Advisories on Fish Farming in Tripura for Coping with COVID 19: An Outlook

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Abstract

The usage of mobile-based agro-advisories and its utilization pattern was unclear, especially in the case of fisheries and aquaculture in Tripura, coming under the North-Eastern region of India, where 1.87 lakh population was primarily identified as fish farmers. Similar to other parts of the country, the COVID-19 outbreak hampered fishery and aquaculture in Tripura, and farmers were physically barred from accessing support systems and technical facilities of different organizations. In view of that, the present study was performed to identify all such mobile-based advisories related to fish farming, which were actively circulated in the state during the COVID-19 outbreak. The accessibility, perceived level of satisfaction, and utility of those mobile-based advisories were studied. It was found that out of 120 respondents, 102 actively sought/accessed some of these advisory services. The advisory on fish farming, released by the Department of Fisheries (DoF), Tripura, was accessed by more than half of the respondents (54.17 %), followed by 'Mobile Based Agro-Advisory' system (20.83 %) under the 'Matsya Varta' project of College of Fisheries, Central Agricultural University (COF-CAU), Tripura. Other advisories from KVKs were also accessed by the respondents (9.16 %) indicating a significant rate of accessibility and utility. The findings suggest the existence of adequate advisory services in the state during COVID-19 outbreak.

Keywords: Lockdown, mobile-based advisory, agro-advisory, fisheries, aquaculture

Introduction

The COVID-19 pandemic has led to huge loss of human lives worldwide and presents a serious challenge to public health, food systems, and the world of work. The economic and social disruption caused by this pandemic is devastating. More than a million enterprises faced an existential threat where nearly half of the (3.3 billion) global workforce is at risk of losing their livelihoods, especially the farmers (Pavankumar et al., 2021; WHO, 2021). Due to mobility restrictions amid COVID-19 lockdown, the farmers could not physically go out, resulting in getting acquainted with farming information from different public extension systems (Kumar & Nataraj, 2020). In this perspective, non-conventional advisory services like mobile-based agro-advisory services and other Information and Communication Technology (ICT)-enabled advisory services emerged as an effective and convenient tool for sustaining the production goal in various agriculture-allied sectors (Lahiri et al., 2019; Kassem et al., 2020; Jat et al., 2021). Technical support, as well as, mock training facilities were provided through different advisory services worldwide by means of voice call, video call, Short Message Service (SMS), etc. (Davis, 2020) and India is not found to be an exception. Uncertainty due to COVID forced organizations to shift their mode of information delivery services from conventional to media-oriented ministrations. As a result, a variety of advisory services were found to form in various sectors to cope with those difficulties. 'Mobile Based Agro-Advisory System funded by MeitY, New Delhi, an Interactive Voice Response System (IVRS) based mobile advisory system, covering thousands of beneficiaries in the North-Eastern Region of the country is one among the advisory service providers (Lahiri, 2020; AESA, 2021; CAU, 2021; GFRAS, 2021; IVRI, 2021). However, for a small state like Tripura in the north-eastern part of the country, it was still

unclear how these mobile-based advisories were being used and how often they were being used in sectors such as fisheries and aquaculture.

Tripura, being a hilly-agrarian state, possesses a population size of around 40.23 lakh, ranks 2nd among the NE states (Ecostat Tripura, 2020; NHM, 2019), where, 1.87 lakh was primarily identified to be the fish farmers (DoF, 2019a) and fish is regarded as one of the prime constituents of the daily diet of its inhabitants (DoF, 2019a). But, under the surge of COVID-19 and consequent lockdown, all the activities related to fishery and aquaculture got hampered due to the mobility restrictions in the state (Panday, 2020). As a consequence, all physical means of farmer support systems and technical facilities were disrupted. Therefore, many organizations such as Department of Fisheries (DoF), Krishi Vigyan Kendras (KVKs), College of Fisheries (COF), Central Agricultural University (Imphal) etc. were found to provide mobile-based farm advisories to the fish farmers. In light of this, the purpose of the present study was to identify and evaluate all mobile-based advisory services related to fish farming in the state of Tripura since the outbreak of COVID-19 in terms of their accessibility, utility, and perceived satisfaction, as well as their contribution to sustain fish production.

