



Chapter 6

Prospect of Fish farming in Manipur

Contents:	Page No.
6.1 Introduction	149
6.2 Prospect of fisheries development	149-156
6.3 Fish farming systems for sustainability	156-158
6.4 Loktak Lake: the main source of fish	158-160
6.5 Ngari: A fermented fish of Manipur	161-162
6.6 Entrepreneurship Development through Ornamental fish farming	162-163
6.7 Prospect of eco-tourism through fish farming	163-164
6.8 Prospects of Integrated fish farming in Manipur	164

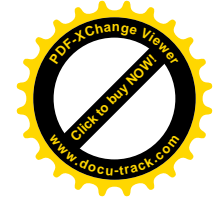


6.1 INTRODUCTION

This chapter tries to examine the prospect of fish farming in Manipur. The sector of fish production has become very important because of many factors. There are 49 lakhs of fishermen in the country and it is urgently and absolutely necessary to improve their economic condition. One gratifying fact in this connection is that this sector is being augmented at an accelerated pace of development. In the year 1950 the total fish production was 7.30 lakh tonnes it shot up to 38.75 lakh tonnes in the year 1990 and in 2009 the production of fish reached to 76.08 lakh tonnes. This means that it has a phenomenal growth and it has tremendous potentialities for further growth. Fishes give protein to the consumer and the proteins are very necessary for the maintenance of human life. The domestic requirement of the fish is about 15 million tonnes. The sources are both inland and marine fisheries.

6.2 PROSPECTS OF FISHERIES DEVELOPMENT IN MANIPUR:

The prospects of fisheries development in the study area are tremendous. All the requirements, factors, features and the elements for the development of fish farming are there in abundance. The first requirement of development of fish farming is that there should be copious water and water should be available throughout the year. The study area has large water resources and therefore, the first requirement of fish farming, which is water, is made available by nature. Manipur being one of the rarest biodiversity belt is blessed with natural resources in the forms of ponds/tanks, lakes, beels, rivers/streams, low-lying paddy fields and suitable for fish farming. The total water area of the state is about 56,461.15 hectares and out of these water resources only 15,000 hectares (i.e. 26.57%) have been brought under fish farming (culture). Most of the houses in Manipur whether in urban or rural areas have also domestic ponds in their backyard that have been utilized for various purposes. The size of



these backyard ponds ranges from 100-1000 sqm (Government of Manipur, 2007). In the rural areas, there are many low-lying areas especially near the lakes where water naturally accumulates during the rainy season from the overflowing of the lakes and rivers. There are also many water sheds which belong to individuals, groups of people and localities. These water bodies can be utilized for fish culture so that it can contribute little more to fish production in the state that is lagging far more behind the normal requirement. This small kitchen ponds serve many domestic purposes like washing, cleaning and even for drinking purposes in some remote area but it can still make use for production of fish. In Manipur, fish comes from both capture and cultured fisheries. Loktak, the largest freshwater wetland of northeast, is an important fisheries resource of the state. About 60% of the state fish demand is met by the Loktak lake and its associated wetlands within Manipur river basin. There has been a significant decline in fish landing from the lake along with an increase in fishermen population, impacting on socio-economic status of the fishermen communities. Therefore, to increase the supply of fish and reduce import of fish from other state, people living in and around the lake should be encouraged to take up fish farming. As we know that large water resources i.e around 75% of water resources are unutilized in the state, this water resources should be utilized properly by the people of the state up taking up fish farming and the unemployed youth of the should also be encouraged to take up fish farming as their source of income by proper training regarding fish farming and providing all the necessary support to the farmers of the state. The recent developments in the culture of many of the organisms have shown their high growth rate and production potential.

The annual requirement of table fish, calculated as per the Standard nutritional requirement of 11kg per capita consumption of fish, for about 24 lakh population of the state is estimated at 25,600 metric tonnes against the present production of 18,800 metric tonnes showing a wide gap between demand and production of fish. The



production rate is about 3400 to 6800 kgs/ha/year in Manipur. Many of the farmers have adopted the composite carp culture technique and getting additional income from fish production (Mahanta,2010) (Joshi, 2010). However, in the study area, the average productivity of fish for the sample fish farmers (owned) is 1553 kg/ha/annum and the average production of fish for the cooperative fish farmers is 2083 kg/ha/annum and it is higher than that of the owned fish farmers in the state. This low production of fish is due to many reasons. If these problems are studied and certain necessary supports are given than the production of fish can be increased manifold. Training should be provided to the fish farmers on scientific method of fish farming.

