have slow growth rate and prone to diseases. Most of the fish farmers stressed on the supply of healthy seed stock from reliable hatchery and some quality control measure by the government. Most of the aquaculture farmers had the knowledge of acclimatization of fries before releasing into the ponds to avoid stress. Most of the farmers having seasonal ponds practice fry and fingerlings raising to get some income from sales. However, most common difficulties reported by farmers are inadequate supply of fingerlings for commercial culture.

Stocking and harvesting

Farmers practice composite fish culture. June, July and August are peak months of stocking. They do multiple harvesting and do most of the harvest during December, January and February. Matrix ranking was carried out to know the criteria of preference of fish by the villagers. Rohu (Labeo) topped the list and the least preferred were murrels (Table 3).

Pond management

Farmers follow low input aquaculture technologies in the water bodies. They hardly feed the fish except rice bran and cowdung, occasionally. Farmers have some knowledge of pond fertilization but they were unable to relate it to the mortalities due to eutrophication.

Epidemiology of fish diseases

Farmers reported that the death of fish occurs more frequently at the early stages of their development, primarily in the 1st week and moths after hatching. Such losses proceeds imperceptibly and revealed only through detailed investigation. The death of fish of commercial sizes, caused by parasites is rarely seen.

Farmers perceptions regarding factors responsible for pond fish losses are presented in Fig 1. In all four stages of fish growth it has been observed that aetiological agents and management factors are equally responsible for pond fish losses.

Table 4. Ranking of diseases at different stages of fish growth.

Fry	Rank	Fingerlings	Rank	Juveniles	Rank	Relative Ranking (Total of Rank Score)	
Pseudomonad tail rot/fin rot	I	Icthyopthirius	I	EUS	I	EUS	14
Trichodiniasis	II	Myxobacterial	II	Argulus	II	Argulus	16
Myxobacterial	III	EUS	III	Dropsy	III	Dropsy	17
Icthyopthirius	IV	Myxosporidial	IV	Frunculosis	IV	Furunculosis	23
Myxosporidial	V	Trichodiniasis	V	Myxosporidial	V	Myxosporidial	14
Argulus	VII	Argulus	VII	Icthyopthirius	VI	Icthyopthirius	11
Dropsy	VIII	Pseudomonad	VIII	Saprolegnia	VIII	Saprolegnia	25
Furunculosis	IX	Saprolegnia	IX	Myxobacterial	IX	Myxobacterial	14
Eus	X	Furunculosis	X	Pseudomonad tail rot/fin rot	X	Pseudomonad	[illegible]

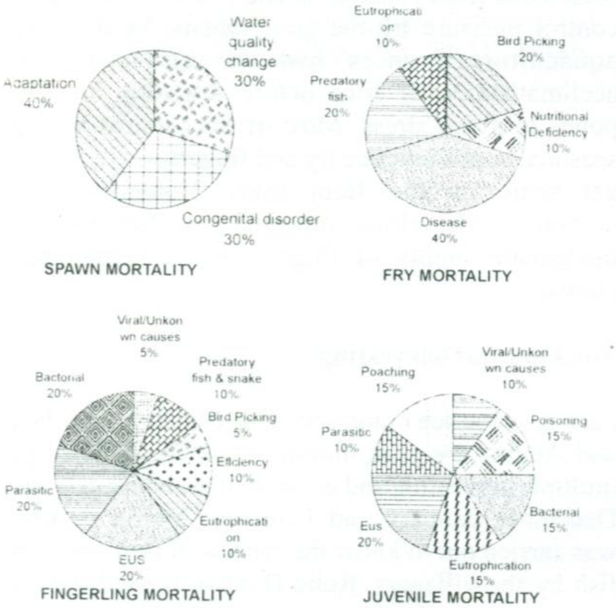

Fig.1. Factors responsible for pond fish losses

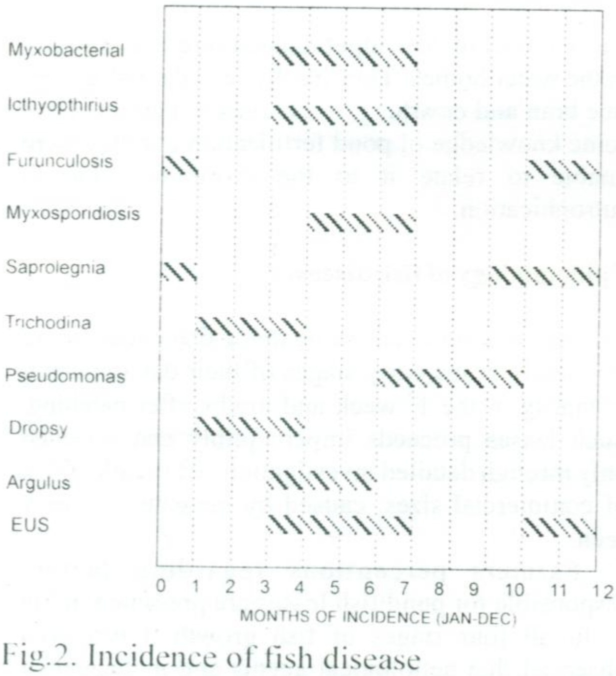

Fig.2. Incidence of fish disease

A fish disease calender for the project area was prepared using information from the farmers (Fig.2). Disease incidence in fish in the project area was maximum in the month of April followed by May, June and July. After a lag period in August to September the third slot of disease incidence occurs in November and December. January, February and March have less incidences of diseases(Fig 3). EUS in fish was a major concern for the farmers (Fig. 4). Most of the fish species and age groups were affected by Icthyopphirius, EUS, Myxobacteria, Myxosporidia, Argulus, Dropsy etc. (Table 4, Fig 2). Farmers revealed that for disease diagnosis and medication they consulted CIFA. Common medicines they were advised are CIFAX, Lime+Turmeric, Salt, Formalin, Copper sulphate, Potassium permanganate, Malathaion, etc. against commonly occurring diseases.