Material and Methods

The study was conducted in Tripura, a land-locked state that extends between 22°56'N and 24°32'N and 90°09'E and 92°10'E (Fig. 1). The state is sharing its borders with Assam, Mizoram and Bangladesh, where the length of its international border is 856 km with Bangladesh (Tripura Info, 2021). Total area of the state is 10,491.69 sq. km and is divided into a total of eight districts (Tripura State Portal, 2021). For the purpose of the present study, a list of fish farmers of Tripura as per the enumeration of the Department of Fisheries, Govt. of Tripura along with other relevant details of those districts were collected from secondary sources (DoF, 2019 b). Accordingly, four districts were selected on the basis of the mean value (23687.63) of the total number of fish farmers in the state where, two districts each i.e., Sepahijala (27919) and Gomati (26302) were randomly selected from the above mean value and Khowai (21573) and West Tripura (21246) respectively were from the below mean value.

For documentation of different advisories accessed by the fish farmers from the public extension system during COVID-19 pandemic (from March 2020 to March 2021), various public organizations such as Krishi Vigyan Kendra (KVK), Department of Fish-
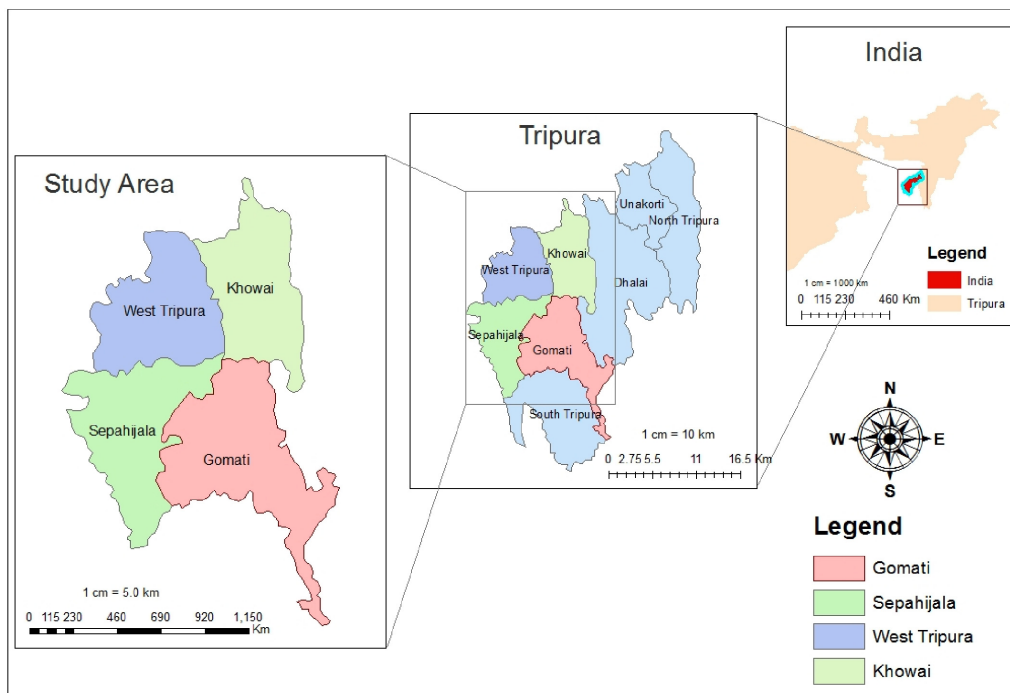

Fig. 1. Map showing the study area in Tripura

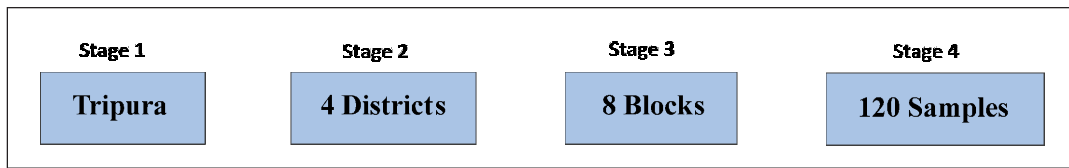| Stage 1	Stage 2	Stage 3	Stage 4
Tripura	**4 Districts**	**8 Blocks**	**120 Samples**

Fig. 2. Sampling procedure: Multi-stage approach (Business Research Methodology, 2021)

eries (DoF), College of Fisheries (COF) etc. were visited and an inventory of advisories was prepared after thorough discussion with various experts. Further, those advisories were pilot tested and valid ones were incorporated in the interview schedule to assess the 'Access', 'Extent of Utility' and 'Level of Satisfaction' as perceived by the respondents. A total of one hundred and twenty (120) fish farmers were selected (Fig. 2.) as the sample size for collection of the primary data under the present study, where thirty (30) fish farmers from each of the four districts were selected randomly.