Quality fish seed is a major bottleneck in expansion of the farming practices, therefore setting of hatcheries; nursery rearing and seed transportation facility would provide significant employment opportunities. An integrated approach is urgently required to harness all possible fisheries resources on sustainable basis for employment generation and livelihood support to the people of Manipur.

Employment potential

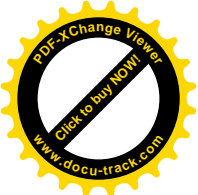
The state has an excellent scientific and technical manpower which has made the recent technological breakthrough in the field of fish farming and this would form the nucleus for further developments. Since the technical problems in future will be greater and more complex, the present teams will have to be adequately strengthened and personnel from the component disciplines should be involved. There is already a need for managerial personnel and at present some *ad-hoc* arrangements are made to manage the farms of some of the private concerns. In the near future the demand for managerial and supervisory personnel will be greater as more and more entrepreneurs come to this field. It has been realised that the existing extension services in the country are inadequate even to serve the current development programmes relating to culture fisheries. This has necessitated the scientific and technical community to



directly engage themselves in extension programmes. The major area for employment potential would be at the primary level of culture operatives and skilled workers. The youth of the fishing communities in Manipur with training at the required levels, could form the source of this base. In the capture fisheries sector, in spite of well established training programmes, the shortage of operative personnel is keenly felt to meet the needs of the current development programmes. It is, therefore, necessary to develop adequate training facilities for fish culture as a part of the programme for the development of this sector. There are certain schemes taken up by the Fisheries Department for pisciculture development. For implementing these schemes, suitable manpower will be needed and which will give employment opportunities to the people of Manipur. The unemployed youth of the state can also avail the necessary supports of the Fisheries Department for taking up fish farming and giving them self employment.

The rural base of fish farming

Fish farming should form an integral part of rural development for the state like Manipur. In inland areas, the need of integration of agriculture, poultry with fish farming, due has been well recognised. An FAO case-study in Thailand has shown that a farmer's income can be increased 21 times by combining aquaculture with agriculture. The fishermen have plenty of leisure time during off seasons and this is being frittered away. The aquaculture system for combining with traditional fisheries must be selected on consideration of several factors relating to the technical aspects of culture as well as socio-economic aspects of the fishermen community of the region. Such integration would necessitate identification of talents among fishermen and imparting basic training. Effective monitoring and consultancy services will have to be provided by the aquaculture extension workers.

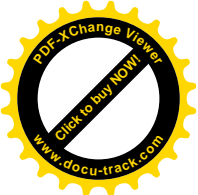


Strategies

The country is rich in water resource and species resource for fish farming. The technical knowhow for the culture of presently valuable species has already been developed and it is under constant improvement. Interest among the fishermen and commercial entrepreneurs is not lacking. Training systems in inland fish farming have also been developed. In the initial stages subsidies and loans will have to be provided as was done in the case of mechanized fishing when the vessels were introduced. The marketing potential is already good for the conventional species. In the case of non-conventional products there is need for finding new channels both in the internal and external markets. With the realisation of its potential, it is urgent that fish farming is taken up on priority basis not only from the standpoint of increasing production but also for its strategic importance as means of employment and as one of the tools for the development of the inland fisheries sector in Manipur.

In spite of macro-economic successes, recent stagnation in the agrarian economy and the overwhelming dependence upon this sector by the majority of the rural population, has given rise to a dual priority focus of efforts to promote rural development and to tackle social exclusion. Some of the mechanisms to foster inclusive growth are to provide infrastructural supports to fish farmers. For inclusive to be realized, rural development must be the priority in public plans and funds.

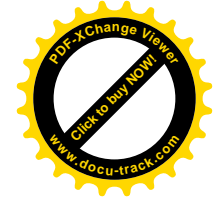
Fish farming may not be for the poorest but ways should be explored by which the poor can gain access to appropriate technologies as part of a livelihood diversification strategy rather than a production-led strategy. Assistance needs to be provided for the development and implementation of sectoral plans and enabling legislation to developing countries for the planned, integrated use of resources and production of benefits for the poorest. Employment



generation in developing countries needs to be promoted through adding value to fish products by processing.

