Farmers as Scientists

This is a series anchored by M.C. Nandeesha. It describes farmer-driven innovations and experiences.

Diversity enhances profitability and sustainability

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The Indian Council for Agricultural Research has instituted an award in the name of late Professor N.G. Ranga, a well-known parliamentarian who contributed significantly to uphold the interest of farmers and initiated a number of farmer-centered developmental activities in the country. The criteria fixed for the award include i) generation of new knowledge of practices and management strategies, ii) increased yield and income from the activity with efficient use of resources and inputs, iii) breaking of technology transfer barriers, iv) disease prevention strategies evolved, among others. Through the countrywide competitive selection process, the first award for the year 2001 has been given to Mr. Haricharan Das, a progressive fish farmer from the Tripura State located in the Northeastern part of the country. Mr. Das was chosen for the award as he has made several accomplishments in terms of diversification of activities, a number of innovations in regard to aquaculture and other agricultural activities like poultry farming, mushroom cultivation, forestry, vegetable and paddy cultivation and increased income through the wise use of resources. In this article, developments that have been made by this farmer in the area of aquaculture, which have relevance to the region are emphasized.

The professional accomplishment of Mr. Das, who is now 74 years old is a noteworthy for all those interested in taking up aquaculture as a profession and an example of the benefits of determination. Traditionally, his family occupation being fishing, Mr Das' desire to be educated helped him secure higher education in commerce. He worked as a railway employee and taught students before venturing into fisheries business. He left the government job and took up independent work as a fish auctioneer. Following his success as an auctioneer, Mr Das moved into fish culture activity by buying land, wherein he could build a pond of less than 0.5 ha. Using the ponds for seed rearing and selling, his activities expanded from that small piece of land to his current holdings of 25 ha. The farm not only has diversity of agricultural activities like horticulture, animal husbandry, forestry and fisheries, but also a good example of how agricultural activities can be integrated and developed in hilly terrain. Apart from his technical accomplishments, on the social side Mr Das has built excellent community bondage,

Mr Haricharan Das, a progressive fish farmer from Tripura recieves the N.G. Ranga award for innovation

Chinese hatcheries are now popular for the production of carps in Kolkata

which provides an example of how commerce can be combined with the motto of community service.

Development of hatchery systems

In the early stages, glass jar hatcheries developed based on the Hungarian models were popular in India. Mr. Das installed a jar hatchery system and even today, he recalls that jar hatchery as his most lucky project. With the introduction of Chinese hatcheries in Kolkata for the first time, the system became most popular throughout the country with medium and large-scale seed producers both in the Government and the private sectors. Mr. Das immediately adopted the system and has brought changes to suit local conditions. By evolving some of the simple management strategies, he has been able to achieve maximum breeding response, hatching and survival of the hatchlings.

Pituitary gland is still the best and most economical method

Though synthetic hormones have invaded the market, Mr. Das continues to depend on pituitary for breeding owing to cost factor as well its organic nature. The seed produced from his farm is the major source of seed to the large part of Tripura State and also to other parts of the Northeast. Fish seed nursing activities being undertaken by other groups of entrepreneurs, the farm largely concentrates on spawn production. This has enabled the farm to use the facilities for the production of table fish as well as fish seed with good efficiency.

Integration

Diversification of activities and their integration wherever technically and economically viable are the major accomplishments that can be seen in this farm. The farm houses nearly 6,000 parent birds for the production of chicks and nearly 30,000 birds for the production of broilers. This has led to the generation of huge amounts of waste from the poultry unit, which is efficiently recycled through fish culture ponds. In addition to poultry, there is also cattle farm consisting about 30 cows for milk production purpose. The grass and other vegetation on the farm provide fodder to cattle. There is also mushroom seed production unit and mushroom cultivation unit. Vegetable production is also undertaken in suitable areas. Coconut trees and other horticultural fruit crops also form an important component on the farm. Tree plantations are widespread on the farm with more than 22 cm annual rainfall, the climate provides good environment for the growth of high value timber trees like teak, mahagony and neem.

Biogas slurry and fishpond integration

The most significant innovation made by Mr. Das is in the efficient utilization of poultry, cattle and kitchen waste in aquaculture after passage through a biogas digester. As there was a problem of regular electricity supply and also difficulties in regulating fish pond water quality by using fresh cow dung, he took advantage of the Department of Non-Conventional Energy special program implemented through the Science and technology Department to install a biogas production unit on the farm. So far he has established eight biogas plants of varying capacity and a special biogas unit based on human excreta. The design changes he has brought in the digestion chamber is reported to have been appreciated by the Ministry and emphasis is now laid on

Carp pituitary gland is still more economical than synthetic hormones for induced spawning

Efficient recycling: Poultry, cattle and kitchen waste is passed through a biogas digester to produce energy, then the residual slurry is used to fertilize ponds, boosting fish production

promoting the new version in rural areas. Currently the entire farm is using the digested slurry for fishpond fertilization as well as for agricultural crops. The usage of biogas slurry for fish culture has given a good boost to fish production with productions obtained being always higher than 5,000 kg/ha/year.

