Using Social Media to Train Aquaculture Farmers: Experimental Evidence from Bangladesh

Marzuk Hossain, BRAC University, Email: marzuk.hossain@bracu.ac.bd
Tahmid Bin Mahmud, BRAC University, Email: tahmid.mahmud@bracu.ac.bd
Khandker Wahedur Rahman, University of Oxford and BRAC University, Email: khandkerwahedur.rahman@oxfordmartin.ox.ac.uk
Munshi Sulaiman, BRAC University, Email: munshi.sulaiman@bracu.ac.bd

Selected Paper prepared for presentation at the 2023 Agricultural & Applied Economics Association Annual Meeting, Washington DC; July 23-25, 2023

Using Social Media to Train Aquaculture Farmers: Experimental Evidence from Bangladesh

Marzuk Hossain, Tahmid Bin Mahmud,

Khandker Wahedur Rahman, and Munshi Sulaiman*

May 17, 2023

Abstract

We conducted an individual-level randomized controlled trial (RCT) to evaluate the effectiveness of providing one-to-one training to aquaculture farmers on using social media. From a phone survey two months after the intervention, we find it increases the likelihood of farmers using social media and their knowledge. An in-person follow-up supports these findings, showing that the impact of the intervention on social media usage and knowledge acquisition from static posts is sustained even after at least six months. Recipients of social media training are significantly more likely (by four percentage points) to use social media for interacting with other aquaculture farmers and gathering trade-relevant knowledge. Additionally, they have a six percentage point higher likelihood of acquiring knowledge from static posts. However, there is no significant impact on farmers' practices, indicating that the acquired knowledge is not being translated into action. These findings suggest that social media training interventions can complement traditional extension and outreach activities for aquaculture farmers for knowledge transfer, but there are unknowns about how to facilitate the translation of knowledge to practice.

Keywords: aquaculture, farmer training, technology, social media.

*Hossain: BRAC Institute of Governance and Development, BRAC University. Email: marzuk.hossain@bracu.ac.bd. Mahmud: BRAC Institute of Governance and Development, BRAC University. Email: tahmid.mahmud@bracu.ac.bd. Rahman: University of Oxford and BRAC Institute of Governance and Development, BRAC University. Email: khandkerwahedur.rahman@oxfordmartin.ox.ac.uk. Sulaiman: BRAC Institute of Governance and Development, BRAC University. Email: munshi.sulaiman@bracu.ac.bd.

1 Introduction

In Bangladesh, most aquaculture farmers typically rely on their own personal experience or traditional family practices as their source of knowledge of fish farming (Burbi and Rose, 2016). This means they are only limited to the information they have gained from their immediate environment. As a result, they do not have access to comprehensive and up-to-date information available outside of their community.

The government and private agencies have implemented various segregated in-person training and extension services to bridge this gap. Extension services in aquaculture or fisheries aim to share knowledge and skills with fishing communities to improve their farming practices and ultimately enhance their quality of life by increasing fish production and income (Anderson, 2004; Nakasone, Torero and Minten, 2014). Such services include technology transfer, linking farmers to support services and credit facilities, establishing marketing and distribution systems, and offering training in aquaculture techniques. However, the effectiveness of these services largely depends on how the technology is disseminated to the end-users, i.e., aquaculture farmers (Rogers, 1995). Successful technology transfer occurs when knowledge, information, and skills related to the new technology are effectively communicated from its source to the farmers (Brown and Fadillah, 2013).

In this study, we assess the impact of creating a social media network for Bangladeshi aquaculture farmers and providing them with information on their knowledge and practices. The study involves a randomized controlled trial (RCT) conducted by partnering with The Right Kind (TRK), a local consultancy and implementation agency. The trial is conducted in three sub-districts (Durgapur, Charghat, and Bagha) of Rajshahi, a northern district in Bangladesh. The training provided to the farmers is a one-to-one session teaching them how to join a Facebook group (The Right Fish, TRF hereafter) and access relevant information about fish farming. Facebook is a good platform for disseminating information about fish farming in Bangladesh as many people own mobile phones and have access to the internet, with many of them using it as a communication platform.

