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Fish-Based Aqua-Tourism Centre for Development of Economical, Environmental and Cultural Security- A Case Study at Jasingfaa Aqua-Tourism Centre, Nagaon, Assam, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Recreational or sports fishing is one of the most popular leisure activities which can also be termed fishing for pleasure or competition. It is regarded as one of the leading adventure tourism activities across the world. The most common form of recreational fishing is angling which generates sizeable income for the people where the angling takes place. The angling may take place in both natural and man-made water bodies. Going by the recent trends, recreational fishing is being

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considered an intrinsic part of eco-tourism which involves exploring scenic locations and experiencing the local cuisine, culture and heritage. Besides providing an opportunity to create income-generating activities, recreational fishing also contributes to conserving natural resources. Looking into the vast and varied fishery resources, Assam has the probability to promote aqua tourism activities as an alternative to adventure and wildlife tourism. This paper, thus, tries to explore and presents a case of a pioneer aqua tourism centre, i.e., Jasingfaa Aqua Tourism Centre, located in the central Assam district of Nagaon, Assam. Angling is a regular sports activity in the centre. Besides regular angling, the centre organises a Fish Festival consisting of an angling competition and other activities once a year following the 'catch and release' rule. The PRA tools like interviews and direct observation methods were administered to carry out the study. Jasingfaa is found to have evolved as a successful model of aqua tourism which generates a large number of direct and indirect employment opportunities besides contributing immensely towards nature conservation.

Keywords: Recreational fishing; aqua tourism; angling; jasingfaa; fish watching; conservation.

1. INTRODUCTION

Fishing for recreation is a popular activity in many parts of the world and this activity has led to the development of a sector of substantial social and economic value worldwide. The maintenance of this sector depends on the ability of the aquatic ecosystem to provide harvest [1]. Recreational fishing also called sports fishing is fishing for pleasure or competition. It can be contrasted with commercial fishing, which is fishing for profit, or subsistence fishing which is fishing for survival [2]. Recreational fishing is primarily considered a leisure activity [3]. Recreational or sport fishing, i.e., capturing fish for pleasure or competition in natural and man-made water bodies has gained much popularity after adventure tourism [4]. It is typically viewed as different from commercial fisheries in that they are self-sustaining and not controlled by the social and economic forces of the open market that have driven many commercial fisheries to collapse [1]. The most common form of recreational fishing is angling which are practiced with a rod, reel, line, hooks, and any one of a wide range of baits (Baruah and Sarma). Other devices, commonly referred to as terminal tackle, are also used to affect or complement the presentation of the bait to the targeted fish [5]. The practice of catching or attempting to catch fish with a hook is known as angling. The history of fishing as a form of recreation is not clear though it took a great leap after the English Civil War, when a newly found interest in the activity left its mark on many books and treatises that were written on the subject at the time. One of the masterpieces written during that time is 'Compleat Angler' by Izzac Walton in 1653. The book was a celebration of the art and spirit of fishing in prose and verse and thus popularized

recreational fishing and brought it to a new height.

Arlinghaus and Cooke [6] reported that globally 10-6% of the population participates in recreational fisheries in the industrialized world. Similarly, there appears to be a shift from small-scale commercial and subsistence fisheries toward recreational fisheries in many transitional economies in Africa, Asia, and Latin America [7,8,9]. The shift happens since as the economy develops the more wealthy nationals need to be accommodated with leisure time or increasing tourism [10]. It should be noted the economic potential of recreational fisheries is considerable throughout the world [11,12] however, it is sometimes unrecognized or underestimated by political decision-makers [13,14].

Though there are no written records of recreational fishing in Assam, India in the distant past, the people of Assam used to catch fish for domestic consumption since time immemorial. Fish farming is one of the main occupations of the people of Assam. The fishery sector occupies a very important place in the socio-economic development of Assam [15]. Assam is the second largest state of the Northeastern region which has been blessed with vast and varied aquatic resources in the form of riverine, floodplain wetlands, and low-lying paddy fields which supports a sizable variety of freshwater fishes. The Northeastern region is considered one of the hot spots of freshwater fish biodiversity in the world [16]. Out of the total 806 freshwater fish species available in our country, the NE region represents 267 species belonging to 114 genera under 38 families and 10 orders which are approximately 33.13% of the total Indian freshwater fishes. However, a total of 217

fish species belonging to 104 genera under 37 families and 10 orders have been recorded and reported [17]. It has been reported that drastic reduction in the abundance and distribution range of fishes due to habitat modification, over-exploitation, and manmade interventions [18].