Fish Culture Techniques Innovated

Because of the locational difficulties, drying of ponds is not a common phenomenon. Application of lime at 400-500 kg/ha as the initial dose is generally adopted. If the ponds are dried, lime is mixed with the dried soil. Following the application of lime, ponds are filled with water and plankton culture is introduced via water from other ponds. To enrich the plankton growth, mustard oil cake is used at the rate of about 200 kg/ha. The quantity is split in to six portions and each portion is applied on daily basis after ensuring that the cake is soaked with water at least for 3-4 days. Plankton enrichment in the pond generally reaches a good level by the time the fourth portion is applied and at this point of time, depending on the plankton density, application of rest of the two portions is decided. Once the pond is rich in plankton, fingerlings consisting of a mixture of Indian carps, Chinese carps, silver barb and tilapia are stocked with a total stocking density of about 15,000-20,000 fish seed /ha. The pond is fertilized regularly with biogas slurry at the rate of about 1,000 kg /ha. The frequency and quantity applied is regulated based on the water color and water quality. During the rainy season and summer, biogas slurry usage would be higher and during winter period dosage is reduced.
weighing more than 150-200 g are taken and replaced with the same number of fish fingerlings. During each harvest, about 25% of the fish are taken out and replaced with same number of fingerlings / yearlings. Year end harvest would also result in fish weighing more than one kilogram. Through this cyclic culture and harvest method, the annual production obtained is reported to be not less than 5000 kg /ha/year with the usage of biogas slurry as pond manure and fed with least cost feed

Profitability

Feed still constitutes major cost of production. The food conversion ratio is reported to vary between 1.5 and 2.00. With the local market value of fish being about USD 1.5 for carps, the profitability obtained is very good. The market demand for tilapia and silver barb being higher these species are mixed with Indian major carps and Chinese carps and cultured. Probably, this is the first farm in India wherein biogas slurry is widely used for fishpond fertilization on a regular basis and on a commercial scale. There is opportunity to enhance the productivity further through further research.

Biogas slurry research in India

The biogas plants are spreading in India rapidly with the increasing fuel crisis. The Department of Non-Conventional Energy is promoting biogas plants of different types and dimensions to suit the different categories of farmers. Early

Production of biogas onsite has solved some of the problems of an irregular electricity supply

research conducted at the College of Fisheries, Mangalore by a postgraduate student demonstrated the immense benefits of biogas slurry in carp culture. With the application of 3,000 kg /ha, in a short-term study, extrapolated values showed that a production of 2,900 kg / ha/year of fish can be obtained. Further research carried out at the Central Institute of Freshwater Aquaculture, Bhubaneswar in Orissa using cow dung and water hyacinth as the basis for the production of slurry have demonstrated the benefit of using the digested components in fish culture. Application of biogas slurry at 15 to 30 tons/ ha/ year has given fish yields which are more than 60% higher as compared to the application of undigested cow dung. Experimental results have also shown the possibility of incorporating biogas slurry in the feed mixture of rice bran – oil cake to the extent of 50%, by taking advantage of the existence of coprophagy in carps. Cultivation of duckweed like Azolla, Wolfia and Lemna has been found to be far more efficient on the slurry. In another study conducted at the Madurai Kamaraj University, results have shown that growth of carps was nearly ten times higher in biogas slurry treated ponds as compared to those treated with conventional methods of chemical fertilizers applications.

Spirulina, which is now considered as an important health food not only for fish, but also for people, has been successfully produced using biogas slurry by the Center of Science for Villages located in Datapur of Wardha. The yield obtained using the slurry was comparable to the one obtained using chemical fertilizers.

Mr. Das is not aware of these research results. He has developed the technique using slurry to meet his requirements. However, he is looking forward to explore ways to further improve production strategies using the available scientific information or generate new information with the facilities available at his farm.

Education to other farmers

Recognizing his entrepreneurial skills, state Department has used his experience to train other farmers and unemployed youth in the State on fish culture. So far three batches of trainings have been organized and there are plans to start regular training programs for the youth. The facilities have also been used to provide hands on training to the students of the Fisheries College by placing them on the farm as part of their work experience program. Mr. Das is an institution by himself who has built a farm and providing livelihood to about 200 families directly and several others indirectly.

Mr Das is now training other farmers and unemployed youth in fish culture

What next

Mr. Das who has not only played a key role in stimulating aquaculture development in Trpura State, but also contributed for the spread of technology through his commercial seed production activity in the region. The northeastern part of India is called the “dark continent”. Though the region is well known for rich biodiversity and culture, it has remained poorly developed for varieties of reasons. Insurgency continues to be a major a constraint in several parts of the region and strategies need to be evolved to reach farmers under these complex situations, wherein the biggest sufferers are again the poor.

Mr. Das has not only been honored with this prestigious award, but also has received Central Institute of Fisheries Education Award for being the best farmer in the year 2000. While he has been able to produce good amount of fish and maintain healthy community relationship, his empirical knowledge should be documented and investigated further to improve productivity and sustainability. The information generated from this type of actual farming conditions in the “field set up”, would help in the generation of ready to use information of other farmers. Mr. Das is willing to cooperate with research institutions to undertake further studies on his farm and allow the information for the benefit of other farmers. The College of Fisheries being located in the area is looking forward to undertake research in partnership with other interested institutions. We hope to report the progress of research in the future.