For measuring the 'access' of advisories, different descriptive statistics such as mean and standard deviation were used, along with frequency and percentage (Yashashwini, 2016; Yemin, 2019), whereas 'utility' and 'satisfaction' of those advisories were measured on a five-point Likert scale (Bertram, 2013). Further, to know the differences in the level of utility and level of satisfaction as perceived by respondents over different advisories, the Independent-Samples Kruskal-Wallis Test (at 0.05 level of significance) (Daniel, 1990) was undertaken by using Statistical Package for the Social Sciences (SPSS) version 22.0.

Results and Discussion

Agricultural and allied advisory services are proved to be important tools, which provide critical and scientific farming information in a timely manner, which in turn help in livelihood development and farmers' welfare especially, in rural areas (Lahiri et al., 2020). Among the different key attributes of agricultural advisory services, providing coping strategies for reviving the agriculture and allied sectors amid different challenges due to diseases outbreak was reported to be an effective one (Anderson, 2008). For documentation of different advisories, various public organizations such as KVKs, DoF, COF etc. were visited, different fish farming-related advisories released during the COVID-19 outbreak were identified and finally, an inventory of advisories was prepared. Further piloting revealed that, in general, seven advisories

named, 'CAU (Imphal) Advisory for Nursery and Rearing Pond Management', 'CAU (Imphal) Advisory for Good Management Practices (GMPs) of Fish Farmers', 'CAU (Imphal) Advisory for Fish Seed Growers/Hatchery Owners', 'Fish Farming', 'Diseases Control and Health Management', 'Fish Farming Practices' and 'Fish Health Management' were reported to be accessed by the fish farmers of the study area during the COVID-19 outbreak towards redressal of different issues of fish farming. For drawing a comprehensive view of the aforesaid advisories, the respondent-fish farmers were asked to respond on the 'Access' to those advisories as well as to rate 'Extent of Utility' and 'Level of Satisfaction' on a five-point continuum. The results of the same are presented in Table 1.

It was observed from Table 1 and Fig. 3 that out of 120 samples of respondent-fish farmers, only 102 of them used any of the advisories mentioned above.

Fig. 3. Advisory accessed by the fish farmers
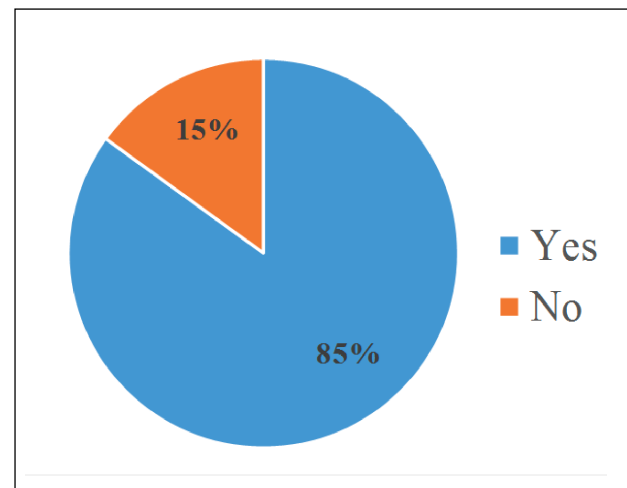
As depicted in Table 1, it was found that only 2.5% (Fig. 4) of the respondents had accessed the particular advisory during the COVID-19 outbreak. This advisory was disseminated through Mobile Based Agro-Advisory project, *'Matsya Varta'*, at the College of Fisheries, Tripura under the monitoring

