

Overview of pond aquaculture in Nepal

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Abstract— Pond aquaculture is the foremost contributor to the aquaculture contributing 80.25% (58,433 mt. tonnes) to the total aquaculture production in fiscal year 2017/18. There are 44,722 ponds covering 11895.31 ha area in Nepal with the productivity 4912 kg/ha. Among, the different agro-ecological region, terai region is the main contributor to aquaculture as large number of ponds covering the highest area are located in this region. The highest production of pond aquaculture is from Province-2 followed by province-5. The various challenges faced by the farmers in Nepal are lack of technical knowledge, lack of sustainable fingerling supply system and lack of infrastructure development related to fish farming due to less priority of government in fisheries sector. Hence, the government should develop the plan and policy to disseminate the technical knowledge among fish farmers, management of fingerlings production and supply channel at the community level.

Keywords— Aquaculture, pond, Nepal, production.

I. INTRODUCTION

Aquaculture is one of the most promising means of intensifying the utilization of natural water resources and hence improving the conditions in the rural areas of Nepal (Katz, 1987). Being landlocked country, Nepal is deprived of any oceanic resources due to which it depends only on inland aquaculture with finfish farming. The total production of fish in Nepal is 86,544mt.tonnes out of which aquaculture contributes 75.54% (65,544 mt.tonnes) in fiscal year 2017/18 (CFPCC, 2018). Aquaculture is increasing rapidly in Nepal with the average annual growth rate of 4.21% which contributes 1.12% to Gross Domestic Product and 4.18% to Agricultural Gross Domestic Product in fiscal year 2017/18 (CFPCC,2018). Aquaculture practices that contributed to fish productions in Nepal are pond culture, rice cum fish culture, ghol culture, enclosure culture, pen culture, rainbow trout culture and government farm centre. Pond culture is a very popular aquaculture practice with many aquatic species cultured in the pond. Out of all the aquaculture practices, pond culture is the major contributor which alone generated 80.25% (58,433mt.tonnes) of total aquaculture production in Nepal (CFPCC, 2018). Chinese carps and Indian major carps are the dominant species in pond aquaculture which are generally stocked under polyculture. However, the monoculture of Common carp, tilapia and pangasius has also been reported (Mishra,2015). The contribution of various

aquaculture practices to total aquaculture production is shown below in the table 1:

Table 1: Contribution of various aquaculture practices to total aquaculture production (CFPCC, 2018)

Aquaculture practices	Production(mt. tonnes)
Pond culture	58,433
Rice cum fish culture	15
Ghol culture	6,390
Enclosure culture	65
Cage	302.28
Rainbow trout	320
Government farm	18.8
Total	65,544

History of aquaculture in Nepal is about 80 years which is considered relatively short compared to other aquaculture developed countries of south and south-east Asia (Shrestha, 2015). Aquaculture in Nepal began in the 1940s with pond culture of Indian major carps. Further development began in the 1950s with the introduction of exotic species common carp (*Cyprinus carpio*) whose breeding success in the 1960s

followed by monoculture practices and gained considerable popularity in private sector (FAO, 2005). More significant progress was seen in the 1970s with the introduction and farming of three exotic Chinese carp species : silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Aristichthys nobilis*) and grass carp (*Ctenopharyngodon idellus*) and their successful breeding in the captivity. Similarly, the induced breeding of three commercial valuable indigenous major carps: rohu (*Labeo rohita*), mrigal (*Cirrhinus mrigala*) and catla (*Catla catla*) were successfully established which was followed by polyculture system of production in the ponds with seven species of fish with different habits (FAO, 2005). Although the aquaculture begin earlier, the aquaculture production was recorded only from 1966 with only 3 mt. tonnes of fish production (Mishra, 2015).

II. CATEGORIZATION OF POND AQUACULTURE

In Nepal, pond aquaculture has been categorized into extensive, semi-intensive and intensive farming (Mishra, 2015). The different farming system are illustrated below (Shrestha and Pandit, 2017):

2.1) Extensive farming

In this farming system, fish are stocked in density of 7000 fish/ha in large ponds measuring 1-5 ha. The fish are reared

with no supplemented feed and fertilizer and yield is low i.e. 1-2 ton/ha/yr.

