

## Fisheries Sector: Research and Development Strategies in Nepal

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### Abstract

Inland fisheries an ancient part of our civilization gradually developing as tradition, science, art and business of freshwater fish now stepping towards semi-commercialization in Nepal. Fisheries have been the means of livelihood to millions of farmers and several ethnic communities dependent on fishing since tradition. Taking the advantages of such traditional knowledge in blend with scientific knowledge, the modern fish farming was initiated around 1947 in Nepal. Since then, fisheries sector started to receive investment under the government plans especially during 1983-90, when Asian Development Bank supported the fisheries development in Nepal. Later there was slackness in investment in the fisheries subsector. Despite of that contribution of fisheries in Gross Domestic Production (GDP) and Agriculture Gross Domestic Production (AGDP) increased up to about 0.9% and 2.4%, respectively. This increment probably reflected the investment by Asian Development Bank, Government of Nepal, Japan International Cooperative Agency, some donor's efforts and farmers cumulatively. Since the government and donor's investment in later years were small however, indicated that farmers themselves were interested to invest in fisheries. It implies, if government prioritizes to investment on fisheries, the fisheries sub sector could be a reliable source of food and nutritional security, livelihood and job opportunities. Based on these facts, we propose a national strategy for further research and development of fisheries sub sector by which the agenda of food and nutritional security could be achieved by mobilizing aquatic and fisheries resources.

### 1. Introduction

Generally political reforms aspires new expectations for rapid economical development. An agrarian society of Nepal where more than 85% of the people live in villages might have similar anticipation. It is therefore commendable to put efforts in agriculture sector for future economical development. However, all the major area of the agriculture including that of sub-sector fisheries should be reformed focusing on mobilization of human resources according to the doctrine of social inclusion assuring access, participation, equity, gender, citizenry to all citizens (Wang 2003).

### 2. Background

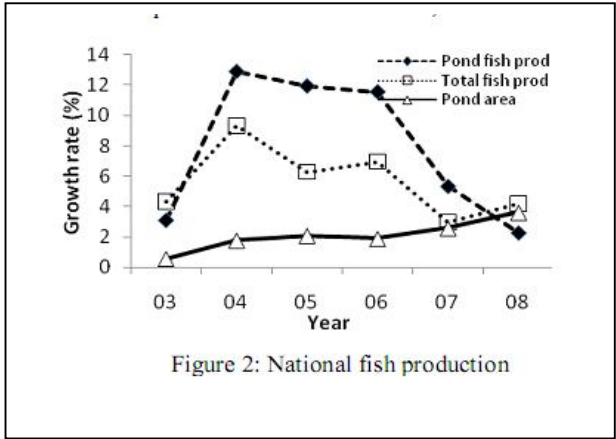
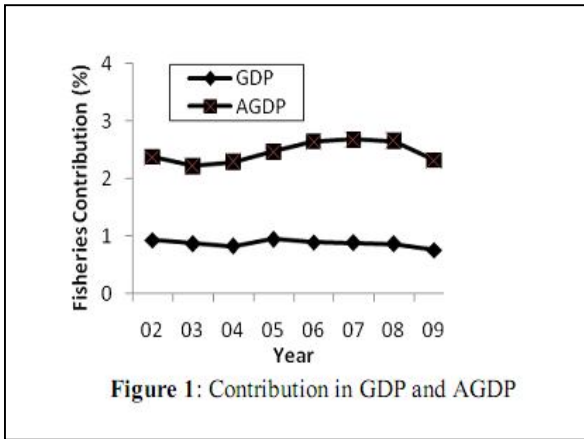
Fisheries program under the Agriculture Development Program was initiated around 1947 in the form of fisheries unit. The success had led to upgrade the fisheries sector with the appointment of national staff in 1952 (Rajbanshi 1995). This initiation was continued to establish the fish farms in between 1955/56 – 1974/75 at Godawari, Parawanipur, Tarahara, Janakpur, Pokhara, Bhairahawa, Hetauda, Bhandara, Balaju, Fatehpur, Trishuli and Dhangadhi. Potential studies of various districts / areas were carried out during the period of 1956 – 72. High valued and fast growing fish were imported in between 1956 – 68 (Rajbanshi 1995; Gurung 2005). The national human resources were oriented or developed with bilateral as well as multilateral technical and financial assistance (Baral 1992).