We find that the intervention increases the use of social media for fish farming-related issues and farmers' knowledge in the short run (two months after the intervention ended).

This short-run knowledge increase is driven by increased knowledge obtained from static posts (e.g., infographics, text posts, etc.).

The intervention also has a positive impact on the use of social media eight months after the intervention. We find that treatment also remains effective in increasing knowledge from static posts. We find no impact of an increase in knowledge from video posts.

Despite this increase in knowledge, the treatment does not impact farming practices. The treatment and control farmers behave almost similarly after eight months of the intervention across different dimensions of farming practices.

We contribute to the literature that studies how to provide information to farmers effectively. Conventional extension services can be inefficient and difficult to scale due to requiring significant fixed and recurring costs for the large human resources (Quizon, Feder and Murgai, 2001). In-person training through multiple yearly visits can be problematic due to time and distance (Cole and Fernando, 2021). Information and communication technologies (ICTs), in the face of obstacles of the traditional services, can be more useful for delivering valuable knowledge to farmers in rural areas of developing countries (Fabregas, Kremer and Schilbach, 2019).

We also contribute to the literature studying the use of social media in agriculture. Mobile phone ownership has increased productivity among maize farmers in Ghana (Issahaku, Abu and Nkegbe, 2018). There are three primary benefits for farmers who own and use mobile phones: obtaining market information and extension services, receiving payments and inputs remotely, and saving time by avoiding travel to obtain extension services. In China, mobile application-based training modules have improved the knowledge and output quality of grape farmers (Chua, Li, Rahman and Yang, 2021). In Central Java, aquaculture farmers who were part of an online Facebook community significantly improved their knowledge and problem-solving skills (Elfitasari, Nugroho and Nugroho, 2018). They also reported financial improvements due to increased market reach and taking advantage of the low costs of inputs when comparing costs over the internet. Social media supports farmers' resilience by providing farming-related knowledge, serving as a platform for connecting with customers and marketing products, and providing emotional support (Daigle and Heiss, 2021). The storytelling component of social media contributes to customer loyalty and serves as a performance of identity for women farmers.

Our study significantly contributes to the existing literature on using social media to deliver training in aquaculture or fish farming. It represents the first intervention in Bangladesh, where aquaculture farmers are trained to utilize Facebook as a platform for accessing farming information, engaging with other farmers to address farming queries, and facilitating the buying and selling of various farming inputs or harvests.

The rest of the paper is organized as follows: in Section 2, we discuss the background of aquaculture in Bangladesh and the use of mobile/internet technology in the country. Then, we provide details of the intervention in Section 3. Section 4 discusses how we collected data and Section 5 describes the empirical strategy. In Section 6, we present the results of our analysis and findings. Section 7 concludes the paper.

2 Background

Aquaculture acts as a panacea for the countries in the Asia-Pacific region, contributing to the region's food security, income, employment, and poverty alleviation, as such, enhancing the rural socioeconomic standards (Belton, Bush and Little, 2017; FAO, 2020). The region boasts 89% of global aquaculture production. Bangladesh has positioned itself right after China and India as the third largest producer of fish captured from inland waters – producing 10% of global production (FAO, 2020). The inland fish production stands at 57% of the total fish production in Bangladesh, with 79% of this inland production coming from ponds (Department of Fisheries Bangladesh, 2021).

However, there is plenty of room for improvement for the fish farmers in Bangladesh. There is sub-optimal use of input among the farmers in Bangladesh (Khan, Begum, Nielsen and Hoff, 2021). They also find that technical know-how acquired through access to training and extension services significantly reduces this inefficiency. Adoption of new technologies in aquaculture involving the improved feed and feeding methods; improved production process and disease management; and genetically enhanced fish strains results in growth in aquaculture production - specifically, in the production of shrimp, salmon, and tilapia (Kumar and Engle, 2016). Such technology adoption also enhances efficiency in aquaculture farming, particularly in the farming of carp in several countries of Asia, including Bangladesh (Dey, Kumar, Chen, Khan, Barik, Li, Nissapa and Pham, 2013).