Among the eight Northeastern states, Assam has the highest potential fisheries resources. The state is rich in both culture and capture fisheries. The main capture fisheries resources are constituted by the river Brahmaputra and its tributaries and their associated wetlands [19]. A very congenial environment for fisheries development prevails in the region in general and Assam in particular by way of the high demand and price of fish [20].

There are various species of fish in the culture and capture fisheries of Assam which are the dream fishes for anglers. Among them, the Golden mahseer is, undeniably, the only species the anglers would love to chase any distance to catch. Golden mahseer is one of the fiercest fighting freshwater game fish in the world and is thus termed by anglers as the Tiger of Water. It occurs all through the north, northeastern, and even parts of central India [21].

Looking into the abundant fishery resources for developing recreational tourism in the state of Assam, this paper attempts to present a case study of Jasingfaa Aqua Tourism Centre with the following objectives:

1. To assess the trend of development of the fish based aqua-tourism centre at Jasingfaa.
2. To assess the implications of such recreational eco-tourism in the local economy
3. To assess the conservation activities undertaken in the fish based aqua-tourism centre.

2. MATERIALS AND METHODS

This section outlines the sources of data and a short background of the study area.

2.1 Data

The paper is based both on the primary and secondary data. Since, the paper presents a

single case, it relies absolutely on the primary method of data collection. For this purpose, participatory rural appraisal tools such as interviews and direct observation were taken to elicit the required data. Both the qualitative and quantitative data were collected during the study period to understand the larger role of the Jasingfaa aqua-tourism centre in the economy of the state as well as in its vicinity. For the interview method, a semi-structured questionnaire was prepared and the proprietor and some of the employees of the centre were interviewed. For secondary data, various journal articles, books and written records of the centre were consulted to establish the case [22].

2.2 Study Area

Jasingfaa Aqua-tourism Centre – an overview.

Jasingfaa Aqua-tourism Centre which is basically a fish-based tourism centre was started on 2nd October, 2010 on the bank of a beautiful natural wetland named Mahrul beel. The beel itself is a home to and visiting and breeding ground of various endemic and migratory birds and attracts a large number of bird lovers. The centre is located 5 km away from the district headquarters of Nagaon. Sprawling over a land area of 20 acres (more than 10 acres are covered by water consisting of twelve different sized ponds), it is comparatively a new and unique concept for the people of the region. Jasingfaa has converted its small ponds into recreational fisheries where the visitors can play with fish with much zeal and catch them. Angling is considered as the recreational sports fisheries which is gaining importance and becoming popular across the state and region.

2.3 Profile of Jasingfaa Aqua-tourism Centre

Located between 26° 25' 32.47" North and 92° 51' 39.86" East, Jasingfaa offers its esteemed visitors a harmonious blend of nature and modern comfort in a rural setting. The centre, sprawling over a large open arena amidst water bodies and rustic surroundings, provides visitors with an eco-friendly atmosphere. It is, indeed, the only aqua tourism centre in Assam (and perhaps in the Northeast region) that the visitors love to cherish for their lifetime. The brief profile of Jasingfaa is represented in Table 1.

Table 1. Profile of Jasingfaa aqua-tourism centre

Name	Jasingfaa Aqua-tourism Centre
Address	Mahrul, Dimoruguri, Nagaon, Assam
Year of establishment	2010
Initial area of the centre	12 acres
Present area of the centre	20 acres
No. of ponds	11
No. of indigenous fish	40
Number of ornamental fish species	5
No. of staff	25
Casual staff	5
Number of zone	3
Children's' play ground	1
Angling	Round the year
Angling competition	Once a year
No of bird species	25

Source: Primary survey

3. RESULTS AND DISCUSSION

3.1 Fish Diversity at Jasingfaa

The present study reveals that Jasingfaa has as many as 40 species of fishes indicating high fish diversity in the centre. Among these, four fishes identified as endangered (as per IUCN red list data base) and five fishes are vulnerable, which are being reared at Jasingfaa. The centre keeps fishes belonging to both Indian major and minor carp. Most of the endemic fishes reared at Jasingfaa have ornamental values [23]. Striped loach, striped dwarf cat fish, spotted snake head, garfish, climbing perch, blackline rasbora, Indian glassy fish, colisa, etc. are some of the endemic fishes reared at the centre having high ornamental values. A list of the fishes found in Jasingfaa has been prepared in Table 2.