The development of basic infrastructures and human resource resulted good impact (ADB 1995). As a result a number of fisheries development projects for enhancing the technical knowhow, adoption of standardized technology and implementation of production programs were launched primarily in the private sector. The successful launching of production programs lead to semi-subsistence production projects (Aquaculture Development Project, Phase I and II) with the assistance of FAO/ UNDP – Asian Development Bank which has successfully turned the country from net importer of fish to exporter of fish though yet not self sufficient (ADB 1995).

The fisheries sector received investment from Asian Development Bank (ADB) in 1981 which lasted for the next 10 years. Under which warm water pond fish culture was promoted in 21 districts of terai and inner terai (Shrestha 1992; Thapa & Pradhan 1996). In later years the sub sector fisheries always remained in low profile for investment, except few specific supports from International Development Research Center (IDRC) Canada; Japan International Cooperation Agency (JICA), and Department of International Development (Gurung 2007; Gurung et al. 2005). However, in due course the sub sector successfully developed new technologies especially in the areas of cold water fish cultivation and scaling up fisheries technologies in mid hills (Swar 2002; Gurung 2008). This has not only opened the new horizons for development but overruled the view, Nepal as unusual place for aquaculture development being a predominantly mountainous country.

The new technological achievements have brought "paradigm shift" in our insights for fish production from Nepal. This has assured that variety of fish can be commercially produced from all over the country, if the sector is prioritized by adopting participatory approach among researcher, extension, and farmer. Visualizing these facts recently the vision document of Nepal Agricultural Research Council has given high emphasis to fisheries and aquaculture subsector and upgraded as one of the thematic areas including crops, horticulture, livestock and cross cutting research for development (NARC 2011).

Among various the ADB loan based project had been instrumental to popularize carp based fish culture. As an impact the contribution of fisheries sector has been increased in Agricultural Gross Domestic Production (AGDP) from earlier 0.9% in 1990s (Mathema 1992) to 2.4% within a period of 19 years (Fig 1). The growth rate of fisheries sector ranged from 3.9 to 9.6% per annum in between 2003 to 2008 (Fig 2), which should be considered since the country in this period was politically disturbed. In general, Nepal falls one of the least fish consuming countries comparing to its neighbors (), due to unavailability and poor access. Therefore, considering the market demands, public health, food and nutritional security perspective, the country should priorities fish production in its program. The total fish production is around 47 thousand metric ton in 2006/07, contributed through captured fisheries and aquaculture components by nearly 43% and 57 %, respectively (Fig 4; CBS 2007).



Besides, such a positive trend the demand of fish in the market is ever increasing. As a result Nepal has imported huge quantity of fish from outside the country. To fulfill the local demand of fish into the market and to control foreign currency on fish import. The prioritization of fisheries sub sector in national planning and program has been essential.

### **3. Statement of the problem**

Fisheries sub sector is one of the ignored areas of agriculture sector in Nepal, despite of high importance in regional countries for food, nutritional security, aquatic biodiversity conservation, governance, employment opportunities and sustainable development. Fisheries had been reflected in some of the national agricultural policies; however, a legalized national fisheries perspective plan is lacking. For the promotion of fisheries, there are agencies like Nepal Agricultural Research Council, Department of Agriculture; Institute of Agriculture and Animal Science (IAAS), NGO and INGOs, Cooperatives, Business organizations. However, due to the poor coordination, the optimum benefit of the fisheries technologies have yet to be contributed in national building and sustainable development by utilizing the vast aquatic resources of the country for the benefit of farmers and stakeholders (Bhujel et al. 2008). Because of these, severe economic losses have been occurred by importing fish commodities from abroad. The fisheries can also contribute substantially if linked with hydropower development, tourism promotion for social development opportunities. The fisheries sector productivity at present is far below than neighboring countries which is highly desirable to create new technological, social, economic opportunities.