2.2) Semi-intensive farming

In this farming system, fish are stocked in the density of 7000-10000 fish/ha in relatively small ponds 0.2-0.5 ha. Care is taken to develop natural foods by fertilization and feed are supplemented and the yield is moderate i.e. 3-6 ton/ha/yr. It is the most common farming method practiced in Nepal.

2.3) Intensive farming

In this farming, fish are stocked at the density of 10-15 fish/m³ of water in small ponds. Complete formulated feed are supplied and the yield is high i.e. 15-100 ton/ha/yr.

III. TRENDS OF POND AQUACULTURE IN NEPAL

Pond culture is the dominant aquaculture practice among various culture practices and is increasing rapidly.

3.1) Expansion of pond area

From the fiscal year 2001/02 to 2017/18, ponds have been constructed in 5,941 ha for aquaculture. From the below figure-1, the pond area in the fiscal year 2008/09 is decreased because of the consequences of natural disasters(flood) that damaged many fish ponds in terai region (Kunwar and Adhikari, 2017). The highest area of pond constructed was achieved in fiscal year 2016/17 (1461.6 ha)

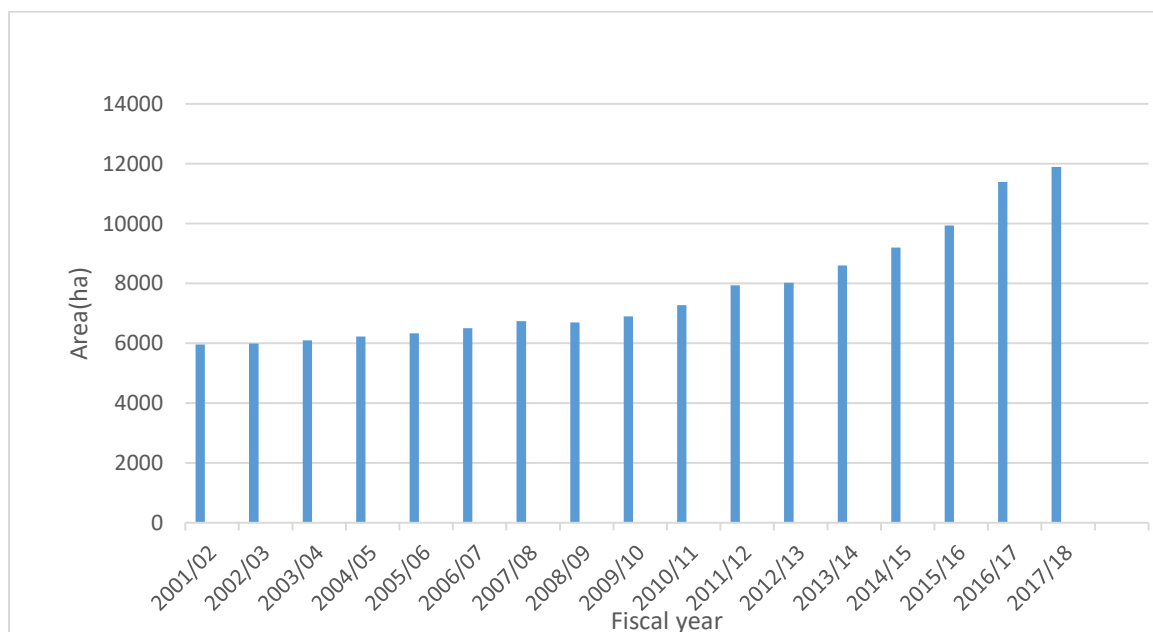


Fig.1: Expansion of pond area (CFPCC, 2018)

3.2) Pond production

From the figure-2, we can conclude that the fish production from the pond increases annually. Significant improvement of fish production was recorded in the fiscal year 2016/17 because in the same fiscal year highest area of pond

constriction was achieved. In the last eighteen years, fish production from the pond aquaculture was increased by 47,209 mt. tonnes mainly due to the both horizontal and vertical expansion of pond aquaculture practice and pond productivity.

