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DOUBLING FISH FARMER INCOME THROUGH BLUE REVOLUTION

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Abstract:

Fisheries is a sunrise sector with varied resources and potential, engaging over 14.50 million people at the primary level and many more along the value chain. Transformation of the fisheries sector from traditional to commercial scale has led to an increase in fish production from 7.5 lakh tonne in 1950-51 to 107.95 lakh tonne during 2015-16, while the export earnings from the sector registered at around 33,441 crore in 2014-15 (US$ 5.51 billion). The sector registered an overall annual growth rate of about 4% during the 11th Five Year Plan period. It has contributed about 0.91% to the National Gross Domestic Production (GDP) and 5.23% to the agricultural GDP (2014-15). Constituting about 6.30% of the global fish production and 5% of global trade, India has attained the second largest fish producing and second largest aquaculture nation in the world.

Sustainable livelihood is top priority for the nation today over half the country's working population is employed in agriculture and sustained as well as steady growth in rural income is critical for a positive ripple impact on the manufacturing and services economics of the nation. However, this diversification has been largely driven by a few states only, like Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra and west Bengal.

Diversification needs to be more geographically widespread and augmented through further thrust on processing of perishable. Government support in identifying commodity- specific cluster, developing infrastructure and encouraging entrepreneurship shall go a long way in ensuring diversification led sustainable livelihoods.

India is bestowed with varied potential resources in the form of rivers and canals (1.95 lakh km); floodplain lakes (7.98 lakh hectare); ponds and tanks (24.33 lakh hectare); reservoirs (29.26 lakh hectare) and brackish water (11.9 lakh hectare). The marine fisheries resources is estimated at 4.41 million metric tonne and its activities spread along the country's long coastline of 8118 km with 2.02 million square km Exclusive Economic Zone (EEZ) and continental shelf area of 0.53 million sq.km. Foreseeing the high potential in the sector, the Hon'ble Prime Minister has called for "a revolution" in the fisheries sector and has named it as "Blue Revolution".

2. BLUE REVOLUTION - NEEL KRANTI MISSION

Blue Revolution, the Neel Kranti Mission has the vision to achieve economic prosperity of the country and the fishers and fish farmers as well as contribute towards food and nutritional security through full potential utilization of water resources for fisheries development in a sustainable manner, keeping in view the bio-security and environmental concerns. The Neel

Kranti Mission, 2016 (NKM 16), being the year in which the Vision has been given by the Prime Minister will have multi-dimensional approach to all activities

concerned with development of the fisheries sector as modern world class industry in India. It will focus on tapping the full

resources, both inland and marine. Substantially increasing the share of Indian fisheries in the export area would be a key goal. It will ensure doubling the income of the fishers and fish farmers with inclusive participation of the socio-economically weaker sections and ensure sustainability with environment and bio-security.

3. VISION

"Creating an congenial environment for integrated development of the full potential of fisheries of the country, along with substantially improvement in the income status of fishers and fish farmers keeping in view the sustainability, bio-security and environmental concerns."

4, MISSION

(i) Formulation of a Neel Kranti Mission Plan (Blue Revolution Mission Plan) for tapping the full potential of the inland and marine culture fisheries of the country by developing it as a professional modern world class industry .

(ii) Ensure doubling of income of fishers and fish farmers of the country

(iii) Ensure sustainability of, bio-security and address environmental concerns for enabling sustainability of the fishing industry

5. OBJECTIVES

(i) To fully tap the total fish potential of the country both in the inland and the marine sector and triple the production by 2020

(ii) To transform the fisheries sector as a modern industry with special focus on new technologies and processes

(iii) To double the income of the fishers and fish farmers with special focus on increasing productivity and better marketing postharvest infrastructure including e-commerce and other technologies and global best innovations

(iv) To ensure inclusive participation of the fishers and fish farmers in the income enhancement