**The main statement of the issues and problems of fisheries subsector can be outlined as follows:**

#### **-Low priority in agricultural policies**

Fisheries are the sub sector which has been least prioritized in APP (1995). Probably the low priority in governmental plan and policy might have impacted relatively slower growth in this sector around the middle of APP implementation year. During the APP period, there could be no substantial investment from donors in fisheries sub sector, this could also be the reasons that fisheries has been slacked far behind

#### **-Low fish production due to insufficient research and investment for development**

There are several problems associated with low production of fish in Nepal, however the main hindrances are insufficient research for technological backstopping to farmers and extensionist and negligible investment from government sector.

#### **-High import of table fish and by products for consumption**

Due to exceeding market demand and low production of fish, it is inevitable to import. The recent data from Kalimati Market revealed that more than 98% of fish sold in Kathmandu valley is imported. This does not include canned and other byproducts of fish such as dried fish; ornamental and various other forms from abroad for marketing in Nepal.

#### **-Fish biodiversity degradation**

In recent years aquatic ecosystem and fish diversity have been highly impacted due to rapid population increase, urbanization, water diversion and unwanted fishing etc. The fish biodiversity plays important role in food and nutritional security. These problems and issues need to be addressed urgently.

**Present area coverage in fisheries and aquaculture**

The total fish production is mainly contributed by around 6000 hectares ponds especially located in eastern and central regions; and more than 6000 rivers and lakes (Table 1, DoFD 2007/08). There is high potentiality of pond fisheries in western terai, which is socially, geographically and climatically more conducive than the eastern terai for fish cultivation, characterized for suitable water resources and responsive communities for fisheries promotion (Rajbanshi 1995). In western terai, the major population is comprised of *Tharu* community (CBS 2007), those requiring fish as one of the most essential foods in all social gatherings and auspicious occasions. This might be the reason that the most families in this community generally are acquainted with traditional knowledge and skill of fish handlings. The skill and knowledge of the community in combination with their social need could be utilized for fish production commercialization.

Recently, participatory research on cold water fish cultivation in mid and high hills have been successful (NARC 2006; Rana 2007a, b). This success has opened opportunities to utilize one of the world's wealthiest unpolluted, clean and cold water fresh water resources flowing down from world highest snow clad mountain perennially.

### **Need of the fisheries strategic plan**

Low productivity, increasing fish import to supply in the country, high demand of fish product, and increasing loss of aquatic biodiversity and to utilize the natural water and aquatic resources of the country for employment opportunity of women fisher, deprived communities depending on fishing, and to control migrating youths from agricultural sector, plan in fisheries sector is important. At present more than 98% of fish product in major cities of Kathmandu valley is supplied from India costing billion of Nepalese currency. In next 30 years the current population of the country has been projected to be double. It is certain that socio-economic changes and doubling in population will demand much more fish than at present. To address these problems there are policies and strategies in agriculture sector, however, it would be more focused if the fisheries sector develop its own strategic plan to cope with the future demands of fish product in the country. A well developed fisheries strategic plan if implemented properly, it is expected that there would be following advantages:

- a) The plan can assure the food and nutritional sovereign right of the people by enhancing fish production within the country.
- b) Optimum use of waste going aquatic resources for better livelihood opportunities, integrated food production program for social, economical and environmental benefit.
- c) The plan would facilitate and contribute in rapid hydropower generation by the developed technology of fish conservation in rivers and hydropower dams
- d) The plan support in developing the country as one of the best tourist destination through enhancing recreational tourism through adding new adventure of fishery in rivers and lakes of southern, middle and northern Himalayas.

### **Vision**

Fish production increase and aquatic resource conservation for food and nutritional security; employment and income opportunities

**Goal:** To increase the overall productivity and production of fish for food and nutritional security in the country

**Objectives of the strategy:**

The following have been identified as the objectives and strategic actions for investment in fisheries subsector

**1. Governance**

Food and nutritional security; poverty alleviation; and semi-commercialization and commercialization are the primary concern of governmental plan and policy. Demonstration of economic, environmental and social sustainability of fisheries subsectors is the challenge and responsibility of the economic developers, regulators and the industries to the public. To support the effective development greater knowledge is required in the areas of aquatic environment public and potential impacts, site remediation and mitigation methods, etc. Environmental sustainability is of high importance as the aquaculture and fisheries production requires a healthy environment for optimal productivity.

