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Community-Based Aquaculture in India- Strengths, Weaknesses, Opportunities and Threats

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Abstract

Community-based aquaculture founded on the principles of common interest groups working together regardless of sex and age has been an effective tool for implementing scientific aquaculture programs in India. Water bodies that do not interest villagers are targeted for use to avoid communal problems. Farmers who share common interests are identified and organized and a team leader chosen among them. An inventory of resources using the SWOT analysis is made. A participatory approach to identify major problems, socioeconomic and biophysical constraints is used and appropriate interventions are planned. This process is then evaluated and the results of the impact assessment are provided to research/extension/policy planners for setting directions and priorities for further improvement. The potential for expanding community aquaculture for generating self-employment and improving food security of the rural poor as well as improving the environmental conditions of the villages in India can be further tapped.

Introduction

About 80% of India's population live in villages and 90% of its rural population depend on agriculture and allied activities for their livelihood. During the last few decades, a number of programs have been implemented in rural India for the socioeconomic upliftment of the population. However despite these efforts, the objectives of socioeconomic development, employment generation and improvement of food security have not been achieved. Various quarters now feel that the single important reason for this failure has been the lack of organizational capacity among the poor. Poverty in general and ignorance in particular stand as two main barriers in the development of such capacities even on a cooperative basis. In many cases, the aid provided to individuals for implementation of development programmes gets diverted to consumption subsidies. As a result, they not only remain resource deficient but are also unable to derive benefits from public investments. Given these conditions, the concept of community-based aquaculture can be an effective and ideal tool for implementing scientific aquaculture programs by organizing common interest groups in an informal way, utilizing semi-derelict and swampy water bodies and community village ponds. This paper describes how community-based aquaculture is being carried out in India.

Principle of Community-Based Aquaculture

In community-based aquaculture, common interest groups work together by sharing equal responsibilities irrespective of sex and age. Such working groups are essential for aquaculture operations, which involve construction of new or renovation of old ponds, eradication of aquatic weeds and management of culture operations which include fertilization of ponds, feeding fish, monitoring growth, security, harvesting and marketing, etc. As community aquaculture is informal there is little paper work to manage.

Participatory cleaning of water-hyacinth from a village pond for community-based fish culture by the fellow farmers.

Resource Potential for Community-Based Aquaculture

Natural resources are the ecological boon for economic development of rural communities. Various water resources – large, medium and small waterbodies are available for community fish culture in villages, but most of them are underutilized and/or unutilized. Some unconventional water areas such as canals or roadside ditches have the potential for intensive aquaculture. The village sewage which drains into burrowed pits emit foul smell and provide breeding grounds for mosquitoes. Such water-bodies can also be exploited for community-based fish culture.

Methodology

Location and resource inventory

To begin with, an area is surveyed for its resources and socioeconomic characteristics so as to evaluate its potential for community-based aquaculture. As far as possible, water bodies with community interest or involving interests of different groups in the same village are avoided as this may lead to communal problems amongst the villagers. Instead derelict water bodies, swampy areas, burrowed pits and ditches by roadside, railway tracts and irrigation canals, etc. which normally do not interest the villagers are targetted for use. Identification of common interest groups and organizing them at the initial stage is a difficult task for the implementing and aid agencies. Farmers who share a common interest are identified and organized, and from these a team leader with appropriate leadership qualities is chosen. The team leader must be a farmer, sociable, influential, responsible and have missionary zeal for serving his fellow farmers/rural poor. He should be easily approachable and flexible enough to work along with fellow fish culturists.

Depending upon the agro-climatic conditions and resource availability, the potential exists for carp breeding, carp seed rearing, composite fish culture and integrated fish farming by the communities. Before implementation, an inventory of resources is made using the participatory approach.