(v) To triple the export earnings by 2020 with focus on benefits flow to the fishers and fish farmers including through institutional mechanisms in the cooperative, producer companies and other structures

(vi) To enhance food and nutritional security of the country

6. STRATEGY - CENTRAL SECTOR ASSISTANCE SCHEMES

The Ministry of Agriculture and Farmers Welfare, Department of Animal Husbandry, Dairying & Fisheries has accordingly restructured the scheme by merging all the ongoing schemes under an umbrella of Blue Revolution. The restructured scheme provides focused development and management of fisheries, covering inland fisheries, aquaculture, marine fisheries including deep sea fishing, mariculture and all activities undertaken by the National Fisheries Development Board (NFDB).

e The restructured Plan Scheme on Blue Revolution: Integrated Development and Management of Fisheries" has been approved at a total central outlay of Rs.3000 crore for implementation during a period of

five years (2015-16 to 2019-20) with the following components:

(1) National Fisheries Development Board (NFDB) and its activities,

(ii) | Development of Inland Fisheries and Aquaculture,

(iii) | Development of Marine Fisheries, Infrastructure and Post-Harvest Operations,

(iv) Strengthening of Database & Geographical Information System of the Fisheries Sector,

(v) Institutional Arrangement for Fisheries Sector

(vi) Monitoring, Control and Surveillance (MCS) and other need-based Interventions

(vii) National Scheme of Welfare of Fishermen

7, KEY INITIATIVES UNDER BLUE REVOLUTION

e Double fish production with increased farmer income

e Increased productivity by intensive and technology driven utilization of water resources e Modernize fisheries through innovative technology infrastructure and marketing support e Increase employment with higher export earning

e Ensure food and nutritional security

8. SUGGESTION FOR ENHANCING INCOME OF FISH FARMER

The aim of this exercise is to suggest technological and institutional reforms to double farm incomes in Kerala within a narrow period of five years. In this endeavor, this proposal is an attempt to combine and integrate all the best known practices in the most harmonious manner leading to assured high yield. Simultaneously, it looks at another aspect of reducing expenditure in the farm front through sustainable and cost effective technologies and through improved delivery system to ensure better farm income. With a focused approach that enables optimal use of resources and by adopting technically superior and economically viable farming practices, the state can achieve an era of bountiful opportunities in farming. In short, the proposals are aimed at realizing systems efficiency at its best not only for the farmers to double incomes, but also realize self-sufficiency in food

production through ecologically safe technologies. For this a set of proven crop/ enterprise specific technologies and policy interventions are presented in this paper.

8.1) Use of low coast feed’

The global aquaculture production will continue to increase, and much of this will occur in the developing countries of Asia and Africa, through the expansion of semi-intensive, small- scale pond aquaculture. Nutrition and feeding play a central and essential role in the sustained development of aquaculture and, therefore, fertilizers and feed resources continue to dominate aquaculture needs. The feeding which are critical for sustainable aquaculture production in both industrialized and developing countries, e.g.: nutrient requirements of fish and their supply under practical farming conditions, availability and supply of feed resources and their implication on development of aqua feeds, forecasting of demand and supply of marine resources, and maintenance of environmental quality and sustainability of aquaculture systems. While discussing the nutrient requirement of fish under farming

conditions, the possibility of accessing existing databases on nutrient requirements is examined, along with their application for establishing general nutritional principles. Particular emphasis is placed on understanding the contribution of naturally available food in semi-intensive aquaculture and its role on the development of on-farm feed management strategy.

Recommendations for improvement of income in fish farming by reducing aqua feed costs, researchers and farmers are investigating ways to lessen resources spent on feeds by feeding less and feeding differently. “Green water” technology applied through pond fertilization generates food items produced naturally in culture water. Further approaches include product substitutions through alternative sourcing of feed ingredients, increasing the nutritive content of feed to grow healthier fish and improving locally produced, low-cost feeds by the process of palletization. Technology developed for low coat aqua feed to be made available to the fish farmers for use in farming system for example incorporation of seaweed gracilaria, ulva, aquatic weed lemna, eichornia and probiotics to reduce the coast of production.