3.2 Angling

Angling or sports fishing is one of the most fascinating outdoor physical activities which satisfy diverse taste and pursuits of anglers. It is a form of eco-tourism promoting sustainable form of resource use and contributes to environmental conservation. Sport fishing is one of the leading adventure tourism activities worldwide, especially in USA and Europe. It generates income as the anglers spent substantial amount of money in food and accommodation [24]. For example, a 5-day angling tour for three anglers on the Ramganga river, Uttarakhand, India, in 2007 generated USD 1,220 and in the same location in 2010, the anglers spent USD 7,800 on food and accommodation [25]. Similarly, one can be very enthusiastic about aqua sports like fish angling at

Jasingfaa and spend hours catching fish which are open for tourists around the year. The tourists, obviously, have to abide by the rules and regulations framed by the management. There are eleven ponds, as mentioned earlier, covering about 60% of the centre that can offer some of the most exciting fishing experiences.

Recreational fishing includes hand gathering, spear fishing, netting, angling, and trapping however, Jasingfaa promotes only angling on its premise. Rich varieties of fish stock has been maintained at different blocks (ponds) of the centre which are potential game fishes. Some of these fishes (like grass carps, bata, catla, calbasu etc.) are reared absolutely for the purpose of angling and there is no commercial selling of big fishes that gives a golden opportunity for the anglers to catch a hook a sized fish. To check the availability of these fishes in all the angling blocks, netting is done periodically. The world famous priced sport fish and the tiger of the water "Golden Mahseer" is one such variety. Jasingfaa is very keen on conserving the Golden Mahseer and other similar species. Jasingfaa centre provides the anglers all other facilities according to the rules framed by its management.

3.3 The National Angling Competition and Fish Festival

Jasingfaa organized the first angling competition in 2011. The state level angling competition was later stretched out to regional and finally national level looking into the representation from different parts of the country and was renamed subsequently to the National Angling Competition

Table 2. List of fishes at Jasingfaa

SI no	Assamese Name	English Name	Scientific Name
1	Chital	Humped feather back	<i>Notopterus chitala</i>
2	Kandhuli	Feather back	<i>Notopterus notopterus</i>
3	Darikana	Blacklinerasbora	<i>Rasbora daniconius</i>
4	Moa	Mola/ Indian carplet/ Pale carplet	<i>Amblypharyngodon mola</i>
5	Puthi	Swam barb/ Chola barb	<i>Puntius chola</i>
6	Cheniputhi	Olive barb	<i>Puntius sarana sarana</i>
7	Bhakua/ Bahu/ Dhekera	Catla	<i>Catla catla</i>
8	Mirika	Mrigal	<i>Cirrhinus mrigala</i>
9	Bhangone/ Nara/	Bata labeo	<i>Labeo bata</i>
10	Mali/ Kaliajora	Calbasu/ Black rohu	<i>Labeo calbasu</i>
11	Kurhi	Kurialabeo	<i>Labeo gonius</i>
12	Rau/ Row	Rohu	<i>Labeo rohita</i>
13	Common carp	Scale carp	<i>Cyprinus carpio</i>
14	Grass carp	Grass carp	<i>Ctenopharyngodon idella</i>
15	Botia	Loach	<i>Noemacheilus beavani</i>
16	Gethu/ Rani botia	Nectie loach/ tiger loach	<i>Botia dario</i>
17	Singorah	Day's mystus	<i>Mystus bleekeri</i>
18	Arii	Giant river cat fish	<i>Aorichthys seenghala</i>
19	Bordaia	Indian Potasi	<i>Pseudotropius atherinoides</i>
20	Magur	Magur	<i>Clarias batrachus</i>
21	Singhi	Stinging cat fish	<i>Heteropneustes fossilis</i>
22	Kokila	Freshwater gar fish	<i>Xenentodoncancila</i>
23	Sal	Giant snake head	<i>Channa marulius</i>
24	Chengeli	Smooth breasted snake head/ Asiatic snake head	<i>Channa orientalis</i>
25	Goroi	Green snake head/ Spotted snake head	<i>Channa punctatus</i>
26	Sol	Striped snake head/ Banded snake head	<i>Channa striatus</i>
27	Kuchia	Cuchia/ Gangetic mud eel	<i>Amphipnouscuchia</i>
28	Chanda	Indian glassy fish	<i>Chanda ranga</i>
29	Dum Vacheli	Badis/ dwarf chameleon	<i>Badis badis</i>
30	Gedgedi/ Bhetki/ Khaloibhangi	Mottled nandus	<i>Nandus nandus</i>
31	Patimutura	Bar-eyed-goby	<i>Glossogo biusgutum</i>
32	Kawai	Climbing perch	<i>Anabas testudineus</i>
33	Kholihona	Banded colisa/ Striped gourami / Giant gourami	<i>Colisa fasciata</i>
34	Bhasaylee	Colisa	<i>Colisa colisa</i>
35	Bami	Spiny eel/ Tire-track spiny eel	<i>Mastacembalus armatus</i>
36	Tora/Turi	White spotted spiny eel/ Striped spiny eel	<i>Macragnathuspancalus</i>
37	Tora/ Tura/ Turi	One- striped spiny eel	<i>Macragnathusaral</i>
38	Gangatop	Ocellated puffer fish	<i>Tetradon cutcutia</i>
39	Pengba	Pengba	<i>Osteobrama belengari</i>
40	Sonali Pithiya	Golden Mahseer	<i>Tor putitora</i>