SWOT Analysis

SWOT analysis is an informative tool for assessing the potential of aquafarming. It provides a complete picture of its potential strengths (S), weaknesses (W), opportunities (O), and threats (T). It helps in problem identification, planning, decision making, appropriate technology implementation, precautionary measures for accelerating fish production at sustainable level, etc. A SWOT analysis carried out with the participation of farmers in a community is summarized below:

1. Strengths

a. Availability of diversified natural and man-made water resources in rural areas with potential for higher productivity, cost reduction/saving, multiple cropping/harvesting, risk reduction and reduced rate of degradation.
b. Continuous accumulation of allochthonous organic matter from the village catchment area and from domestic drainage enriches water resources with nutrients for cost effective fish production.
c. Availability of under utilized and/or unutilized human resources, agricultural and livestock wastes and cheaper fish feed ingredients.
d. Availability of region- and resource-specific technologies.
e. Involvement of common interest groups with equal and joint responsibility lends strength to and facilitates better operation of aquaculture.

A haul of carps from community-based fish culture.

Community-based matured brood fish identification by the village women through participatory approach.

2. Weaknesses

a. Poor organizational capacity among rural farmers due to pre-existing personal disputes and lack of capable community leaders.
b. Rural farmers lack infrastructure, ponds, material inputs, credit facilities, etc. for carrying out fish culture.
c. Farmers are reluctant to participate in such schemes because of inequity in multi-ownership of the community ponds.
d. Weak research-extension linkages, poor cooperation among operational agencies, low technical awareness among the community members, and a lack of commitment and understanding from farmers, etc.
e. Dual leasing policy, short leasing period, increased leasing rates, multi-water rights for irrigation, bathing, drinking and other domestic purposes of the community ponds.
f. Vandalism among the fisher folk and social stigma, poor training facilities at grassroots level, ambivalence towards the involvement of women

in fish culture and poor marketing facilities in the region.

3. Opportunities

a. Increased aquatic productivity and contribution to economic efficiency, social equity and environmental sustainability.
b. There will be equity in income, employment, food security, and poverty reduction, as well as participation and empowerment of rural farmers and rural women.
c. Judicious utilization of available nutrient-rich village water resources, human resources and waste materials for multi-commodity production at one place.
d. Easy implementation of carp seed production and rearing, composite fish culture, integrated fish farming, cage/pen fish culture, value addition and processing and marketing technologies through community approach.
e. Landless and resource poor farmers have the opportunity to undertake fish culture in leased out ponds.
f. Rural poor get equal chance in decision making, planning, implementation, harvesting and marketing, monitoring and evaluation, profit distribution and feedback.
g. There is participatory learning by fish farmers irrespective of sex and age, and empowerment of the rural poor.
h. Reduction in migration of fisher-folk to other parts of the country as wageworkers.

4. Threats

a. If aquaculture is not undertaken in unutilized and/or under utilized village water bodies, they will be infested with aquatic weeds providing breeding grounds for mosquitoes and may cause health hazards for the villagers.
b. Entry of polluted water from agricultural surface-runoff, domestic drainage and industrial effluents is not only a major threat to the survival of aquatic organisms but also contributes to water deterioration and affects the sediment quality of community ponds.
c. Introduction of indiscriminate fishing and illegal species.
d. Weed infestation, poor water quality and disease outbreak in fish.
e. Natural disasters such as floods, cyclones and droughts.
f. Declining per capita fish catch and irregular income generation.
g. Unemployment, food insecurity and labour migration in search of a means of livelihood.
h. Reluctance to invest due to short leasing policy.
i. Social conflict due to increased incomes from technology implementation.

Problem Identification for Technology Implementation

For better implementation, it is necessary to prepare location maps, Venn-diagrams, transect maps, hydrological maps, system maps, time lines and crop calendars of the target villages for reference by involving the community. A participatory approach is used to identify major problems, socioeconomic and biophysical constraints and plan appropriate intervention points. Constraints are prioritized and ranked according to criteria such as extent, severity, importance and frequency (Table 1). Appropriate technologies are then identified. Since at any single intervention point the technological integration may not produce the desired improvement in productivity, many intervention points (constraints) are considered for technological integration at a time alternatively and/or simultaneously.