Promotion of organized fisheries development of aquaculture industry with suitable location for easy access, market opportunities ensuring respect to the environment; aboriginal fisheries and meet the regulatory requirement will be essential. It would also be essential to sorting out the socially acceptable technologies in fisheries and aquaculture. There are challenges to promulgate the policy on aquaculture development and aboriginal fish conservation through regulatory formulation of exiting Aquatic Life Conservation Act 2061. These regulations and new policies would be essential in shaping the upcoming aquaculture industry and fisheries promotion in the country. To have the proper governance of the aquaculture and fisheries following strategies might be adopted:

Strategic Actions:

- Continue the support with refinement in aquaculture and fisheries research and development with improved codes of practices in freshwater fisheries stewardship.
- Proactively involved in identifying and prioritization of research and development initiatives that address or minimize potential interaction among aquaculture, the environment, wildlife and other uses of the aquaculture resources including knowledge gaps.
- Proactively involved in identifying and prioritization of research and development initiatives that address high yielding suitable breeds, technologies having minimum potential interaction among aquaculture, the environment, wildlife and other uses of the aquaculture resources.
- Continue support initiatives aimed at benefit of aquaculture with emphasis on communication, extension of fisheries technologies, participatory research and community relation.
- Advocate the promotion of fisheries and aquaculture in other activities such as promotion of aquaculture in integration with irrigation, tourism promotion, and hydropower development, so other sectors could be enhanced in harmonization with fisheries.
- Promote extension of cold water aquaculture in all districts of Nepal. Likewise depute the fisheries extension officers in all districts with mandates to promote aquaculture, fisheries resource conservation and promotion, fisheries dependent communities, traditional knowledge

of fisheries and utilization of water bodies for fisheries and conservation of fish and aquatic resources.

- Continue the support of fisheries through upgrading organizational status, so an independent organization set up could maximize the aquaculture production through available technologies.
- Diversify the governance of fisheries in different areas, such as ornamental and sport fisheries, culture fisheries, natural water fisheries etc.
- Continue support to farmers cooperatives, NGOs, and aquaculture industries
- Support to unite fish farmers and entrepreneurs for membership and their rights in Federation of Nepal Chambers of Commerce and Trade

## **2. Competitiveness and Business Financing**

Farming including that of aquatic organism is recognized as risky business. In addition the flow of foreign originated fish product in substantial amount has caused the domestic farmers in pressure to be competitive. These have also impact to be reluctant for investment to financial institutions. Therefore, to promote the domestic fish farmers to increase fish production the fish farmers need to be more competitive. For the purpose the financial institutions should bring special packages to promote aquaculture production. For competitiveness and business financing there should be improvement through technological advancement, improvement in fish feed and human skill development in aquaculture. There is also need to strengthen the education system to produced qualified human resource in fisheries and aquaculture in the country.

### **Strategic Actions:**

- Review financial programming of available aquaculture practices in connection with other appropriate farming with view to long term financing.
- Continue support to fish mission for pilot scale/pre-commercial trials in fisheries sector. Continue this support in favor to cold water aquaculture to evaluate engineering designs of raceway ponds, new technologies and grow out trials for enhancing knowledge base.
- Continue support to develop semi-commercial ornamental aquaculture and develop market linkage and market assurance.
- Develop insurance system to assure the damage recovery through climate change issues and other risks.
- Support technical missions, technology transfer, and workshops for knowledge and information transfer for aquaculture development and research.
- Request for further investment in aquaculture research and development sectors to donors and global financial institutions for supporting the development of appropriate aquaculture technologies and their transfer to the farmers, business groups and stakeholders in the value chain.
- Support regularized advances in genetics through bloodstock management
- Support initiatives that reduces feed cost and farming cost seed delivery and feed delivery systems
- Support the training programs that enhances the aquaculture and fisheries
- Support workshops and education programs that enhances the knowledge base and supply the trained human resource chain

### 3. Business Risk Management

Aquaculture technologies of rainbow trout, carp and tilapia farming could be developed as business and commercial scale. However, aqua farming in general is taken as high risk investment. New investors need to be developed considerable confidence to initiate the investment. Thus, to promote the business of aqua industry development of investment friendly environment is imperative. Therefore, the investors, promoters as well as government must work together to define reduce the risk in aquaculture business.