Table 1. Different advisories accessed by the fish farmers

Name of advisory	Key aspects covered	Name of organization	*Extent of utility VL	L	M	H	VH	Average score	*Level of satisfaction/Farmers' access VL	L	M	H	VH	Average score	Frequency	%
CAU (Imphal) Advisory for Nursery and Rearing Pond Management	- Maintaining general hygiene.- Following SOPs for carrying out general farm work. - Preparation of nursery pond. - Preparation of rearing pond. - Maintaining general safety and security measures during fish farming.				2 (66.67 %)	1 (33.33%)		3.33 ± 0.58			1 (33.33%)	2 (66.67%)		3.67 ± 0.58	3	2.50
CAU (Imphal) Advisory for Good Management Practices (GMPs) of Fish Farmers	- Fish farming tips for maintaining farm biosecurity, water quality, stocking, feeding, monitoring, disease prevention, harvesting and marketing of fishes. - Management of pre-breeding activities	CAU (Imphal)			12 (66.67%)	6 (33.33%)		3.33 ± 0.49			8 (44.44%)	10 (55.56%)		3.56 ± 0.51	18	15.00
CAU (Imphal) Advisory for Fish Seed Growers/ Hatchery Owners	- Management of regular activities such as feeding of brooders, monitoring water quality and management of brood health - Breeding of fish in the hatchery or in hapa - Feeding management of fishes maintaining SOPs			1 (25.00%)	3 (75.00%)	1 (25.00%)		3.25 ± 0.25		1 (25.00%)	1 (25.00%)	2 (50.00%)		3.25 ± 0.96	4	3.33
Fish Farming	- Fish growth and farm management practices	DoF (Tripura)		6 (9.68%)	39 (62.90 %)	17 (27.42 %)		3.18 ± 0.59		8 (12.90 %)	43 (69.35 %)	11 (17.74 %)		3.05 ± 0.56	62	51.67
Diseases Control and Health Management	- Treatment of fish diseases				3 (100.00 %)			3.00 ± 0.00			1 (33.33 %)	2 (66.67 %)		3.67 ± 0.58	3	2.50
Fish Farming Practices	- Feeding management - Fish growth	KVKs		3 (30.00 %)	5 (50.00 %)	2 (20.00 %)		2.90 ± 0.74		1 (10.00 %)	5 (50.00 %)	4 (40.00 %)(Tripura)		3.30 ± 0.67	10	8.33
Fish Health Management	- Treatment of fish diseases				1 (100.00%)			3.00 ± 0.00			1 (100.00%)			3.00 ± 0.00	1	0.83

(* VL- Very Low, L- Low, M- Medium, H- High, VH- Very High)

and coordination of the Directorate of Extension Education, CAU, Imphal (CAU, 2021). The advisory precisely consists of the following:

a. Maintaining general hygiene through proper sanitization of different equipment and utensils, used in fish farming.

b. Maintaining physical distancing, personal hygiene, and following COVID-appropriate behaviours.

c. Restricting the entry of visitors and vehicles to the farm complex for containment of COVID-19 outbreak.

d. Usage of clean and purified water for fish farming.

e. Preparation and usage of homemade low-cost, protein-rich fish feed.

f. Cleaning of pond/farm sides and renovation of ponds by following proper pre and post-stocking strategies.

g. Preparation of nursery and rearing ponds by following standard management parameters and COVID-appropriate behaviours.

Regarding the 'extent of utility', two third (66.67 %) of the respondents found it moderately useful, whereas one-third (33.33 %) considered it as highly useful, as depicted in Table 1. In case of the 'level of satisfaction', 66.67 % of the respondents were highly satisfied with its positive results observed in fish farming.

As evident from Table 1, it was observed that 15 per cent (Fig. 4) of the respondents had accessed this advisory. This is also pushed through the public extension system, named 'Matsya Varta'. It basically promotes the followings:

a. Usage of a separate set of cloth, cap, mask, and gumboots during performing any fish farming-related activity.

b. Regular washing of hands and use of sanitizer to maintain personal hygiene.

c. Avoid touching eyes, nose, and mouth during any farm work.

d. Maintaining travel history of the individuals towards minimizing/avoiding the chances of COVID-19 infection

e. Managing farm and non-farm activities such as biosecurity control, water quality management, fish stocking, fish feeding, monitoring, disease prevention, fish harvesting, marketing of fish etc. by adhering to all Standard Operating Procedures (SOPs) for COVID-19.