8.2) Monosex culture

The biggest challenge in monosex culture fish farming is a different aged and sized fish in same pond due to their unconditioned propagation. There are some cultivable fishes/prawns and shrimps where either male or female is having better growth performance than male or female can be produced by hormonal or genetic manipulation and made available to the farmers for obtaining higher yield. e.g. male tilapia fish grown faster and gain good weight compare to female tilapia, one should consider raising male tilapia fish by separating female which is known as monosex fish culture. As the male tilapia fish is well adoptedto supplementary feeding and due to its rapid growth there is huge profit in commercial tilapia fish farming. This fish has higher demand in local as well as commercial market.

8.3) Production of viable hybrids

Hybridization is only one tool to improve aquaculture production and will require knowledge of the genetic. structure of the broodstock, good broodstock management and monitoring of the viability and fertility of the progeny. Hybridization does represent a genetic modification wherein genes are moved between different species.

Viable hybrid fishes have been produced for aquaculture and stocking programmes to increase growth rate, transfer desirable traits between species, combine desirable traits of two species into a single group of fishes, reduce unwanted reproduction through production of sterile fish or mono-sex offspring, take advantage of sexual dimorphism, increase harvestability, increase environmental tolerances, and to increase overall hardiness in culture conditions. Technology is available for production of viable hybrids of indian major carp and exotic carp to be made available to the fish farmers for obtaining higher yield. Hybridization _ between some species of tilapias such as Oreochromis niloticus x O. aureus results in the production of predominantly male offspring and reduces unwanted natural reproduction in growout ponds. The African x Thai catfish hybrid (Clarias gariepinus x C. macrocephalus) is preferred to the Thai catfish because it has the desired flesh quality of the Thai catfish and the fast growth of the African.

8.4) Production of sterile fish

The production of reproductively sterile fish (triploids) is very useful in responsible fish farm management and limits the genetic risk

associated with the escape of domesticated fish into the wild. These farmed populations cannot interbreed with wild populations and therefore do not pose a threat to the natural biodiversity. Growth performance in some species may also be improved, in comparison to that of diploid fish. It improved that about 30% energy is utilized by fish in the activities of reproduction and gametogenesis. If hormone manipulated sterile fish (tilapia) are produced, yield 30% more growth as the energy which was used for reproduction and gametogenesis can be diverted for somatic growth.

8.5) Transgenic fish production

Transgenic fish species can be routinely produced by transferring foreign DNA into developing embryos via microinjection or electroporation. This technology offers an excellent opportunity for modifying or improving the genetic traits of commercially important Fishes, mollusks, and crustaceans for aquaculture. Transgenic fish technology has great potential in the aquaculture industry. By introducing desirable genetic traits into fishes, mollusks, and crustaceans, superior transgenic strains can be produced for aquaculture. These traits include faster growth rates, improved food conversion efficiency, resistance to some known diseases, tolerance to low oxygen concentrations, and tolerance to extreme temperatures. Transgenic Fish produced by introduction of DNA from fast growing species gives higher yield, technology is available need to be made available to the fish farmer.

8.6) Selective breeding

Selective breeding is a breeding programme that tries to improve the breeding value of the population by selecting and mating only the best fish (largest, heaviest, those with the desired colour, etc.) in the hope that the select brood fish will be able to transmit their superiority to their offspring. The result of selective breeding is increase yield of stock and other traits particularly for disease resistance. Aquaculture farmers should be stimulated to start breeding programs for major breeds. This will increase productivity and better utilizing of natural resources. In addition, the welfare of the animals will be improved. E.g, As CIFA, Bhubaneswar developed Jayanti Rohu through selective breeding which gives better yield (18% more as compared to normal rohu). But, unfortunately availability of fish seeds of J ayanti rohu to the fish farmers for cultivation is only restricted in some parts of the country. It is envisaged to develop a mechanism of supply of quality fish seeds of improved variety is ensured and fish farmers should be encouraged to adopt using such fish seed to enhance their production and profitability.