Nevertheless, adopting such technologies can only occur if the information regarding their existence is disseminated among the farmers in their preferred method, among other factors that influence the take up of such information (Kumar, Engle and Tucker, 2018). Almost nine out of every ten people (89% of the people) in Bangladesh own mobile phones, and about one-third (35%) have access to the internet (Hassan, Aziz, Mozumder, Mahmud, Khan and Razzaque, 2020). Among those that do have access 71% use Facebook to communicate with others. Facebook is also the most popular platform for communication among the people of the Rajshahi Division of Bangladesh, the setting where this study takes place. Therefore, Facebook can be an excellent medium for the dissemination of information relative to fish farming among farmers.

3 Intervention

The Right Kind (TRK) conducts various projects to train farmers on using social media platforms for aquaculture-related information and create an online community of fish farmers to share knowledge. They are trying to facilitate the transfer of technology through social media. The training is being conducted one-to-one, which involves demonstrating to farmers how to join the Facebook group "The Right Fish" and obtain information related to fish farming. The intervention being studied is the introduction of the farmers to this Facebook platform.

The advantage of employing a digital platform for training dissemination lies in its ability to overcome geographical limitations, allowing individuals with basic digital skills to access the training content through their Facebook profiles anywhere at their convenience. By connecting farmers online through social media, disseminating updated farming knowledge and new technological innovations can reach a larger audience. Fish farmers can access important information tailored to aquaculture farming. Farmers can freely share knowledge and seek advice from other farmers or experts in the field who are also on the same platform. The platforms are also useful for sharing critical information such as costs and locations of farming equipment, feeds, or medicines and government loans available to farmers. All of these elements work together to increase the agency of aquaculture farmers in making informed decisions.

TRK conducted an enrollment survey to recruit aquaculture farmers for the intervention from 3 sub-districts[1] of Rajshahi (a Northern district of Bangladesh).. Representatives from TRK reached out to all the listed farmers with the help of their local contacts. These representatives visited the farmers' homes and collected information about the farmers, the availability of smartphones in their respective households, their usage of social media, and their earnings from aquaculture farming and the sizes of those farms.[2] Computer-aided personal interviewing (CAPI) survey forms were used to collect this data. Embedded within these survey forms was a code for randomly assigning each listed farmer to the treatment or control groups. This ensured that each farmer had a 50% chance of being in either of those groups. To ensure randomization, potential participants are oversampled and randomized at the individual level during enrollment by embedding a random assignment option (assignment to the treatment or the control group) within the enrollment form. We ensured an over-selection of potential participants to account for attrition.

We identified 628 treatment and 609 control aquaculture farmers with smartphones in their respective households (either owned by them or another household member). We only introduced the treatment farmers to TRF. TRF is a restricted Facebook group; only individuals with accounts added to the group can access its curated content. One requires a reference to be added to this group — in this case, the names of the TRK representatives were used as a reference. TRK representatives added them to the group and explained how to use it. However, the control farmers were only told that the data collectors visiting them were representatives of TRK or TRF.

Access to the Facebook group "The Right Fish" is restricted to the treatment group, and referrals are made by field officers during the enrollment process, ensuring an inherent barrier to spillover effects. The intervention was administered from 6 April 2022 to 8 August 2022, lasting for four months.

[1]Durgapur, Charghat, and Bagha are the three sub-districts.

[2]Only the aquaculture farmers with smartphones in their respective households were listed.

4 Data

4.1 Data Collection

We conduct two rounds of follow-up surveys: a phone survey conducted two months after the listing (October 2022), and an in-person survey conducted six months after the phone survey (April 2023). We also have baseline characteristics collected from the enrollment that TRK carried out.

We interviewed 562 treatment and 524 control farmers in about a 30-minute-long phone survey two months after the enrollment survey. We allowed for two months' time so that all the farmers in the treatment group had ample time to learn new information from TRF. Through this survey, we try and sift out farmers' social media usage to acquire knowledge on various aspects of aquaculture farming.