In general, sudden mortality due to small mistakes, bad weather, rain outburst, dryness, outspread of aqua diseases are some of the critical weaknesses of investment in aqua business. Government may increase the capacity of investors by providing training, adopting best management practices (BMP), and standardizing operating procedures (SOP) and improving biosecurity practices. It is believed that these practices would reduce the risks of loss and minimize the impact not only to producers but also to investors and other stakeholders of value chain. Product certification though new terminology in aqua business sector but have implication to enhance the trade. These all would serve to enhance aquaculture productivity, competitiveness, profitability and social license.

#### Strategic Actions:

- Encourage the identification, development and implementation of climate and likely to be risk management business plan to promote aqua farming.
- Encourage insurance system of risk management in aqua farming.
- Initiate the development of Best Management Practices, Code of Practices and certification program
- Support aqua farming through business initiatives for critical risks.

### 4. Fish Health and Biosecurity

Disease and parasites affecting aquaculture are natural cause. Therefore it is essential to develop technologies and management practices that reduce the risks of disease and parasites. Thus, it is essential to be proactive to control and cure the fish disease. For the purpose there should be research and extension strengthening to manage the fish health and biosecurity.

#### Strategic Actions:

- Support research through fish health projects.
- Increase the human capacity in fish disease diagnosis and control measures.
- Create more scientific position to work on fish disease diagnostic measures and control.
- Initiate bio security program on governmental extension and research program.

### 5. Strategic Infrastructures for research and extension networks in potential areas

The main strategies of fisheries development have been the food and nutritional security. In the present context to feed about 30 million people, the traditional infrastructure and organizational institution may not be able to feed the increasing population of Nepal, which has been projected to be double by next coming 30 years. Therefore, more rational institutional framework should be developed for increasing contribution of fisheries sub sector in agriculture.

**Strategic Actions:**

- Initiate institutional capacity of fisheries and aquaculture sector to cover up more provinces and districts, so aquaculture and fisheries could be promoted and extended in all over the country. For institutional strengthening expand aquaculture sector up to Departmental level under the Ministry of **Livestock and Fisheries** (?).
- Establish more research and development centers representing all agro-ecological belts of developmental regions or provinces.

**6. Species Diversification**

Research on rainbow trout cultivation has been successful. Its adoption in private sector has been rapid in mid and high hills mountains close to the capital city Kathmandu. Research on *Pangassius*, *Tilapia*, *Labeo dero*, *Shizothorax*, *Tor putitora* etc are also promising. The commercial scale seed production of *L. dero*, *T. putitora* and *Schizothrax* indigenous fish has been made possible recently. Similarly, substantial progress on technological development of ornamental fish has been commendable. These achievements shows that by soliciting and focusing on specific thematic areas could indeed bring substantial changes in particular sector.

There are several option developed for promotion of aquaculture in warm water areas, however, optional culture technologies have yet to achieve in cold water aquaculture area. For the purpose, several aquaculture technologies should be developed. There is increasing demand of additional cold water aquaculture species for product diversification. The future commercial production of alternative fish would require additional investment to perform scaling up technologies and pilot scale projects to assess technical and financial possibilities and obtain consistent results. It is anticipated that a number of federal and provincial funding opportunities might be available for commercialization and alternative fish for production.