In the developing countries fish is the single largest animal protein for augmenting the nutritional standard of human diet. It is also one of the most important commodities of economic value to its producers and sellers. In the latter half of the twentieth century there has been a phenomenal growth in production and trade in fisheries. However, evidence from around the world fisheries sector suggests that, as we are in the 21st century, the majority of fish stocks will be over fished and increasingly impacted by degraded aquatic environment. All these are going to happen due to human activities. In the current transitional state, while fisheries scientists are seeking new technologies to improve state of fish production in captivity and to manage natural stocks in better ways, the time has come to frame policies and measures, whereby we might strive to increase and sustain the supply of fish for consumption and raise economic benefit from this sector. This is an area where significant policy improvements are needed at the Government level.

During the several decades, aquaculture has expanded, diversified, intensified and made technological advances. The potential of this industry to enhance local food security, alleviate poverty and improve rural livelihoods has been well recognized. Fish farming shares many similarities in concept to many land based agriculture industries such as cattle farming and many of the same management techniques are used in aquaculture. Like more traditional forms of agriculture the goal of commercial fish farming is to maximize healthy and robust production at a minimal cost to maintain a profit margin. fish Farming is a non resource extractive food sector that is sustainable, renewable and provides safe high quality food products to consumers while creating considerable benefits for the general population. Based on science and technology, it is a market driven sector that has emerged to provide consumers with value, taste and products similar to that expected from other food role to the wild



fishery by making possible restocking and enhancement activities and by filling a complimentary niche in export markets. Fish farming requires clean growing waters to maintain a good level of production. Therefore, the industry encourages environmentally friendly practices and has taken many practical steps to protect the local environment. In fact without ensuring protection of the environment, itself, the industry would not flounder. Such safeguards include government measures controlling the health protection, better site selection, and actions to minimize fish escapes and prevent waste discharges.

Socio-economic milieu under which the inland fishermen operate is not conducive enough to attract credit and infrastructure support for required modern crafts and gear from traditional banking and financial Institutions. A sector's ability to attract finance and especially loanable funds depends largely on evaluation of risk elements by prospective funding agencies. The migratory character, seasonality of fishing activity and unstable catch composition of capture fishery does adversely affect investment appraisal and assessment of funding possibilities because of various reasons. There is an inescapable need to evolve some distinct criteria for financing the capture and culture based capture fisheries of inland open waters where the input-output relations are relatively less precise. This would need evolving a new set of criteria for the creditworthiness and repaying capacity of such fishers.

The Asian countries contribute about 60 per cent of the total aquaculture production and India occupies second position in the world after China. It is estimated that out of about 24.38 lakh tones fish production in the country from the inland sector during 1997-98, about 19 lakh tones was contributed by aquaculture and the remaining from capture fisheries. This was possible due to fisheries/aquaculture extension activities. Adopting the integrated approach to fish farming taking into account the need for sustainable fish farming has been the main objective of fisheries extension programmes. Besides enhancing the production of fish and the productivity of fish



farmers, fisheries extension programme has also been aiming to generate employment and higher incomes in aquaculture sector so as also to improve the socio-economic condition of traditional fish farmers. However, aquaculture extension faces several challenges ahead. Providing sustainable livelihood opportunities for ever-increasing population of rural communities is perhaps the biggest challenge faced by the country. Fish farming will have to play an important role in meeting this national challenge. Essential ingredients required for contributing to rural livelihood development through aquaculture are adequate natural and human resources, infrastructure facilities, viable technologies, and research support. There is need at this time is a dedicated extension services system to assist the large population of resource poor rural communities-target groups of aquaculture extension-to enable them to draw benefit from fisheries and aquaculture. Also there is a need to switch over from directive to participatory extension. Experts now feel that there is a need to have a comprehensive aquaculture extension policy that fully supports coordination between education, research, input supply and fisheries extension services, all aiming together to achieve the desired goal of sustainable aquaculture.