Moreover, it was also observed that majority of the respondents *i.e.,* 66.67 % found this advisory modˆerately useful, whereas 33.33 % mentioned this as highly useful. In case of the 'level of satisfaction', 55.56 % of the respondent found to be highly satisfied, followed by 44.44 % who were moderately
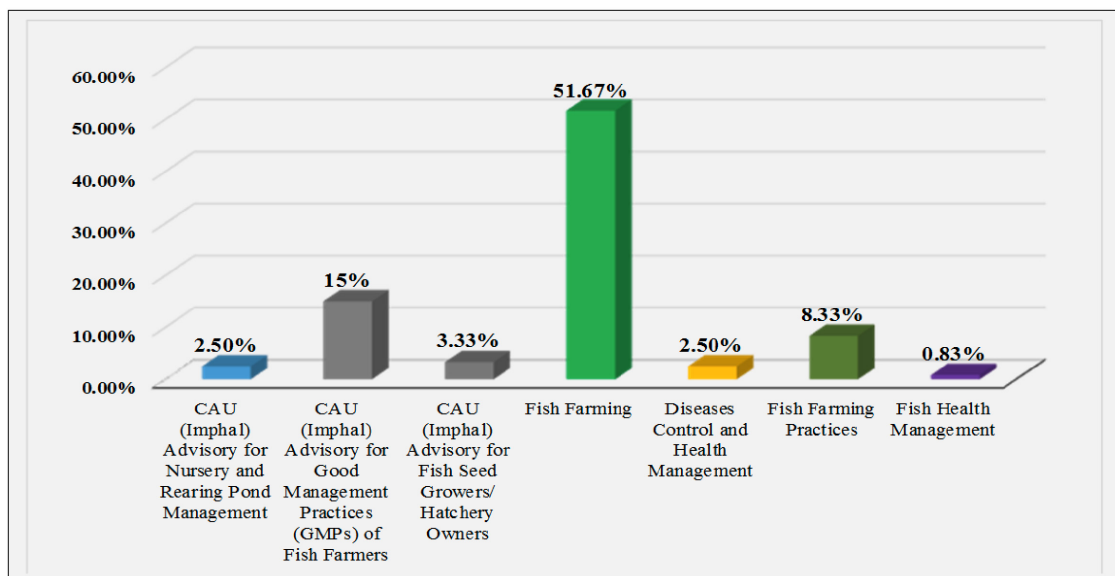

Fig. 4. Different advisories accessed by the fish farmers

Table 2. Hypothesis testing for 'extent of utility' and 'level of satisfaction' among different groups of advisories

Null hypothesis	Test	Significance level (α^*)	Decision
There is no difference in the distribution of extent of utility across the different advisories as accessed by the fish farmers	Independent-Samples Kruskal-Wallis Test	0.687	Retain the null hypothesis
There is no difference in the distribution of level of satisfaction across the different advisories as accessed by the fish farmers	Independent-Samples Kruskal-Wallis Test	0.020	Reject the null hypothesis

satisfied with the advisory.

The advisory for Fish Seed Growers/ Hatchery Owners was also disseminated through 'Mobile Based Agro-Advisory' system of CAU, Imphal during the COVID-19 outbreak and was found to be accessed by 3.33 % of the respondents (Table 1 and Fig. 4) from the study area. The advisory is made up of the following key guidelines:

a. Maintaining personal hygiene through using sanitizer and using the proper mask to restrict the COVID-19 spread.

b. Maintaining physical distancing from other individuals during various pre-breeding activities such as fish segregation and stocking.

c. Disinfecting all the utensils and tools after any breeding operation with $KMnO_4$.

d. Controlling biosecurity of the farm land and prohibiting unwanted invasion for individuals/visitors.

e. To follow all COVID-19 related SOPs during the breeding of fish in hatchery or hapa.

Regarding the 'extent of utility', the majority of the respondents (75 %) found this advisory moderately useful. In contrast, only 25 % perceived it as highly useful, as depicted in Table 1. In the case of 'level of satisfaction', 50 % were found to be highly satisfied, followed by 25 % moderately satisfied, and 25 % had a low level of satisfaction with the content and utility of the said advisory.