Source: Primary survey

and Fish Festival as suggested by the scientists and esteemed anglers. Besides angling, the National Fish Festival consists of fish identification competition, traditional fishing gear identification competition, art competition, speech competition, fish catching on muds (by hands)

competition for children and fish cuisine cooking competition. All these sporting events have been receiving overwhelming responses from across the region. Besides the competitors, people of all age groups congregate to celebrate the event each year. Thus, Jasingfaa has become the first

organization to introduce a new era in the scenario of eco-tourism in the state. The documentation of number anglers, winners with address, big catch winners, number of catch and weight of big catch during 2011-2019 has been recorded in Table 3. Due to COVID-19 pandemic competition was not held during 2020 and 2021 and the aqua-tourism centre has been badly hit as a result of the pandemic.

3.4 Conservation Ethics in Angling

One of the important features of the angling competition held at the centre is 'Catch-and-Release'. Though catching fish with a rod is termed as recreational fishing, the captured fishes have been generally harvested for domestic consumption purposes. But there is a growing tendency among anglers to release the fish caught so as to increase the abundance or existence of the fish [26,3]. In a commercial fishery, a caught fish has a quantified value. Similarly, in recreational fisheries also, existence

of fish itself has a value termed 'existence value'. Most recreational anglers prefer to forgo their harvest to improve the quality of the fishery and ensure fish existence [3]. The awareness and concern that the fish should exist in abundance are motivated by the growing conservation ethics which has fueled interest in the 'Catch-and-Release' method. Motivated by such conservation ethics Jasingfaa is promoting strictly the 'Catch-and-Release' practice during the angling competitions. After some initial resistance, the anglers understood and accepted the practice as a measure of awareness camp organized by several institutions across the country.

3.5 Mahseer Watching

Jasingfaa did its best and proved that golden mahseer can also be reared in the tropical pond condition of the region. A brief note on development mahseer stock for mahseer watching purpose is described in Table 4.

Table 3. No of anglers, prize winners, no of catch and weight of the big catch at different angling competitions held at Jasingfaa during 2011 to 2019

Year	No of anglers	Winners with address	Big catch winners	Nos. of catch (1 st , 2 nd , 3 rd)	Weight of big catch (kg) 1 st /2 nd /3 rd /
2011	70	Ashis Kumar, Bishwanath Chariali	Moinul Haque, Golaghat	28, 21, 15	4.2
2012	75	Dipankar Sen, Nagaon	Subhasis Das, Nagaland	33, 28, 21	3.55
2013	78	Pradyunma Bora, Golaghat	Altaf Hussain, Golaghat	12, 10, 9	2.00
2014	85	Prahlald Majumdar, Kaliabor	RajibSarma, Nagaon	23, 20, 17	3.75
2015	107	Wati Walling, Nagaland	Mr Mezeng, Nagaland	9, 7, 6	3.9, 3.8
2016	101	Gosai Chandra Das, Nagaon	Rajib Hazarika, Kaliabar	16, 7, 7	3.5, 3, 2.5
2017	117	Mustaq Ahmed, Nagaon	N. Alom, Nagaland	18, 15, 14	5.9, 3.7
2018	110	Abdul Hannan, Nagaland	Nilakanta Handique, Golaghat	6, 5, 5	6.0, 3.0
2019	87	Jiaur Rahman, Nagaon	Rasidul Haque, Nagaland	46, 31, 29	3.60, 3.42

Source: Primary survey

Table 4. Brief description of rearing of golden mahseer at Jasingfaa during 2011-2019

First consignment	7 th July, 2011
Source of seed	ICAR-DCFR, Bhimtal, Nainital, Uttarakhand
Total numbers	2000
Size at the time of rearing	Fry
Habitat size	1 acre water area
Ph	7 - 8
Temperature	12 ^o – 32 ^o C

Source: Primary survey

After eight years of rearing with care in pond condition by regularly monitoring water quality, feed, health etc. the mahseer achieved 2-3 kg in size. It is important to note that a section of the visitors (nearly 10%) come especially to watch the “Golden Mahseer” and enjoy their fastest swimming behavior in captivity. Thus, ‘Mahseer Watching’ is evolving as another important tourism activity at the centre.