8.7) Soil health card

Soil Health Card Scheme is a scheme launched by the Government of India in February 2015. Under the scheme, the government plans to issue soil cards to farmers which will carry crop-wise recommendations of nutrients and fertilizers required for the individual farms to help farmers to improve productivity through judicious use of inputs. All soil samples are to be tested " in various soil testing labs across the country. Thereafter the experts will analyses the strength and weaknesses (micro-nutrients deficiency) of the soil and suggest measures to deal with it. The result and suggestion will be displayed in the cards. In Gujarat the implementation of Soil health card scheme is gaining momentum and farmers are benefitted. Similarly, it is proposed to implement this scheme for the benefit of Fish farmers as in culture systems for maintaining pond productivity Chemical fertilizers are used.

8.8) Promotion for aquaculture in larger water bodies like lake and reservoirs

At present reservoir and lakes are leased to the fishermen for stipulated time. They stock fish seed in reservoir and lakes but fishermen are not sure how much production they will get because, large water bodies cannot be managed unlike ponds. Therefore, in such water bodies floating net cage system should be encouraged to adopt for enhancing controlled fish production.

8.9) Utilization of rivers and canals for cage and pen farming

India has very good freshwater resources amenable for fish production. About 29,000 kms of river and canal system exist in the country. These resources are not properly utilized for aquaculture purpose. It has been utilize by using cage farming in shallow part of the rivers and canal for enhancing fish production. Fish cages are made using a few cheap materials or high quality material that is covered in netting, and floats and cages rise and fall in the water. Cages have a top cover to prevent fish jumping and escaping, or being caught by birds. Cages and pens

have several advantages over other methods of culture. Because: they use existing water bodies, require comparatively low capital outlay and use simple technology. It give high production and yield to fish farmers in less investment.

8.10) Promotion of Integrated Aquaculture system

Integrated fish farming is a system of producing fish in combination with other agricultural/livestock farming operations centered on the fish pond. The farming sub-systems e.g. fish, crop and livestock are linked to each other in such a way that the byproducts/wastes from one sub-system become the valuable inputs to another sub-system and thus ensures total utilization of land and water resources of the farm resulting in maximum and diversified farm output with minimum financial and labor costs (M. Mokhlesur, et al., 1992). Integrated rice—fish culture, an age-old farming system, is such a farming system technology which could produce rice (source of carbohydrate) and fish (source of high quality animal protein) sustainably at a _ time by optimizing scarce resource use through complementary use of land and water (Edwards et al., 1988; Frei and Becker, 2005). Integrated fish farming offers tremendous potential for food security and poverty alleviation in urban and perturbing areas. It is an efficient way of using the same land resource to produce carbohydrate as well as animal protein and important micronutrients concurrently or serially. Optimization of available natural resources use, Diversification of income generating activities, Improvement of soil fertility, Improved pest control with less use of chemicals (pesticides, fertilizers), Aquatic Biodiversity conservation and sustainable use could be enhanced (Ruth Garcia Gomez, 2011).

8.11) Adoption of Fish culture using genetically improved fish species

The increase in aquaculture production is a combination of area expansion and technological change. Technological change in aquaculture has largely taken place in the design of hatcheries and grow-out facilities and through increased dependence on formulated feeds or fertilizer, and improved management regimes. Unlike the development of high yielding varieties during the Green Revolution period, the genetic improvement of aquatic species lacks far behind. Until today, there are still relatively few examples of systematic genetic improvement of fish strains (Bilio

