

SMALL-SCALE AQUACULTURE: LESSONS FROM THE FIELD

S. S. Tabrez Nasar

Former Dean, Institute of Livelihood Research and Training
3rd Floor, Surabhi Arcade, Troop Bazar, Bank Street, Koti
Hyderabad, Telangana 500001, India

**Corresponding author: tabrez.nasar@gmail.com*

Abstract — There are several issues, concerns, situations, and dilemma that are often omitted because the focus and emphasis of program implementation, sometimes for very valid reasons, is on the technological aspects. As a result of this, many initiatives, especially those that are aimed at benefiting smallholders, are not able to meet the expectations of the results – outputs, outcomes and impacts – mostly as the emphasis on social as well as economic dimensions are lacking. Any technology cannot be owned and accepted by farmers if they are not designed with the social dimensions in mind. This paper that deals with issues as well as the possible approaches and solutions, carries the experiences of the author working as a development professional in some South-east Asian and South Asian countries including in the Philippines, Lao PDR, Viet Nam, Bangladesh and India. Some of these perspectives also reflect point of views and experiences of other professionals in the field.

Keywords — Aquaculture, livelihoods, small-scale, social dimensions, women

INTRODUCTION

It has been observed that most aquaculture and fisheries projects and programs are run by very competent fisheries and aquaculture specialists and organizations. However, though in most such programs, there is a provision for 'social scientist' but unfortunately they do not have much of a say on how things should be run. While having emphasis on technical dimensions is an essentially apt approach, it misses out on the understanding of community members – the primary stakeholders to such initiatives – if the social dimensions are not considered seriously. As a result very often extremely well-structured, well-designed, and well-meaning interventions fail as the social dimensions of the program are either not taken into account during the designing and implementation of the program or have a mismatch on how it is structured. The technical solutions of most small-scale aquaculture systems are in place and the focus should be emphatically matched with the social dimensions of the program to achieve direct and positive impacts. This paper typically represents "smallholders" which is defined in India as those owning less than 2.0 ha of farmland. In India, for example, they comprise 78 percent of the country's farmers, but own only 33 percent of the total cultivated land; they nonetheless produce 41 percent of the country's food-grains.

Aquaculture and Livelihoods

While aquaculture, for many farmers can be a main source of livelihood or primary livelihood, for many it is a secondary or tertiary source of livelihood. On several instances, aquaculture projects and programs, attempt to 'impose' aquaculture as the primary livelihood for the household and attempt to 'graduate' the farmer into considering this as the primary source of livelihood. It may, however, not be the best thing to do as it has serious implications on their primary livelihoods and the way

it is carried out by them. These kinds of forced changes may have several negative implications on their lives and livelihoods.

In order to introduce aquaculture to subsistence farmers, it is necessary to understand how the role of aquaculture impacts other livelihood activities. The understanding of the 'space' they have or can have for aquaculture, will be the key to a successful intervention.

Increasing Farmers' Income

In recent times there has been a lot of emphasis on increasing farmers' incomes. However, many a times it is misconstrued as increasing 'farming incomes'. Most small-scale farmers do what they can best do with the given limitations of resources – infrastructure, land, water bodies, input supplies, etc. – and in some ways have reached a point of saturation. Hence even if they have a little more of resources, they will not be able to add much to their incomes.

So while on one hand improving efficiencies will lead to improved production (both quality and quantity), they need to be encouraged to additionally explore possibilities of off-farm and non-farm enterprises either individually or in collectives. While the 'farming' itself has reached a point of saturation, the additional and complementary sources of livelihoods (off-farm and non-farm) not only provide an additional opportunity but also allow other members of the family to be engaged meaningfully (Nasar et al., 2018).

Partnerships

In most instances, 'partnership' is seen as 'partnering with donor or funding agencies' and not with like-minded organizations that can complement rather than compete for the cause. There are several organizations that are, for example, working around health or watershed management or agriculture programs that can become a very effective partner.

Partnering with local government agencies and local NGOs is a proper strategy in order to phase out smoothly. This also takes care of institutional capacity building and enables the community to work closely with the government or other major stakeholders. Complimenting each other in a holistic manner will be important to accelerate livelihood growth (Al Ruqishi et al, 2020).

Convergence

There are several wonderful government and other initiatives and programs such as watershed management, agriculture, horticulture programs and the likes that have demonstrated a fairly visible impact over a long run. Different states in India, for example, have different sets of policies and programs for the fishery sector. The central government has published a Report on Convergence Initiatives in India (Ministry of Rural Development) and states that the convergence of different programs like: Watershed Programs, National Agriculture Development Program (Rashtriya Krishi Vikas Yojana), National Horticulture Mission, Scheme of Artificial Recharge of Ground Water through dug well, BRGF (Backward Regions Grant Funds), with MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) will enable better planning and effective investments in rural areas. This convergence will bring in synergies between different government programs/schemes in terms of planning, process and implementation. This will also facilitate sustainable development. (Report on Convergence Initiatives in India - An Overview; 2013).