3.6 Fish Production

It is noteworthy to mention here that Nagaon is a big production center of fish seed which is being supplied to different districts of the state, especially the districts of upper Assam [27]. Jasingfaa feels privileged that it supplies a large number of brooders of Rohu, Catla, Bhargon (*Bata labeo*), Mirika (*Mrigal*), Kurhi (*Labeo gonius*), Grass Carp, Silver Carp, etc. to different hatcheries of the district so as to produce quality seed for the entire fish markets of the state. The trend of sale of fish (including brooders) from 2011 to 2019 is presented in Fig. 1.

3.7 Trend of Tourists

Attracted by its beautiful and serene rural ambience, fishes, scenic beauty and the rustic surroundings, a large number of tourists through the centre. Figs. 3 & 4 shows the influx of national and international tourists into the centre

since inception (2011). International tourists come from different countries viz. Japan, Dubai, USA, Germany, Netherlands, Bhutan, Italy, Poland, England and Russia. Jasingfaa feels bliss that the number of tourists coming to the resort is also increasing over the years. It is worth mentioning that the students and the faculty members of different colleges including College of Fisheries, Raha, Assam visit the resort for educative purposes.

3.8 Impact on Local Community and its Surrounding Environment

It is a well-established fact that recreational fisheries can generate enormous social welfare. It can contribute immensely to the national and local economies [28]. Jasingfaa Aqua Tourism Centre is a blend of both aqua (recreational fishing) and rural tourism which is relatively a new concept. Rural tourism is a growth industry and protects the ways of life that can hardly be seen in cities nowadays. It has the potential to provide sustainable livelihood to rural communities without the risk of seasonality [4]. Jasingfaa, thus, has emerged as the pioneer in the field of aqua-tourism in the state of Assam in particular and the Northeast region in general. Recreational fishing blended with the provision of mouth-watering food and cozy resting places is the principal capital of Jasingfaa. The positive impacts are listed below.

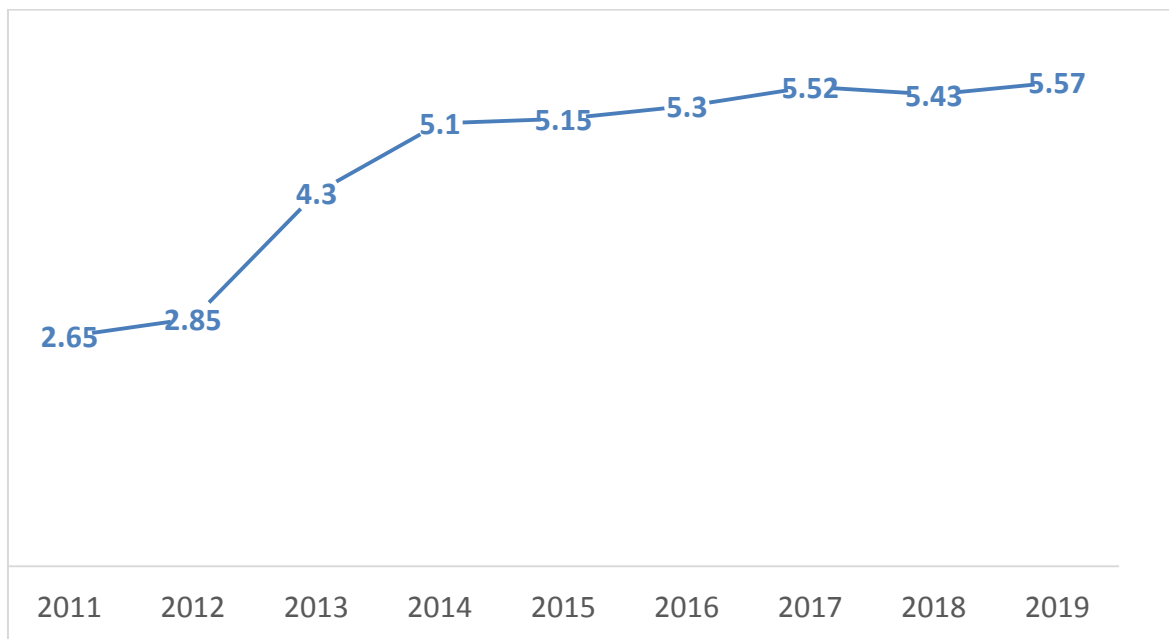


Fig. 1. Gross turnovers from the sale of fish (Rs. in Lakh)