Indigenous Technology Knowledge

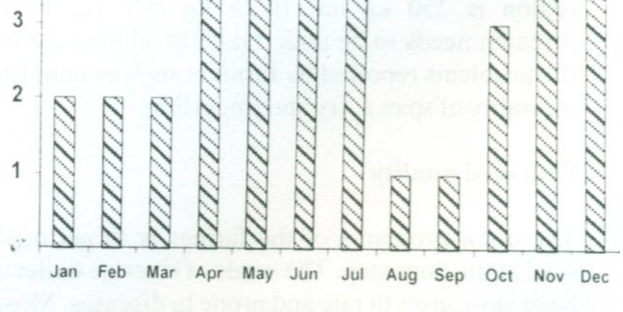

Fig. 3. Seasonality of Fish Disease

Information gathered from the farmers were as follows :

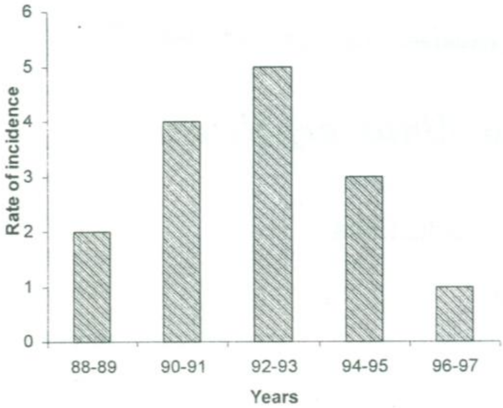

Fig. 4. E. U. S. Incidence in villages around cifa farm

(a) For preventing EUS, farmers cut banana plants and put into the fish ponds,

(b) Farmers have hardly seen the fish (Notopteros spp.) suffering from any disease or parasites including EUS.

Farmers felt that disease has been and will continue to be a major constraint to the development of aquaculture. They also witnessed high loss of revenue due to disease and health related problems. So the importance of epidemiology/epizootiology in providing solutions to aquaculture health problems can not be overlooked. Fish health diagnosticians, researchers and extensionists should be familiar with on-farm-conditions, diagnostics and therapy, so that the informed decisions on control and treatment can be made. There is an urgent need on further research on epizootiology and epidemiology of aquatic animal diseases to develop a comprehensive list and data base on notifiable diseases.

1. This survey is expected to provide a feedback to diagnosticians for making improvements in technology and diseases surveillance.
2. The areas of need at regional/national level.
3. Identification of appropriate research need and refinement of methods to conduct fish health research programme.
4. Ranking of diseases/syndrome causing key production constraints in aquaculture.

The preliminary nature of this work permits few definite conclusions. However, it is now clear that indigenous knowledge must be the foundation of experimentation in aquatic health management. Indigenous knowledge provides a common language for researchers and farmers. There is no doubt that farmers participation must be advanced from information gathering to farmers skill building in experimentation and decision making. However, time series data on more villages/fish pockets are needed to be developed for more and better indicators.

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REFERENCES

Deomampo NR 1995 Farming systems, marketing and trade for sustainable aquaculture. In: Report of the ADB/NACA Regional Study and Workshop on Aquaculture Sustainability and Environment. NACA, Bangkok, Thailand.

Joseph S 1992 Participatory rural appraisal in identifying major illness, health care providers and costs. RRA Notes No 16 pp. 53-56.

Kinne O 1984 Introduction to volume IX, Part 1: Pisces 1-16 pp. In: O. Kinne (ed.) Diseases of Marine Animals, Vol IV, 1, Biologische Anstalt Helgoland, Hamburg, 541 p.

Lightfoot C, Singh VP, Paris T, Mishra P and Salman A (compilers). 1990 Training Resource Book for Farming Systems Diagnosis, International Rice Research Institute, Los Banos, Laguna, Philippines and International Centre for Living Aquatic Resource Management, Manila, Philippines.

Lightfoot C and Noble R 1993 A participatory experiemnt in sustainable aquaculture, J. Farming Sys. Res. Ext. 4: 11-34.

Mascarenhas J and Hildalgo R 1992 Experience of a participatory Rural Appraisal Exercise, Silang, Cavite, Philippines, International Institute for Rural Reconstruction.

Shariff M 1995 Fish health: An odyssey through the Asia-Pacific Region, Syrahan Inaugural, University of Perthanian, Malaysia Serdang, 25 p.

Townsley P 1993 Rapid Appraisal of Coastal Communities, BOPP-FAO, Madras, India.

Welbourn A 1991 RRA and the analysis of difference. RRA Notes 14, pp. 14023.