Then, six months after the phone survey, we interviewed 515 treatment and 480 control aquaculture farmers[3] who currently have smartphones in their households and did so during the enrollment survey too. The time gap of six months helps us understand the retention of knowledge among farmers, the translation of this knowledge into practice, and the consequent impact on income.

We have three main outcomes of interest: 1) farmers' using social media, 2) farmers' knowledge about good fish farming practices, 3) farmers' farming practices. We measure the first two outcomes in both survey rounds, while the last one is only measured during the in-person survey. Our analytical sample consists of respondents who were successfully interviewed in both rounds of the follow-up survey.

4.2 Sample Characteristics

Tables 1, 2, and 3 show that there are no significant differences between treatment and control aquaculture farmers. Table 1 shows that the average household size of the sample is about five, slightly higher than the rural national average of 4.30 (BBS, 2023). However, the representation of female-headed households at 1% is well below the national statistic of

[3]We also dropped three singleton observations in 3 different Unions.

12.6% households (BBS, 2023). This may be because our sample only considers a specific segment of aquaculture farmers from a Northern district of Bangladesh who has smartphones in their respective households. Moreover, all the respondents in our sample are male farmers. They have an average age of 40 years and 11 years of education on average.

Table 2 shows that the farmers are similar regarding their social media, smartphone, and internet usage across treatment and control groups. They spend BDT 350 monthly on average for the internet. They have a 70% chance of owning a smartphone by themselves and are slightly more likely (76%) to have access to these phones by themselves. Although they are not quite as likely (at 47%) to look up fish-farming-related information online, almost all of them are likely (at 95%) to have a household member with a Facebook account. However, they are less likely (74%) to use Facebook themselves. They are equally as likely to use other forms of social media.

Table 3 shows that the farmers have similar levels of assets, with similar poverty scores and yearly production. On average, they have about three ponds covering an area of about 4.8 acres. The land for the ponds is most likely (at 45%) leased and least likely (at 25%) to be owned land. Over the year 2021-2022, these ponds produced 10 tonnes of fish, on average, earning a consequent revenue of BDT 1.98 million over the same period. Given the farmers' average assets and production level, it is pertinent that their average simple poverty score is rather high at 79.

5 Empirical Strategy

We use data from the phone survey and the in-person survey to estimate the following regression to estimate intention-to-treat (ITT):

$$Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu} \tag{1}$$

Here Y_{iu} is the outcome variable for individual i as explained in the previous section and union u; α_u are the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term. β in Equation 1 is the ITT effect of the social media training.

We use robust standard errors to account for heteroskedasticity.

6 Results

We find that the training has prompted the treatment group to use social media (TRF Facebook group) to interact with other fish farmers, gather information regarding aquaculture, and improve knowledge on some farming practices. Table 4 shows that the training increased the likelihood of using social media about aquaculture farming by six percentage points.[4]

While the intervention increased the likelihood of acquiring knowledge about fish farming from online posts in both static (including written posts, infographics, pictures or any combination of them) and video form by one percentage point, it had a much larger impact for static posts alone — increasing the likelihood to 10 percentage points as shown in Table 4. This suggests that disseminating knowledge through social media posts is more effective when presented in static form.

The analysis from the in-person survey complements the phone survey findings. Table 5 shows that even in the long run (over a period of at least six months), the impact of the intervention on social media usage and knowledge acquisition from static posts is sustained. The social media training recipients are significantly more likely (by four percentage points) to use social media to interact with other aquaculture farmers and gather knowledge relevant to their trade. They are also significantly more likely (by six percentage points) to acquire such knowledge from static posts. However, there is no significant impact on the practices of the farmers shown in Table 6, indicating that the knowledge is not being translated into practice.

7 Conclusion

While providing farmers with up-to-date information and training them is important, they come with many challenges. Extension services provide this support, but they incur high costs. ICT provides an alternative, but there is much yet to unpack about how ICT can be

[4]Table A1 shows the results for all the phone-survey sample.

leveraged in this regard.