Convergence of such programs to include aquaculture and fisheries initiatives is not only possible but also extremely practical. Also lots of learning can be drawn from different state policies like that of the Madhya Pradesh State fishery policy in India that protect farmers during drought and also gives special consideration to women.

Common Property Resources (CPRs) and Individual Ponds

While most of the laws are meant to address the needs of the stakeholders on CPRs, there is very little understanding and clarity about the support and contributions that can be received or made for smallholder individual ponds.

Proper documentation of issues, concerns and needs of smallholder individual pond owners should be encouraged in order to influence policies conducive to their practices. Also, it must be noted that common properties need a strong institutional base that require sustained facilitation and different set of protocols as compared to private water bodies.

Community mobilization

In a large percentage of cases for small-scale aquaculture and fisheries projects, the focus is on individual households across the value chain. As a result of this there are scanty examples of fisheries collectives unlike in the agriculture sector. Small and marginal farmers constitute a majority in Indian agriculture but are integrated through traditional value networks which lack supportive environment with institutional and infrastructural system, inadequate resources and effective coordination within the value networks (Singh et. al., 2018). Given the success of Farmer Producer Organizations (FPOs) in India, the country aims for an additional ten thousand FPOs and several agencies, both government and private, are contributing to the cause. Encouraged by this, there have been some evolution around Fisheries FPOs but a lot more needs to be done.

Considerable groundwork on community organizing has to be done before introducing an aquaculture project to communities which do not have any previous experience in aquaculture. The government will need to take a cue from the Agriculture sector and promote fisher collectives as well.

Informal Collectives

Grouping large number of households for one large cage, reservoir or pond system, for example, has its negative impact (such as conflict etc.). Similarly single-system single-household methods also do not always work because of the lack of confidence with technical aspects on the part of the farmer in addition to the required investments. This also includes the issues pertaining to inaccessible input and output prices and markets.

One relatively good strategy would be to have 'small affinity groups' (three to four households) working together. The process of grouping 'birds of the same feather' has to be carefully done. In any case, it will be important to have informal collectives first before they graduate into more formal and larger structures.

Information, Education and Communication (IEC) Material

Reliance on extension materials of the usual descriptive type is unfounded in communities with low literacy. In such instances, hands-on training and demonstration are more successful. With the emerging scenario, digital learning space is going to play a key role.

Extension materials should be user-friendly with lots of self-explanatory sketches and diagrams. Video documentation to which the farmer are seen to be most responsive, is a good training material. The farmer trainer should be trained to use such simple materials for echo-training, etc. With the changing times, digital learning is and will play an important role in educating the farmers both technically as well as on social issues.

Role of Women

Women involvement especially in fish culture is not guaranteed although many women participate. The reasons for this could range from the roles that is assigned to women at the household level to the distance

of ponds from the household. Since women are engaged with multiple roles both at the household and at the community, they have little time left for accommodating additional responsibilities. Women play a critical role in every link of the value chain in small-scale fisheries, although their best-known roles are in processing and marketing of fish and other fishery products. This perception of the highly gender-segregated division of labour (men fishing / women processing) has shaped the generalized approach in supporting development initiatives for small-scale fisheries (Lentisco & Lee, 2015)

Fish-ponds and / or culture systems close to the house have been observed to enable women's involvement. This will also enable other members of the household to contribute in fish culture across the value chain – all the way from feeding, up keeping of ponds, watching out for disease outbreaks, harvesting, cleaning, shelving and eventually selling.

Planning and Management

While the projects plan according to their preferences of logistics and other criteria, it oftentimes fail to address the needs of farmers related to their timings that they are mostly available. When a training, for example, is planned in seasons when the farmer and other members of the household are busy with other livelihood activities, it misses out on the expected attendance and attention of farmers.

Training courses must follow the relevant seasons of fish spawning and grow out. The rice planting season is critical to farmers and their involvement is limited during this period - do not plan farmer activities during the preparation and planting season.

Pond Management

Pond management is critical and crucial for all aquaculture systems but particularly so with small ponds. As stated earlier, better pond management will result into a robust ecosystem, thus providing an able

environment for fish growth.

There are plenty of reference materials that are simple and easy to use and can be found online. Several agencies provide short trainings and insights into pond management. There is a plethora of information materials available on YouTube, for example, that will come very handy to train farmers. However, the best way is learning by doing but the key to it is sufficiently good plankton growth (greenish tinge of the water) and sufficient oxygenation.

Disaster Management

Aquaculture and fisheries face the brunt of most disasters – mostly floods and typhoons. As a result of this, on one hand the projects suffer a serious setback but on the other, it is the resource poor community member who gets into a no-return situations.