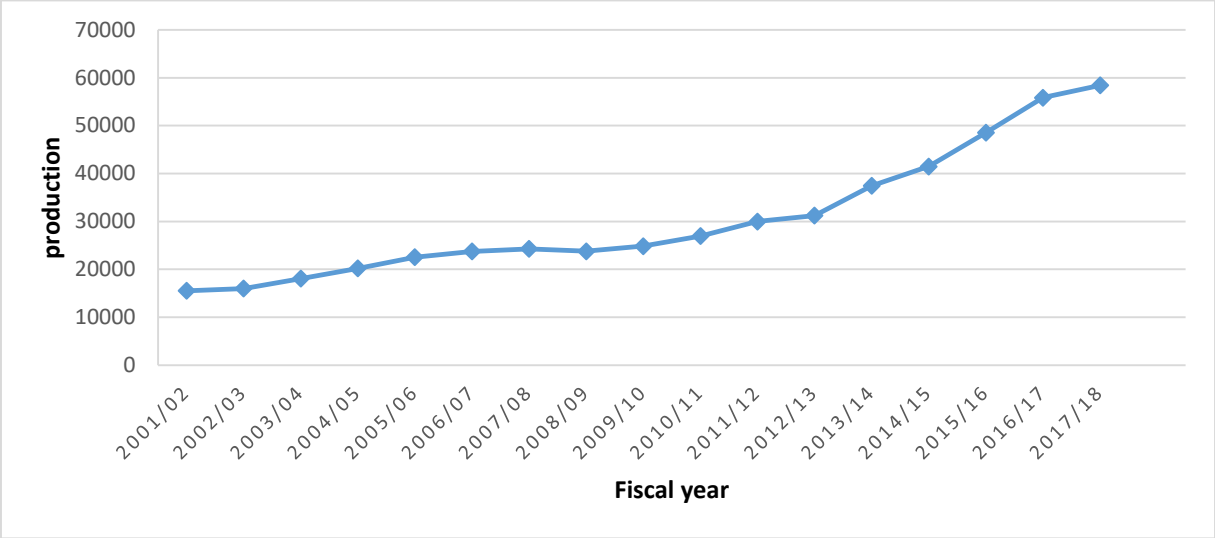


Fig.2: Fish production from pond (CFPCC, 2018)

3.3) Pond productivity

Pond productivity was only 2.61 mt. tonnes/ha in fiscal year 2001/02 which is increased to 4.91 in 2017/18 as shown in the figure-3. This increased productivity of fish pond has significant impact on national fish production. The reasons for the increased productivity are improvement in

technology, mechanization in fish farming system, good management practices and policy of government for the improvement of fish production (Kunwar and Adhikari, 2017).

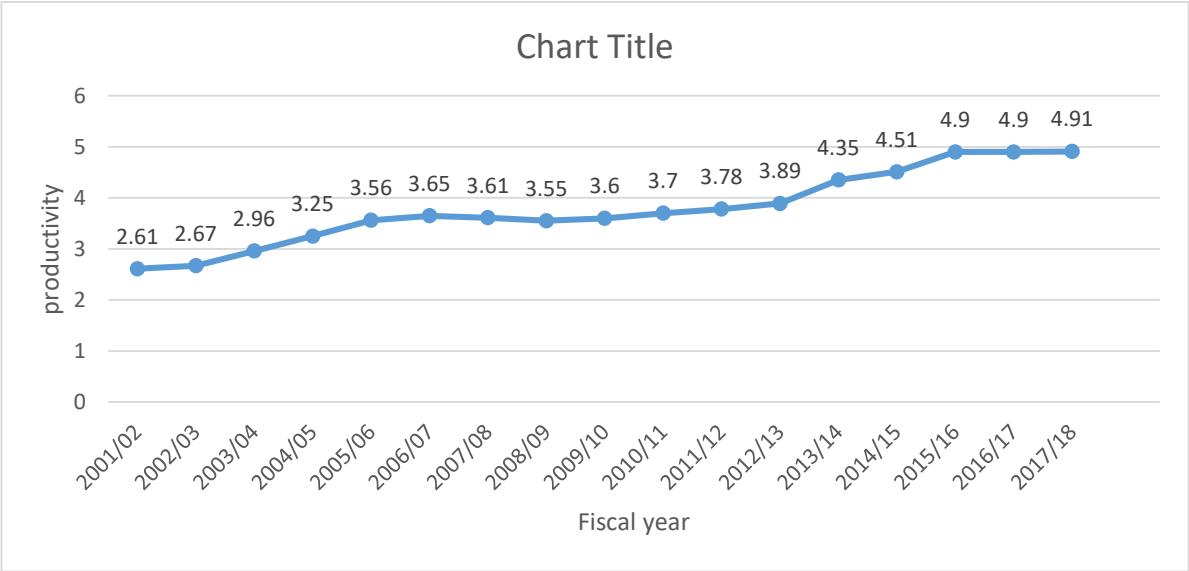


Fig.3: Productivity of fish pond (CFPCC, 2018)