6.3 FISH FARMING SYSTEMS FOR SUSTAINABILITY

Sustainable development and sustainability are complex issues that are difficult to define and apply to fish farming. The term sustainability has been defined in various ways but perhaps the most widely used is based on the definition of 'sustainable development' in the Brundthland report: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The Food and Agricultural Organization of United Nation (FAO), on particular, recognized that increased capacity at the national level is required to achieve sustainable development by including the need for institutional change in definitions of sustainable agricultural



development (FAO, 1995). The recognition that institutions are important highlights the need for education and training, effective institutional arrangements and a legal and policy framework to underpin sustainable development of agriculture, and indeed aquaculture.

There should be a system approach to fish farming business through the use of a structured, systematic approach to operation and business approach. In fish farming, software (fish farmers) is more important than the hardware or technology. There are many facts and variables, so in order to understand and manage the system, things have to be simplified and systematized.

Aquaculture can be socially, environmentally and economically sustainable and, contribute to the production of food and rural development, provided appropriate farming systems and management practices are adopted.

The multidisciplinary and multisectoral system approach recognizes that technical, economic, social and environmental issues, as well as institutional factors, have to be considered in the process of development and management of fish farming. The farmers should try to understand the way the fish farm operates and the interactions between components, and serve as a basis for better management. This multidisciplinary approach requires different skills and, as such, also needs cooperation among different disciplines and information exchange among different stakeholders.

There is a need for better information on fish farming systems and promotion of more effective information exchange between stakeholders. Information requirements include social and environmental interactions at the farm level, development of better practices targeting important environmental and social impacts, and seeking incentives for farmers to adopt better farming practices.

From the present study it is found out that most of the fish farmers are educated, so it easy from the policy maker side to develop and promote agricultural entrepreneurship among the educated youth



of the state to reduce unemployment. This can further provide food safety and improving economic conditions of the people of the state. In inland rural areas, increasing attention is being given to integrate fish farming with rural development and special area plans. Increasing emphasis is so being given to promote fish farming for poverty alleviation by promoting self help group of fish farmers among the people of the state. Certain training programs are conducted by the department of fisheries to promote fish farming in the state. But more emphasis should be given on fish farming for development rather than development of fish farming in the state and this will lead to the fundamental changes in the approach to promotion of fish farming in the coming year. At the state level, government policy, and institutional and capital are the most important factors in the development of fish farming.

6.4 LOKTAK LAKE- THE MAIN SOURCE OF FISH:

Loktak Lake located between $93^{\circ} 46'$ and $93^{\circ} 55'$ E and from $24^{\circ} 25'$ to $24^{\circ} 42'$ N is the largest natural fresh water lake in North East India. It is the lifeline of the people of Manipur by providing livelihood and improving socio-economic conditions of the people. The lake is oval shaped with maximum length and width of 32 km and 13 km respectively. The depth of the lake varies between 0.5 and 4.6m with average recorded at 2.7m. The lake covers an area of 287 sq km which is mainly dictated by maintenance of water level at Ithai at 768.5 m above MSL. There are 14 hills located in the Lake varying in size and elevation appears as islands in the southern part of the lake. The most prominent among these are Sendra, Ithing and Thanga islands. The characteristic feature of Loktak is the presence of floating islands, locally called *phumdis*. A large population living in and around the lake depends upon its resources for their sustenance. The lake is rich in biodiversity and has been designated as a Wetland of International Importance under Ramsar Convention in 1990. The lake is an important source of water, fisheries and vegetation providing



sustenance to a large population dependent upon lake resources for their sustenance. The lake water is used for irrigation, domestic purposes and power generation.

The lake has also been the breeding ground of a number of riverine fishes and continues to be a vital fisheries resource. Over exploitation, indiscriminate methods of fishing, extensive growth of *phumdis* and weeds are responsible for decrease in fisheries production. Construction of Ithai Barrage across Manipur River has interfered with the migration of fishes from Chindwin-Irrawady River system of Myanmar and consequently brought changes in the species composition.

Loktak Lake is the largest fishery resource of the state accounting for more than 50% of its fish producing area. Prior to 1950s', the lake contributed 60% of the total fish production of the state of which migratory fishes from Chindwin - Irrawady River system contributed 40% of the total capture fisheries. Currently, it accounts for merely 11% of the total state fish production.

High rates of population growth in the valley accompanied by insignificant growth in the secondary and tertiary sectors have led to stresses on the natural resource base of the state including fisheries. Over a period of time the availability of fishes and other products, such as vegetables, fuel and fodder from the lake has declined causing immense hardships to the communities. There has been a significant decline in fish landing which along with the increase in fisher population has seriously impacted the livelihoods of these communities. Changes in fishing practices, use of exploitative fishing techniques and inadequate marketing infrastructure have further led to their poverty.