Proper planning and foresight needs to be considered in relation to typhoon and other natural disasters. This entails proper location of ponds, cages and other systems that are less affected by typhoons. Short-cycle systems with fingerlings in place of fry stage will ensure harvesting before a predictable flood season.

Integrated Agri-Aqua (IAA)

It is not uncommon to have farmers indulge with several farming initiatives such as agriculture and aquaculture in a combined way. There are several examples of this such as rice-fish culture, duck-fish culture, etc. Several farmers, for example, are engaged with ornamental fish breeding and culture which not only fetches a comparatively higher price but can also be done in relatively smaller water bodies. The fish yield from the IAA ponds was 60% higher compared to non-IAA ponds because of a more frequent use of on-farm resources and better management. The net income from IAA ponds was 175% higher compared to non-IAA ponds, due to reduced costs and higher yields. (Mulokozi, 2021).

Farm diversification is a risk aversions strategy for smallholders. If one component fails, the other can provide the critical support for survival. The different components interact in a symbiotic and synergetic manner, enhancing overall production, optimizing resource use and thus providing for the subsistence needs of the household. Trees provide shade for crops and livestock while producing fruit; livestock manure is used as a fertilizer and crop by-products are fed to animals. Integration of aquaculture into smallholder farming system improves food and economic security. This also serves as a platform for additional income and engagement of other family members. With the emerging focus and success of Farmer Producer Organizations (FPOs) and other form of agriculture collectives, it is possible to educate and convince them to use their water bodies for integrated agri-aqua systems.

Monoculture vs Polyculture

In many cases, fish farmers prefer single species culture for many reasons but primarily because they have gathered experience over the years with a single species throughout the value chain including marketing. In the Philippines, for example, the most preferred species is Tilapia because of its established success in other parts of the country and its market value. Similar trends are being seen in India primarily because it is demand driven. Culture of carps such as Rohu and Catla in the Bhimavaram region of Andhra Pradesh, is a good example of this. In the case of Bhimavaram though, the produce is essentially commercial and may not necessarily cater to the needs of smallholders.

Polyculture for small-holders can serve as a risk aversion strategy and the diversity also helps to maximize natural food in the ecosystem. Ideally larger ponds should be stocked with different varieties of carps although local market preference is also for smaller species. Markets in states where fish is a major consumer item, such as West

Bengal, Odisha, Assam, etc. also prefer smaller species on their table. This also encourages in situ conservation of species in addition to providing value in micro-nutrient supply which otherwise larger species lack.

Demonstration

In many instances, farmers fail to adapt a practice as it is unknown to them. If a new technology or practice such a cage culture or pen culture or for that matter, rice-fish culture is introduced, farmers would like to see a working example of these before deciding if they want to take it up.

A working example (of systems - ponds, cages, etc.) in their village is necessary for them to believe that a new system/method of production is possible. Setting up demonstration systems is therefore a good way not only to create awareness but also for the farmers to see it as something doable.

Farmer Trainers

It is very difficult logistically and financially to train a very large number of farmers in one go. At times it is also not possible to have ideal field sites for demonstrations etc. Even if the trainings are conducted, there is no manpower to hand hold or follow up and support the farmers in the field.

Farmer to Farmer (F2F) extension approach in agriculture is a systematically utilization of community leadership and informal communication between farmers. As a generic term we use it as 'farmer trainer', even though it goes by different names e.g. lead farmer, farmer-promoter, and community knowledge worker. This approach helps in building effective, farmer-centred extension systems and empowering farmers as change agents for improving livelihoods in their communities (Meena et al, 2016).

Echo-training with farmers themselves as the lead resource persons is a good

strategy. It enables farmers to have a sense of ownership on the process also and not on the culture systems alone. This also enables better use of limited extension staff resources as some of these farmer trainers (also known as 'farmer friends') can be used as extension agents and technical staff.

Seed Availability

While many projects ensure production of quality seeds, there are very few examples of community owned and managed hatcheries. As a result of this, the producer has to be completely dependent on either government owned or private hatcheries. On one hand there are very few collectives and on the other, even lesser community owned and managed hatcheries.

Fish fingerling availability and distribution is a major constraint in geographically isolated areas. Therefore farmer-based fingerling production is critical for expansion of aquaculture especially in geographically isolated areas.

Seed Production and Beyond

Most of the hatcheries operate in a location where they can supply seeds to a very large geographical area. Many a times because of the distance that has to be covered for transportation of fish seed and fry, there is a very large percentage of mortality. This discourages the farmers to invest time, money and effort. Entrepreneurs who can produce quality seeds and grow out seeds to fry to fingerlings stages should be encouraged.

Community owned and managed seed production systems will go a long way. Nursing of fingerlings to a larger size separately in nursery systems will overcome many production related problems - transportation stress, short grow out season in rainfed ponds, predation, water quality stress at stocking, etc.