We conduct an RCT among fish farmers in Bangladesh to assess the impact of providing access to a social media network on the farmers' usage, knowledge, and practices. Farmers are more likely to use social media because of the training and their knowledge increases - both impacts sustaining for at least eight months. We do not find an increase in farming practices.

While the lack of uptake in farming practices is disappointing, it is encouraging to see that such intervention can increase knowledge — that is, ICT can reduce the knowledge gap. For future research, we need to focus on why ICT-transmitted knowledge is not being translated into practice and under what conditions that will happen.

References

Anderson, J. R. (2004) "Agricultural Extension: Good Intentions and Hard Realities," *The World Bank Research Observer*, 19 (1), 41–60, 10.1093/wbro/lkh013.

BBS (2023) "Key Findings: Household Income and Expenditure Survey (HIES) 2022.," https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/57def76a_aa3c_46e3_9f80_53732eb94a83/2023-04-13-09-35-ee41d2a35dcc47a94a595c88328458f4.pdf.

Belton, Ben, Simon Bush, and David Little (2017) "Not Just for the Wealthy: Rethinking Farmed Fish Consumption in the Global South," *Global Food Security*, 16, 10.1016/j.gfs.2017.10.005.

Brown, Ben and Ratna Fadillah (2013) "Fish farmer field school: towards healthier milkfish/shrimp polyculture and fish farmer empowerment in South Sulawesi," *Aquaculture Asia Magazine*, 18 (2), 12 –19, https://enaca.org/?id=404.

Burbi, Sara and Katie Hartless Rose (2016) "The role of Internet and social media in the diffusion of knowledge and innovation among farmers," 10.13140/RG.2.1.4290.4567, Publisher: Unpublished.

Chua, Kenn, Qingxiao Li, Khandker Wahedur Rahman, and Xiaoli Yang (2021) "Effective Training Through a Mobile App: Evidence from a Randomized Field Experiment," 2021 Annual Meeting, August 1-3, Austin, Texas 312907, Agricultural and Applied Economics Association, https://econpapers.repec.org/paper/agsaaea21/312907.htm.

Cole, Shawn A and A Nilesh Fernando (2021) "'Mobile'izing Agricultural Advice Technology Adoption Diffusion and Sustainability," *The Economic Journal*, 131 (633), 192–219, 10.1093/ej/ueaa084.

Daigle, Kerry and Sarah Noel Heiss (2021) "Perceptions of Social Media Use Among U.S. Women Farmers," *Journal of Applied Communications*, 105 (1), 10.4148/1051-0834.2346.

Department of Fisheries Bangladesh (2021) "Yearbook of Fisheries Statistics of Bangladesh 2019-20,"Technical Report 37, Ministry of Fisheries and Livestock, Bangladesh.

Dey, Madan Mohan, Praduman Kumar, Oai Li Chen, Md. Akhtaruzzaman Khan, Nagesh Kumar Barik, Luping Li, Ayut Nissapa, and Ngoc Sao Pham (2013) "Potential Impact of Genetically Improved Carp Strains in Asia," *Food Policy*, 43, 306–320, 10.1016/j.foodpol.2013.10.003.

Elfitasari, T., R. A. Nugroho, and A. P. Nugroho (2018) "The Importance of Aquaculture Community Group (acg) in Social Media (facebook) Towards the Aquaculture Knowledge and Financial Improvement of Small Scale Fish Farmers (ssff) in Rural Areas of Central Java," *IOP Conference Series: Earth and Environmental Science*, 137, 012097, 10.1088/1755-1315/137/1/012097, Publisher: IOP Publishing.

Fabregas, Raissa, Michael Kremer, and Frank Schilbach (2019) "Realizing the potential of digital development: The case of agricultural advice," *Science*, 366 (6471), eaay3038, 10.1126/science.aay3038.