Annual fish landing of Loktak Lake varied between 1,261 and 1,685 MT, during 1999-2003. Fish population of the lake is dominated by exotic major carps (44%) and Indian major carps (27%). Minnows contributed significantly (14%) to the total fish landing. Other contributing groups were murrels, catfishes and minor carps.



The largest source of fish is the Loktak Lake. Loktak Lake is a mixture of both capture and culture fishery or fish farming. High rate of population growth in the valley accompanied by insignificant growth in the secondary sectors have lead to severe stresses on the natural resources base on the state including fisheries there has been a significant decline in fish landing from the lake along with an increase in population of fishermen and fish farmer, impacting the socio-economic condition status of the communities.

Changes in fishing techniques and inadequate market infrastructure have seriously affected the economic gains from fishing. Ima market which is located in the hub of the Imphal town is the main market of the state. As Loktak is the main source of fish, there are 11 markets in and around Loktak Lake. Moirang is the largest market, accounting for 29.6% of the total fish catch followed by Bishenpur(14.06%),Thanga (13,9%) Mayang Imphal(9.6%). These four market account for around 70% of the total fish catch. Of the 11 markets around Loktak, none have storage facilities and there is only one boat landing jetty. Men and women both do fishing, only women are involved in fish processing and marketing (Loktak Development Authority, 2003).

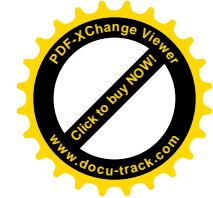
As the economic condition of the people of Manipur is very poor, they depend on the credit for any business. In the absence of proper credit facilities, traditional fishermen have to resort to local money lenders. High interest rate forces these fishermen into a debt trap and a major portion of their incomes is used in debt repayment making the condition worst.

Fishers living in and around the Loktak lake should be encouraged to take up fish farming so as to encourage agricultural entrepreneurship and improve the condition of the people as it has a large potential of augmenting fish production in the state.



6.5 NGARI: AN INDIGENOUS FERMENTED FISH PRODUCT OF MANIPUR

Traditional processing of fish such as fermentation, salting, drying and smoking are the principal methods of fish preservation in Southeast Asia (Soibam, 2010). In Northeast India, fermentation is one of the oldest and most economical methods for producing and preserving food. In addition to preservation, fermented foods can also have the added benefits of enhancing flavour, increasing digestibility, improving nutrition value and pharmacological values. Each fermented product is associated with unique group of micro flora which increases the level of protein, vitamins, essential amino acid and fatty acids (Jeyaram *et al.*, 2009). Indigenous fermented foods contribute a large portion of daily food intake in North-eastern states of India. In Manipur, traditional foods and beverages like *Hawaijar*, *Soibum*, *Soidon*, *Ngari*, *Hentak*, *Ziang sang*, *Atingba* and other fermented beverages has been consumed as a regular food in different recipe over a long period of time (Jeyaram *et al.*, 2009). Among these, *Ngari* a fermented fish product have been most widely used by the peoples of Manipur. *Ngari* is gifted to the people of the Manipur since decades for its enormous values. It is one of the essential ingredients of every household in the area accounting to its taste, therapeutic properties and strong appetizing nature. Due to its ever-growing popularities, its value as a food ingredient has grown into other states of the North-eastern region. *Ngari* is a fermented fish product locally prepared from some fish species mainly the *Puntius* species. *Ngari* is a major ingredient in *iromba* preparation, a pungent vegetable and bamboo-shoot stew. "*Seedal*" is another fermented fish product very popular in state of Tripura (Armaan *et al.*, 2003). It is also prepared from *Puntius* species but the only difference between these products is in the size of fishes used in its preparation In *Ngari* preparation the fishes used are of comparatively small sizes ranging from 5-10 cms. In texture *Ngari* is comparatively softer than *Seedal* which has a



comparatively hard solid texture. The price of ngari is ₹250-300 per kg.

Manipur has the opportunity and potentiality of developing entrepreneurship through ngari business. It has a great demand in the state and also in other part of the country for its high medicinal value. It can be further developed through proper fish farming of the basic type of fish required for making ngari in the state. The ngari entrepreneur can also export their product to other parts of the country and also to the neighboring country.