2007a, 2007b). Tilapia (Oreochromis niloticus), a freshwater fish originating from Africa, was introduced to several Asian countries in the second half of the last century because of its favorable growth characteristics and ease of cultivation (Welcomme 1988). By the 1980s, tilapia aquaculture had reached high importance for income earning and food security in a number of Asian countries. However, the genetic status of the available strains was poor mainly because of inbreeding and introgression of undesirable genes into the existing brood stocks. Thus a selective breeding effort for tilapia was started in 1988 by the World Fish Center (then ICLARM) together with (inter-)national partners. The outcome of the selective breeding effort was a tilapia strain called *GIFT" (genetically improved farmed tilapia) which was available by 1993 and showed significantly higher growth rates in on-farm trials than the original wild and the previously cultured strains (Dey et al. 2000). Selective breeding of rohu has been initiated for

the first time in India by ICAR-CIFA in collaboration with Institute of Aquaculture Research (AKVAFORSK), Norway to genetically improve rohu for higher growth. Rohu (Labeo rohita) has been chosen as the candidate species for selective breeding as its consumer preference is

very high and also it appears to grow slower than other Indian Major carps in multispecies carp culture system (ICAR-CIFA).

8.12) Reduction of culture period of Indian/Cultivable carp through stunted fingerlings.

Fish fry are rear at high stocking density @ 50,000- 70,000 fry/ha and fed with natural food for 6-12 months produce stunted growth fish fingerlings. Pond selection for produce stunted fish fingerlings: Pond size: 0.05-0.20 ha, Pond depth: 1-1.5m (Vishal et al., 2017). Among the different modifications adopted by the farmers to suit their needs, use of stunted carp fingerling round the year is important (Veerina ef al., 1993). The stunted fingerling when stocked in grow- out ponds at normal stocking density with optimal feeding and fertilization exhibited compensatory growth in terms of weight gain and survival in shorter culture period. Application ' of compensatory growth phenomenon by using stunted carp fingerling has been proved to have greater potential in increasing fish production. However to produce stunted fish, advance fry or fingerling are stocked at higher densities with suboptimal feeding and fertilization, rendering the fish to stressful conditions. Crowding (Klinger er al., 1983) and inadequate nutrition (Blazer, 1992) have been considered as important stressors in aquaculture practices.

Recommendation:

e At present Fish/Shrimp farmers are getting electricity for farm operation on Industrial basis which causes higher operational cost. Since, aquaculture is also an agriculture under water therefore, electricity should be provided at subsidized rates at par with the agriculture farmers so that, fish farmer's income can be enhanced,

e The monsoon pattern has changed and rainfall has become erratic in the state. Occurrence of drought and flash floods has become more common in the state. The effect of climate change and weather extremes on agricultural production and related areas is to be seriously researched and programme for mitigating the same needs to be designed. The early warning systems of climate abnormalities are to be further strengthened.

e The existing extension system of Central, State Fisheries department and State Agricultural Universities may be strengthened to provide information of improved farming technologies to the door step of the fish farmers for adoption in the farming system, so that, farmers can get better returns of their crop.

e All the State Fisheries Department should ensure to supply of improved varieties of fish/Prawn/ Shrimp seeds to the farmers at reasonable cost.

e It is recommended that, the technical staff of State Fisheries Department should be trained about the fish farming technologies so that, they can provide suitable guidance to the fish farmers for the adoption of modern technology in their farming system;

State Fisheries Department should promote floating net-cage culture in larger water bodies to enhance fish production and farmer's income. The cage farming technology has immense potential to be taken up along the coasts of maritime states. It is already being popularized through a series of demonstrations and participatory farming in the maritime states of India. A number of farmer groups have started adopting it, mostly under group farming approach. The National Fisheries Development Board (NFDB) has included marine cage farming among its developmental schemes with inputs from CMFRI. Imparting periodical training to the farmers to upgrade farming technologies. Strengthening of Extension Machinery to provide suitable technology to the fish farmers. To create awareness to adopt fish farming in the unutilized area.

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