Impact Assessment

At the end of each technological implementation (on farm trials, farm research and demonstrations), the performances are evaluated based on indicators such as technical observations, economic profitability, farmer's reactions, etc. The fish farmers' reactions to technological flexibility and divisibility, ease of handling, compatibility with household resources and existing farming system, easy availability of input materials, element of risks and alternative suggestions from the farmers for refinement are recorded. After the evaluation and impact assessment of technology implementation, feedback is provided to the research/extension/policy planners.

Impact assessment of community based aquaculture is carried out in three stages viz. i) *ex ante* impact assessment and priority setting; ii) monitoring and evaluation; and iii) *ex post* impact assessment. The *ex ante* impact assessment and priority setting uses an innovative approach in application and management of community-based fish culture through subjective and qualitative assessment of expert-opinion and user's demand potential backed up by benchmark information (production and demand). The outcome of the community-based aquaculture management model application is monitored and evaluated based on users experiences, institutional analysis, socioeconomic and environmental cost-benefit analysis, etc. Finally, the *ex post* assessment is carried out upon implementation of the appropriate technological packages including assessment of adoption, lags and gaps analysis, comparison between potential and realized outputs, input costs and returns, environmental assessment, etc. This will generate information for scientists and research/extension

managers for setting directions and priorities and allocating resources for further improvement.

Conclusion

In rural India, major water resources are owned by village communities and the revenue department. The water resources are neither leased to farmers nor utilized by the concerned department because of social and political reasons. The majority of farmers in rural areas do not own ponds and over 67% of freshwater fish farming in certain areas of the country is undertaken in leased out ponds. Due to the short leasing policy, farmers are reluctant to make investments, resulting in ponds remaining under utilized and/or unutilized for fish production. By leasing such ponds on a long-term basis to common interest group farmers of the village, fish productivity can be enhanced many fold. This would provide self-employment to the rural poor in their villages.

Community-based carp breeding operation by village women.

In community aquaculture management, social, cultural, economic, political and environmental conditions of the community members are considered for sustainable, profitable, stable, equitable and compatible development of rural aquaculture. At the same time, judicious exploitation of human and water resources, village infrastructure and waste materials is carried out with proper coordination by operational agencies and strong cooperation from fellow farmers of the community. In community aquaculture, decision making, planning, technology implementation, control and maintenance management measures and evaluation of activities are carried out with the participation of members of the community. There is rational exploitation of resources, equitable profit distribution, conflict resolution and compliance with agreed terms and conditions. It would not only provide income, self-employment and food (fish) security to the rural poor but also improve environmental conditions of the villages. There is ample scope for the development of community aquaculture for generating self-employment and income and improving food security of the rural poor. Its potential for expansion in the country with regard to agrarian economy in general and aquacultural economy in particular, are high.

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Table 1. Constraint prioritization for low fish yield in community-based culture ponds.

	Criteria					
Problems	**Extent**	**Severity**	**Importance**	**Frequency**	**Score**	**Rank**
Lack of knowledge	*****	*****	*****	*****	20	Ia
Lack of own ponds	*****	*****	*****	*****	20	Ib
Inadequate quality fish feed	*****	****	*****	*****	19	III
Inadequate manure and fertilizer	****	****	*****	*****	18	IVa
Aquatic weed infestation	****	*****	*****	****	18	IVb
Poor management of soil and water	****	****	*****	****	17	V
Multi-water rights	*****	***	***	****	16	VIa
Poor pond management	****	****	****	****	16	VIb
Presence of predatory and weed fishes	***	****	****	****	15	VII
Most ponds belong to village administration	****	****	***	***	14	VIIIa
Inadequate quality fingerlings	***	***	****	****	14	VIIIb
Short duration lease	***	***	****	***	13	IX
Natural disasters	***	***	***	***	12	X
Seasonality of ponds	***	***	**	***	11	XI
Non-availability of suitable piscicides	**	**	***	**	9	XII
Lack of money	**	*	***	**	8	XIII
Disease outbreak	**	*	**	**	7	XIV
Poaching	**	*	**	*	6	XV

Note : The more the number of asterisks, the more importance.