Source: Primary survey at the Jasingfaa Aqua-tourism Centre

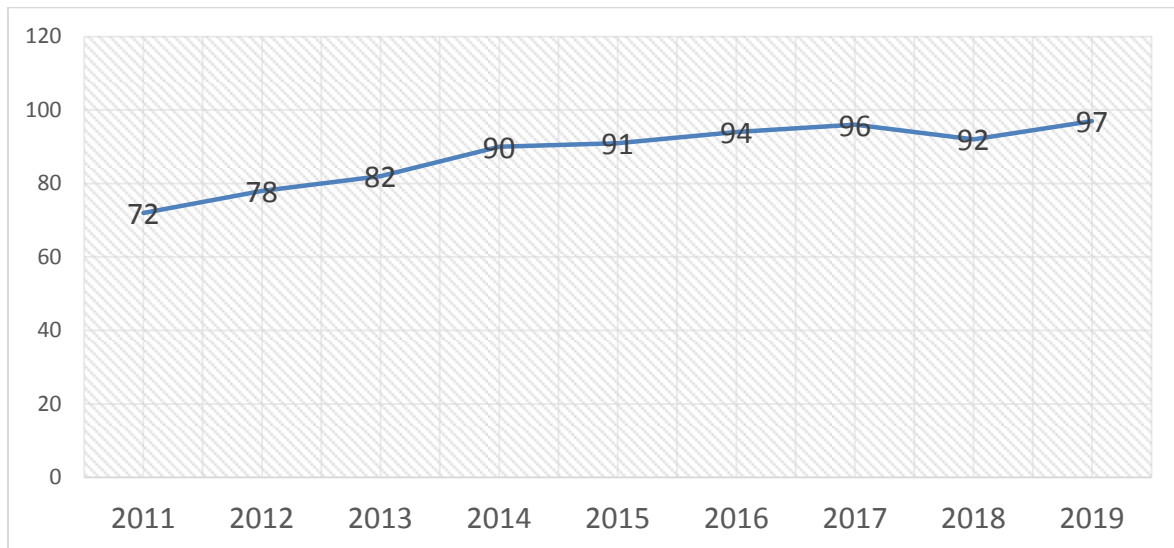


Fig. 2. Footfall of national tourists at Jasingfaa (in thousands) during 2011-2019

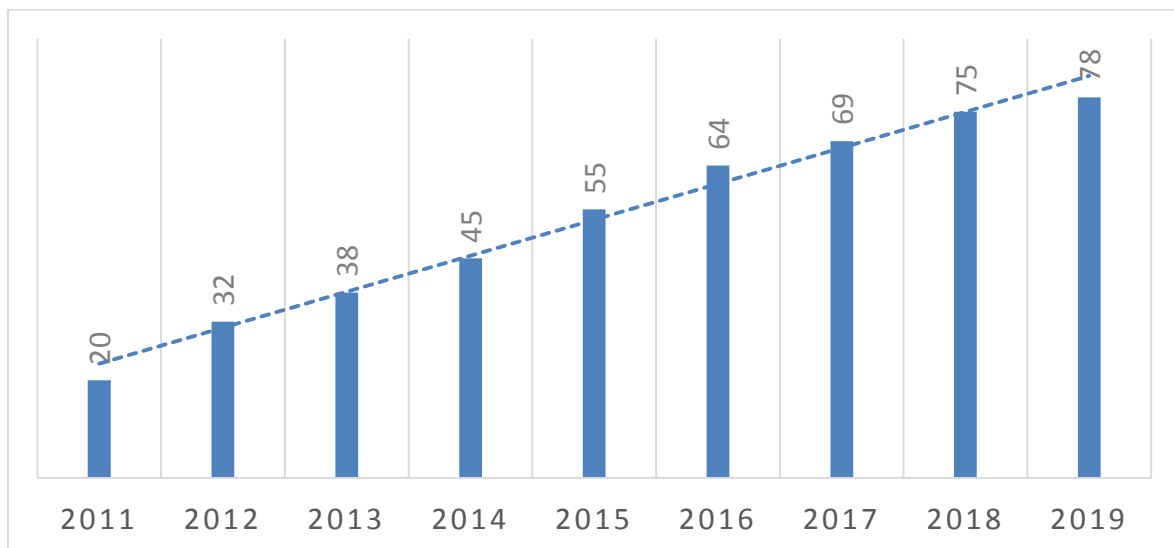


Fig. 3. International tourists' arrival at Jasingfaa (nos)