**Strategic Actions:**

- Government support will continue for fish product diversification that results in positive output, having significant economical contribution in the country
- Support would be continue for product diversification related to warm and cold water aquaculture and fisheries research and development

**7. Aquatic and Fisheries Resources Conservation including Special Package Programs to Deprived Ethnic Fishing Communities****Strategic Actions:**

The aquatic resources are the base of fisheries development. At present the aquatic resources such as lakes, rivers, wetlands are on immense pressure from encroachment, pollution, water diversion, eutrophication, biodiversity loss, climate change, and over and unwanted fishing etc. Due to these activities and lack of proper laws and regulations several native fish species have been lost from many of aquatic ecosystem. The climate change has impacted the livelihood of poor ethnic fish dependent communities. Climate change would further deteriorate the last resort of food and nutritional security of the traditional ethnic communities depending on fishing. To protect these resources and native communities following strategic actions are proposed.



- Government will support to device to protect the aquatic biodiversity including fish species loss from natural water resources
- Government will formulate plans to support the deprived communities exclusively dependent on fishing
- The concerning institutions will formulate fishing regulations, measures for wetland conservation through enhanced fisheries activities in feasible areas
- The concerning institutions will develop plans and execute restocking of fish in depleted ecosystem for rehabilitations

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**TABLE -1** : Inland water resources in Nepal Data based on Swar (2002).  
\*Projection based on ABPS (2003/2004).

Aquatic Resource		Estimated area (ha)
1	Natural Waters	401,500
	- River	395,000
	- Lakes	5000
	- Reservoir	1500
	Artificial Impoundments	
2	- Village Ponds	6500
	- Marginal swamp	12,500
	- Irrigated area	1001411*
<b>Total</b>		<b>1823411</b>

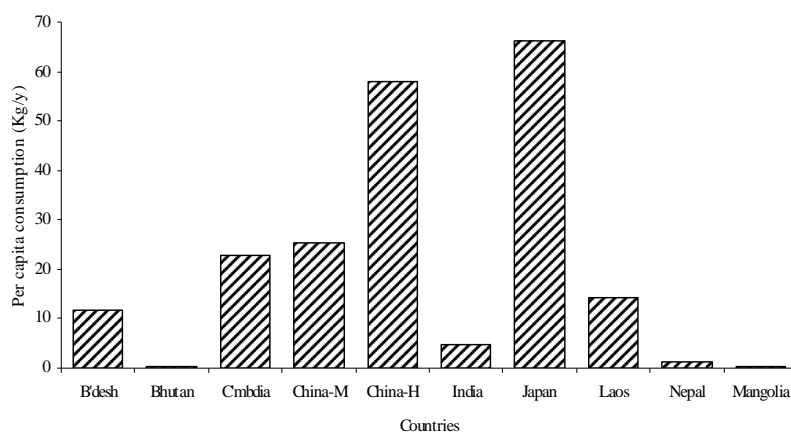


Fig 3. Per capita fish consumption in Asian countries including Nepal

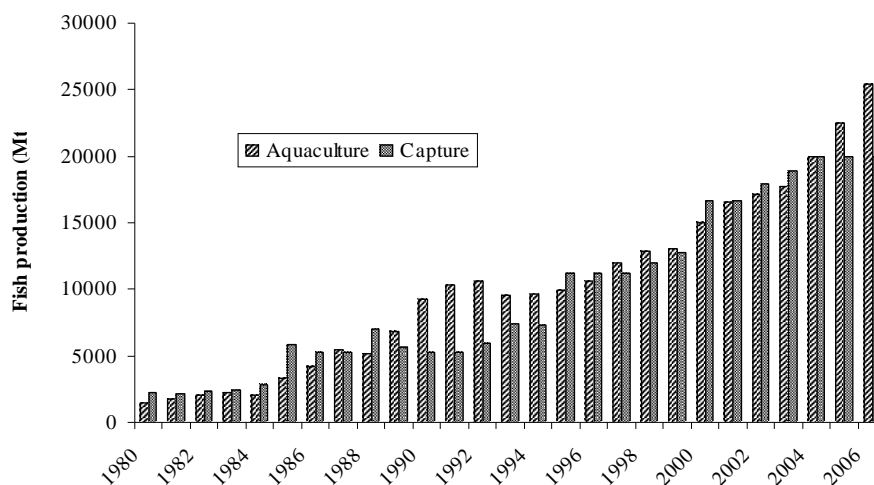


Fig 4. Contribution of capture and aquaculture in total fish production in Nepal