Feed Availability from Local Resources

One of the major costs in fish farming

is the feed. Relatively high prices for commercial feed favor large, vertically integrated fish farms whereas small-scale farms are becoming increasingly vulnerable to rising feed costs and the highly competitive market. Since the volumes produced by small-holders and small ponds cannot compete with commercial enterprises, the margins of profit are abysmally risky.

If the right pond management methods are brought into use, it will also enhance plankton production leading to natural food availability in the ponds. While this may suffice for extensive systems, additional formulated feed may be required for semi-intensive and intensive systems. Encouraging micro- and small feed making enterprises that process locally available resources like crop and livestock byproducts has potential for ensuring the supply of low cost feed without compromising its quality and also generating local employment. This will lead to better profit margins thus encouraging small-holders to invest time, money and effort.

Poaching

Theft of stock is a primary concern of farmers and deters investment and inputs to the system. This is another reason why ponds and cages nearer to the houses or within the community area are well fed and productive. Ponds in rice-paddies away from home do not encourage proper investments.

Some of the approaches to overcome this problem range from forming 'affinity groups' (of 4 to 6 pond or cage owners in the same vicinity), to taking turns to guard the system to outsource guarding to private individuals – most of which cannot be done by individual farmers.

Value Chain

There are several opportunities in the value chain that ranges from farm to fork which have not been tapped effectively. There are several interventions, for example,

hatcheries, transportation of seeds, input and output supply and prevention of post-harvest losses that can be a point of intervention for NGOs that work around fisheries and aquaculture or in partnership with such organization.

Earlier value chain studies were concentrated on tradition approach. In this approach, the focus was mainly to economic dimension. The social, behavioural and institutional dimensions were focused separately without any interconnectedness. While, new approach is a holistic and integrated approach with inter connection of all the dimensions together (Social, economics, behavioural and institutional dimensions). (Jeyanthi and Chandrasekar, 2017).

NGOs and local organizations can possibly identify one or more links in the value chain and play the role of a key stakeholder thus adding value to what the smallholders are engaged with. Hence, it is time to move ahead from traditional fishery cooperatives to Farmer Producer Organization system for developing entire value chain rather than just fish production.

Prevention of Post-Harvest Losses

There is very little authentic data on the percentage of post-harvest losses incurred by both commercial and smallholder farmers. However, there is enough anecdotal evidence and some authentic data to prove that the percentage of losses is high and that it is a major concern.

Huge losses occur along the fish value chain, both in terms of quantity and quality due to discards at sea, improper handling, storage & icing, lack of cold chain facilities and delay in transportation. Reducing harvest and post-harvest fish loss will enable money saving for the primary producer, enable the sector to feed more and ease the pressure on water, land and climate. The fish landing sites are numerous and remote in interior parts of the country

sometimes inaccessible. Delay in transport, non-availability of ice for proper storage brings down the price of freshwater fishes in the markets which is an economic loss for the primary producer (Geethalakshmi, 2020).

It is possible to use local materials backed up with some indigenous knowledge and practices to prevent or reduce post-harvest losses by increasing the shelf-life of the harvested fish especially for smallholder farmers. This will also take care of the quality of the fish that will be made available to the consumers.

Credit and Financial Assistance

One of the bottle necks in small-scale aquaculture and fisheries is that it requires relatively larger investments. In many cases the farmer does not have easy access to credit. Subsidies and state intervention are essential for the sustenance of small-scale fisheries across the world and are also necessary to promote sustainable practices. In a study where semi-structured interviews with small-scale fishers from four fishing villages in two main coastal districts in India show that although a large share of the sampled population (90%) is aware of the existence of subsidies only 42% have availed of them. Results pointed to technical, political and social factors that inhibit small-scale fishers from relying on state welfare measures as a security against vulnerabilities. (John et al., 2014).

As to credit, farmers wish to have money to improve their systems but are unwilling to borrow at commercial rates. The transition from subsistence fish production to income generating activity is gradual, time taking and varies among farmers. While borrowing at commercial rates may not work out well, it is possible that well-established collectives such as SHGs may lend to groups or for that matter, approach lending agencies such as banks as collectives rather than individual farmers.

CONCLUSIONS

There are several examples across the globe where projects have performed well as long as there has been sufficiently robust inputs – technical, infrastructural and social – but have failed to sustain the program due to lack of ownership from the communities. Involving the community members is essential not only during the implementation of the program but also during the conceptualization. Such consultations go a long way to have the right blend of implementation and ownership. While designing projects and programs that are aimed at benefiting small-holders, the above mentioned issues, concerns and dilemma should be considered. This will not only enable better implementation of programs and maximize available resources and opportunities but will also receive a better buy-in from the primary stakeholders – the smallholders.

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