3.8.1 Employment generation

Fisheries is an important sector in India. It provides employment to millions of people and contributes to the food security of the country. Apart from generating employment to a large extent, fisheries and aquaculture contribute 1.07 percent to the national GDP [29]. Jasingfaa contributes to the socio-economic benefits of the local communities by ensuring gainful employment (Fig. 1) for a significant number of local youths. It provides employment to about 45 skilled youths from different parts of the state. Moreover, it also employs 5 casual labourers on a daily basis for maintaining the cleanliness of its premises. It is worth mentioning that a few petty

business establishments have newly cropped up around Jasingfaa generating self-employment opportunities.

Jasingfaa feels proud to state the fact that a large number of students from foodcraft, hotel management institute, situated at Rongagora, Samaguri (which is about 30 km from the centre) visit every year to take organizational training. Once training is completed at Jasingfaa, then only students are eligible to receive an "industrial experience certificate" for their diploma/certificate course from their parent institute. As such, Jasingfaa is contributing hugely to the state's employment and educational scenario.

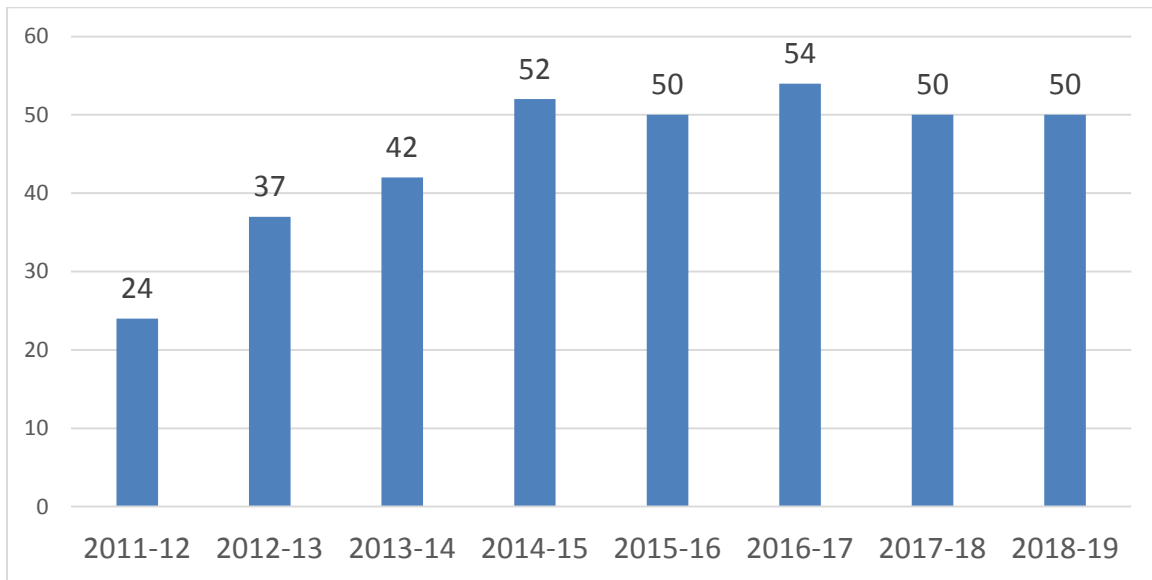


Fig. 4. Employment trend of Aqua-tourism Centre in numbers during 2011-2019

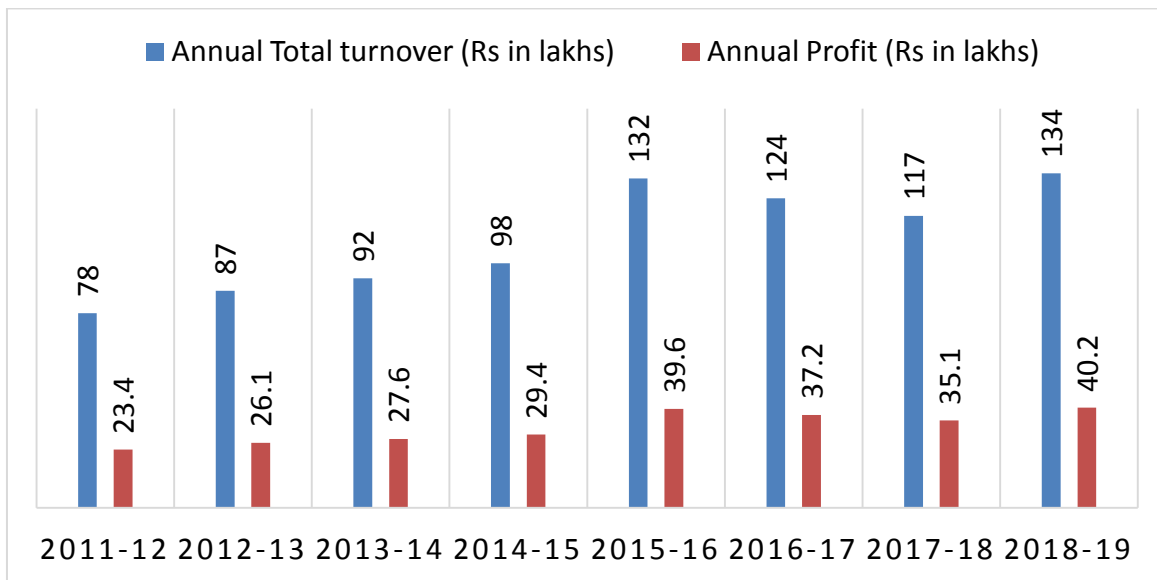


Fig. 5. Gross annual turnover and net profit of the centre during 2011-2019

3.8.2 Creation of rural market

Jasingfaa has created a market for both local agricultural products and services in the locality. Jasingfaa also procures green vegetables, meat, etc. locally and thus creates a ready market for the products grown by the local farmers.

3.8.3 Extension service in the form of conservation of nature

Nature is exciting, inspiring, refreshing and constantly changing. It is full of mysteries to be marveled at and beauty to be admired. One of

the prime aims of Jasingfaa is to generate awareness and conserve nature through the creation of a good ambience at its premise. For this purpose, Jasingfaa takes the privilege to hold “Nature Camp” each year from its very inception in collaboration with other local, national, and international environmental organizations. They also celebrate “World Environment Day” every year inviting 50 students from the schools of remote corners where man-animal conflicts are very prominent and thus trying to create awareness about the burning environmental issue.

3.8.4 Avifauna