FAO (2020) *The State of World Fisheries and Aquaculture 2020: Sustainability in action* in , The State of World Fisheries and Aquaculture (SOFIA) (2020), Rome, Italy: Food and Agriculture Organisation, 10.4060/ca9229en.

Hassan, Mirza M., Syeda Salina Aziz, Tanvir Ahmed Mozumder, Erina Mahmud, Insiya Khan, and Farhana Razzaque (2020) "The State of Bangladesh's Political Governance, Development, and Society: According to its Citizens," national Survey Report, The Asia Foundation, Bangladesh.

Issahaku, Haruna, Benjamin Musah Abu, and Paul Kwame Nkegbe (2018) "Does the Use of Mobile Phones by Smallholder Maize Farmers Affect Productivity in Ghana?" *Journal of African Business*, 19 (3), 302–322, 10.1080/15228916.2017.1416215, Publisher: Routledge _eprint: https://doi.org/10.1080/15228916.2017.1416215.

Khan, Md. Akhtaruzzaman, Ratna Begum, Rasmus Nielsen, and Ayoe Hoff (2021) "Production Risk, Technical Efficiency, and Input Use Nexus: Lessons from Bangladesh Aquaculture," *Journal of the World Aquaculture Society*, 52 (1), 57–72, 10.1111/jwas.12767, _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/jwas.12767.

Kumar, Ganesh and Carole R. Engle (2016) "Technological Advances that Led to Growth of Shrimp, Salmon, and Tilapia Farming," *Reviews in Fisheries Science & Aquaculture*, 24 (2), 136–152, 10.1080/23308249.2015.1112357, Publisher: Taylor & Francis _eprint: https://doi.org/10.1080/23308249.2015.1112357.

Kumar, Ganesh, Carole Engle, and Craig Tucker (2018) "Factors Driving Aquaculture Technology Adoption," *Journal of the World Aquaculture Society*, 49 (3), 447–476, 10.1111/jwas.12514, _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/jwas.12514.

Nakasone, Eduardo, Maximo Torero, and Bart Minten (2014) "The Power of Information: The ICT Revolution in Agricultural Development," *Annual Review of Resource Economics*, 6 (1), 533–550, 10.1146/annurev-resource-100913-012714.

Quizon, Jaime, Gershon Feder, and Rinku Murgai (2001) "Fiscal Sustainability of Agricultural Extension: The Case of the Farmer Field School Approach," *Journal of International Agricultural and Extension Education*, 8 (1), 10.5191/jiaee.2001.08102.

Rogers, Everett M. (1995) "Diffusion of Innovations: Modifications of a Model for Telecommunications," in Stoetzer, Matthias-W. and Alwin Mahler eds. *Die Diffusion von Innovationen in der Telekommunikation*, 25–38, Berlin, Heidelberg: Springer Berlin Heidelberg, 10.1007/978-3-642-79868-9_2.

Tables

Table 1: Demographic characteristics

Variables	**Treatment**	**Control**	**P value**
Household size	5.02	4.92	0.44
	(2.03)	(1.91)	
Sex of household head (Male = 0; Female = 1)	0.01	0.01	0.74
	(0.09)	(0.10)	
Sex of the farmer (Male = 0; Female = 1)	0.00	0.00	
	(0.00)	(0.00)	
Farmers' age (in years)	39.83	39.66	0.62
	(10.38)	(10.76)	
Farmers' years of education	11.01	10.95	0.81
	(4.94)	(4.89)	
No. of Observations	**515**	**477**	**992**

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term.