4) Distribution of Pond

Nepal is agro-ecologically divided into three regions i.e. Terai, hilly and himalayan. The pond aquaculture is highest in the terai region which may be due to the suitability of land area and well-developed infrastructure in terai region compared to other. Terai region consists of 80.25% (44,722) of total number of ponds and 88.76% (11895.31 ha) of total area covered by ponds in fiscal year 2017/18 (CFPCC, 2018). Nepal is divided into seven federal provinces by the constitution of Nepal adopted on 20 September, 2015 before that it was divided into five development regions. The province wise distribution of pond, pond production and productivity is listed in the table -2:

Table 2- Province wise distribution of pond in Nepal
 (CFPCC,2018)

Province	Information on pond			
	Number	Area(ha)	Production(kg)	Productivity(kg/ha)
Province-1	7,751	1,517.6	7,485,029	4,932
Province-2	17,428	6,606.8	33,746,394	5,108
Province-3	3,795	638.26	3,004,765	4,708
Province-4	2,093	273.26	1,167,411	3,989
Province-5	10809	2,483.41	11,604,285	4,673
Province-6	345	32.7	67,238.5	28
Province-7	2501	343.28	1,358,666	3958
Total	44,722	11895.31	58,433,789	4912

IV. CHALLENGES

There are many fish species that would be commercially and economically important but only few species are under culture in Nepal. The reasons behind this are lack of research on the behaviour, propagation, population dynamics and biology of these indigenous species (Gautam, 2015). Furthermore, several challenges are faced by the fish farmers in Nepal. The major problem is the lack of sustainable fingerling supply system (Gurung et al., 2010). The farmers have faced the problem of lack of improved fingerling at

stocking time especially in the rural areas that affect the aquaculture production. In addition, lack of marketing infrastructure, lack of cold storage facilities, poor quality fingerlings and fish feed and lack of technical knowledge are the major issues the fish industry is facing (Gautam, 2015). In pond aquaculture, lack of knowledge of proper pond management practice among farmers is also the major problem. Maintaining the water level, oxygen level, pH, avoiding undesirable pollution residues for fish farming in pond aquaculture might also be challenging task for good and hygienic fish production. The natural disasters like flood in terai region and landslides in hilly region are the factors that affect the pond aquaculture production.

V. CONCLUSION

The production of pond aquaculture in Nepal is increasing annually with the growth rate of 4.64% in fiscal year 2017/18 (CFPCC, 2018). People are constructing the ponds for fish farming by replacing the rice field in many parts of Nepal. From the trend of pond construction and production discussed above we can conclude that the pond aquaculture will further flourish in the future. Pond aquaculture is the first contributor to the aquaculture production in Nepal. Terai region of Nepal contributes the highest production to the pond aquaculture due to the suitability of land area, accessibility to developed infrastructures, availability of fingerlings etc. Among the seven provinces, province-2 contributes 57.75% (33,746,394 kg) to the total production from pond aquaculture as there is highest pond number and area.

Among the various system practiced for pond aquaculture in Nepal, semi-intensive farming is the most common. The rearing of fish by enhancing the growth of natural feed by supplying the fertilizer and additional feed is the most commonly practiced system in Nepal. However, the integration of horticulture crops and livestock rearing with the fish farming in pond is also being practiced in Nepal.

Although the aquaculture is gaining popularity among the farmers, several challenges are being faced such as lack of adequate fingerlings, lack of technical knowledge, lack of developed market facilities, natural disasters like flood and landslides that result in the production loss to the farmers etc. To reduce these challenges in the future, the government should make the plan and policy in fisheries sector of Nepal. The training related to the pond management practices should be conducted in community level. The fingerlings

supply system should be managed well. The awareness programme to inform the farmer about the proper site selection to prevent the heavy loss due to natural disasters like flood and landslides.

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