6.6 ENTREPRENEURSHIP DEVELOPMENT THROUGH ORNAMENTAL FISH FARMING

Keeping colourful fishes, popularly known as ornamental fish or aquarium fish is one of the oldest and most popular hobbies in the world but this can be commercialized to earn a living for the educated youth. The Indian ornamental fish sector is a small but vibrant segment, with potential for tremendous growth and large-scale gainful employment generation. At present the market is mainly domestic. In India the North Eastern states is playing a major role in the ornamental fish market; The North Eastern states contribute around 85% of the total market and the remaining comes from the southern states of India. (Ingochouba Lukram, 2005).

At the moment Manipur has between 80 and 100 species of fish which are and can be used to adorn the aquariums of many homes. Professor Waikhom Bishwanath of the Life Science Department of MU said that at present there are five fish species found in the rivers in the hill districts which are highly prized for their ornamental values in foreign countries (Sangai express, 2012). Some of the fishes which can be used for ornamental fish are Botia species (locally known as Sareng Khoibi, the other species which are highly prized include Acamtopsis (Ching Ngakrizou), Dazio Nemchulines (Ngatup), Rasbora and Botia (Sareng Khoibi). Different species of fish have been found at the Barak



river, Iril river, Chakpi river and rivulets and springs in the hill districts.

As Manipur has a large potential of ornamental fishes but remain unexploited for developing market opportunities. Several agribusiness opportunities can be explored through systematic collection and selling of indigenous ornamental fish (wild catch) as well as rearing of exotic ornamental fish species (captive breeding) suitable in the region. The agribusiness opportunities can be realized at every stage, namely, production, marketing and conservation of ornamental fishes. With the initiatives by the government and other concern authorities such as providing incentive to establish ornamental fish production unit, considerable private investment can be attracted to this industry, which would generate additional employment opportunities educated youth. Public-private partnership can be encouraged through establishment of ornamental fish production units in different parts of Manipur. Rural youth should be encouraged to take up ornamental fish farming from the natural resources available in the state to make the ornamental fishery sector more vibrant and remunerative and provide employment opportunities and income generation. It should also be developed not only for domestic market but also for generating foreign exchange. Ornamental fish farming is the industry full of promise for the future. Public aquarium can also be made to develop ornamental fish farming in the state of Manipur.

6.7 PROSPECT OF ECO-TOURISM THROUGH FISH FARMING

Ecotourism is an emerging industry and has the potential to spread in many countries of the world. A number of countries are promoting aquaculture-related ecotourism. Nature eco-tourism is the travel through and enjoyment of the natural world, its seasonal cycles and events, carried out in a manner that promotes the protection of natural and human communities. Integrate fish farming with tourism is of great interest in many country. Recreational fisheries in lake and



reservoirs and also on ponds (like put and take) can also be developed to attract tourists from all over the world. As fish farming is an old age occupation and it have different types of fishing. The traditional methods of fishing can also be preserved and develop to attract tourist. To save Loktak Lake, Loktak festival is organized is the State and this type of festival can develop eco-tourism and can improve the socio-economic conditions of the people of Manipur.

6.8 PROSPECTS OF INTEGRATED FISH FARMING IN MANIPUR:

Integrated fish farming is a system of producing fish, meat, egg, milk, vegetables and other allied products within a farm itself on an economic scale (Rath, 2000). It is also a system of farming fish with other agriculture and allied activities within a single farm. Inland fish farming in conjunction with other farming like rice, poultry, dairy and livestock rearing is a compatible business and can provide a fish farmer a ready source of manure to fertilize the pond (Jhingran, 1991). It also provide additional source of income to fish farmers. Buhuah, 2000 also encouraged the adoption of fish farming in Assam. Goswami (2004) study has clearly indicated that rice fish culture is a viable, environment friendly, low cost, low risk additional economic activity with multiple benefits including increased income and greater availability of fish to rural farming community. Kujur (2005) also said that integrated pig-cum-fish farming is also a profitable system of fish farming and it also increase the supply of animal protein and also employment among the rural people. The fish farmer of the state of Manipur could take up integrated fish farming in their farm not only to make the farm an independent unit and also to fulfill the demands as input to other structural units but also supply additional food, provides employment and additional source of income to fish farmers.