Table 2: Farmers' use of smartphones, internet and social media

Variables	**Treatment**	**Control**	**P value**
Monthly spending on internet (in 100 BDT)	3.42	3.32	0.82
	(3.02)	(2.95)	
Likelihood of farmers: Owning smartphones themselves	0.70	0.69	0.91
	(0.46)	(0.46)	
Having access to smartphones themselves	0.74	0.73	0.97
	(0.44)	(0.45)	
Searching fish-farming-related information online	0.47	0.45	0.42
	(0.50)	(0.50)	
With a household member with Facebook account	0.95	0.95	0.62
	(0.23)	(0.21)	
Likelihood of the farmer using: Facebook	0.71	0.70	0.84
	(0.45)	(0.46)	
IMO	0.55	0.55	0.76
	(0.50)	(0.50)	
Whatsapp	0.46	0.45	0.90
	(0.50)	(0.50)	
Viber	0.03	0.03	0.70
	(0.16)	(0.17)	
Instagram	0.07	0.06	0.73
	(0.26)	(0.25)	
Tiktok	0.28	0.28	0.86
	(0.45)	(0.45)	
Youtube	0.68	0.66	0.89
	(0.47)	(0.47)	
Telegram	0.04	0.03	0.53
	(0.19)	(0.17)	
None of the applications mentioned	0.25	0.26	0.98
	(0.43)	(0.44)	
No. of Observations	**515**	**477**	**992**

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term.

Table 3: Farmers' assets, simple poverty scores, and production

Variables	**Treatment**	**Control**	**P value**
Number of ponds for farming	3.30	3.48	0.28
	(2.62)	(2.86)	
Total area of just ponds being farmed (in acres)	4.80	4.75	0.94
	(7.49)	(6.84)	
Type of pond ownership: Own land	0.26	0.23	0.24
	(0.44)	(0.42)	
Leased land	0.45	0.45	0.73
	(0.50)	(0.50)	
Combination of both – owned and leased	0.28	0.32	0.15
	(0.45)	(0.47)	
Simple poverty score	79.33	78.26	0.18
	(10.87)	(10.92)	
Total production during 2021-2022 (in tonnes)	9.94	9.90	0.89
	(15.63)	(16.73)	
Total revenue during 2021-2022 (in million BDT)	1.92	1.99	0.87
	(3.52)	(4.71)	
No. of Observations	**515**	**477**	**992**

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term.

Table 4: Impact from Phone Survey

	(1) Social media usage	(2) Knowledge from video posts	(3) Knowledge from static posts	(4) Knowledge
Treatment	0.060***	0.006	0.103***	0.010**
	(0.013)	(0.004)	(0.020)	(0.005)
Control Mean	0.130	0.491	0.247	0.481
Observations	992	992	992	992

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term. The study sample is used.

Table 5: Impact from In-person Survey

	(1) Social media usage	(2) Knowledge from video posts	(3) Knowledge from static posts	(4) Knowledge
Treatment	0.041***	0.000	0.055**	0.000
	(0.014)	(0.004)	(0.022)	(0.004)
Control Mean	0.165	0.410	0.349	0.410
Observations	992	992	992	992

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term.

Table 6: Impact on Farming Practices

	(1) PI_1	(2) PI_2	(3) PI_3	(4) PI_4	(5) PI_5
Treatment	-0.018	-0.013	0.003	-0.003	-0.002
	(0.011)	(0.013)	(0.009)	(0.010)	(0.007)
Control Mean	0.747	0.872	0.423	0.839	0.575
Observations	992	992	992	992	992

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term.
PI_1 is the practice index for pond preparation.
PI_2 is the practice index for management while releasing fish fry.
PI_3 is the practice index for management after releasing the fish fry.
PI_4 is the practice index for the application of lime and fertilisers.
PI_5 is the practice index for all combined farming practices.

A Appendix Tables

Table A1: Impact from Phone Survey : Entilre Phone-Survey Sample

	(1) Social media usage	(2) Knowledge from video posts	(3) Knowledge from static posts	(4) Knowledge
Treatment	0.057***	0.006	0.100***	0.010**
	(0.012)	(0.004)	(0.019)	(0.004)
Control Mean	0.129	0.490	0.249	0.479
Observations	1083	1083	1083	1083

Notes: Robust standard errors in parentheses and *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. The regression equation is $Y_{iu} = \alpha_u + \beta T_{iu} + e_{iu}$ where Y_{iu} is the outcome variable for individual i and union u; α_u is the union fixed effects; T_{iu} is the indicator for being assigned to the treatment group; and e_{iu} is the error term. Sample of phone survey is used.