In the beginning, barren agricultural land has been meticulously converted into ponds of different sizes and further transformed into lush greenery by planting various local trees on the banks of the ponds. The centre and the Mahrul beel along with its boundary take care of the surrounding environment. It encourages several avifauna of both endemic and migratory, which allure several bird lovers. Thus, the centre is providing precious environmental benefits creating habitat to various species of birds and endemic fishes.

3.9 Economic Viability of the Jasingfaa Aqua-tourism Centre

With all the facilities mentioned above, it has been evolved a successful model of aqua tourism in the state and the country. The gross annual turnover showed an increasing trend till 2015-16. Though it slightly decreased in the subsequent years, it took momentum and reached an all-time high in the year 2018-19. Fig. 5 has represented the "Gross Annual Turnover" and "Net Profit" of the centre during 2011-2019.

With the apparent benefits of the concept of rural tourism, some of the budding entrepreneurs have started replicating the concept of Jasingfaa and have started new ventures with little or no modifications at different places in the state.

4. CONCLUSIONS

Tourism is the fastest-growing industry in the world and a major source of income in many countries of the world. Being a people-oriented industry, tourism also provides many jobs which have helped revitalize local economies. At a time when the employment opportunities in the public sector in the post-reform period in India are dwindling, the tourism sector may show a ray of hope by employing huge numbers of unemployed youths. Northeast India including Assam is known for their bio-geographic richness. With its dense forests, uneven topography, flora and fauna, the majestic Brahmaputra and its tributaries, wildlife sanctuaries like Kaziranga, Manas, Pabitora, Dibru Saikhowa, Bhalukpong, Pobitora, and similar others, with many rare species of animals, Assam offers nature-centric tourism. Besides forests and wildlife, there are plentiful tourism resources which are remaining unexploited leaving the region further behind the

development ladder of the country. Against the backdrop of this, it can be said that the tourism activities in private hands are showing optimism. Jasingfaa Aqua-tourism Centre, a fledgling tourism project and comparatively a new and unique inclusion in the state tourism sector feels proud to generate a good number of employment opportunities for the unemployed youth of the state. People certainly heard about 'nature-based tourism', 'ecotourism' and 'cultural tourism' but, perhaps, did not hear the success story of fish based aqua-tourism which Jasingfaa has initiated with glory.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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