This is a general advisory related to fish farming issued by the Department of Fisheries (DoF), Govt. of Tripura. This was reported to be very effective during the COVID-19 outbreak and accessed through mobile-based/ telephonic communication as well as physical mode, which covered various aspects of feeding management of fishes and fish growth and farm management practices by maintaining SOPs of COVID-19. As depicted in Table 1, it was found that majority of the respondents, *i.e.,* 51.67% (Fig. 4), had accessed this advisory (through personal call/visit to office call/digital means). Further, the respondents revealed that they were primarily engaged with the various activities performed by DoF, and their previous association with the officials/extension agents under DoF motivated them to seek assistance related to fish farming during COVID-19 outbreak and lockdown period. In the case of 'extent of utility', majority of the respondents (62.90%) found this advisory as moderately useful, followed by 27.42 % who found it as highly useful, and 9.68 % reported it as less useful. Whereas, 'level of satisfaction' showed that 69.35 % of them were moderately satisfied, followed by 17.74 % who had higher satisfaction and 12.90 % with lower satisfaction.

Disease Control and Health Management is another advisory issued by the Department of Fisheries (DoF), Govt. of Tripura. It was provided with controlling measures of various fish disease and their treatment. During the COVID-19 outbreak, it was also disseminated through mobile-based/ telephonic communication services. The results revealed that only 2.50 % (Fig. 4) of the respondents had accessed this advisory during the disease outbreak, under which all reported it as moderately useful. But, in the case of 'level of satisfaction' majority of them, i.e., 66.67 %, were highly satisfied, followed by 33.33 % who were moderately satisfied with the service and information. Similar results were also found by Ghosh et al. (2022) in terms of the perceived level of satisfaction with the interventions made by the public extension system.

This advisory was also issued by Krishi Vigyan Kendras (KVKs) of Tripura during the COVID-19 outbreak. Considering all the safety and security

aspects related to the COVID-19 outbreak, this advisory provided various instructions and information for the fish farmers telephonically and physically. Feeding management and fish growth-related information were the key aspects of this advisory. Results of the study show that 8.33 % (Fig. 4) of the respondents had accessed this, whereas 50 % of them reported this as moderately useful, followed by 30 % who said it as less useful and 20 % found this as highly useful. Moreover, 50 % of them were found to be moderately satisfied with the advisory provided, followed by 40 % who had higher satisfaction. Only 10 % of respondents were found to be less satisfied.

This advisory was also issued by KVKs of Tripura during the the COVID-19 outbreak on 'Fish Health Management'. It provided comprehensive safety advice to combat the COVID-19 fallout along with various information related to fish disease, its treatment and fish health management practices. As shown in Table 1, it was found that only each of 0.83 % (Fig. 4.) of respondents accessed this advisory with moderate usefulness as well satisfaction, respectively.

To determine the differences in 'extent of utility' and 'level of satisfaction' among the different groups of advisories accessed by fish farmers, Independent-Samples Kruskal-Wallis Test was performed in each case and the results were presented in Table 2.

The results in Table 2, showed that the null hypothesis has been retained (P value > 0.05), where the α value was determined to be 0.687, indicating that there is no difference in the distribution of extent of utility across the different advisories which were in use by the fish farmers. Whereas, the null hypothesis has been rejected (P value < 0.05), and the alternate hypothesis was accepted in case of the 'level of satisfaction', indicating that there were some significant differences in 'level of satisfaction' as perceived by the respondents while using the different advisories during the COVID-19 outbreak in the study area.

It can be translated from the above results, the advisory on Fish Farming, released by the DoF, Tripura, was accessed by more than half of the respondents and the reason of higher access being the state-wide coverage of fish farmers through different schemes of DoF and the existence of a strong network of Fisheries Extension Professionals under DoF across all blocks of the state, for

assisting/serving the fish farmers. It is also pertinent to mention here that the advisories released through the 'Mobile Based Agro-Advisory' system under 'Matsya Varta' project were also accessed by a significant number of respondents and the access is gradually increasing with the increase in farmer's registration. The farmers also appreciated the overall management and experts' advice as well as contact-less, advanced technology-driven dissemination of information under Matsya Varta which proved to be very helpful during the quarantine period amid the COVID outbreak.

Acknowledgements

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