

The impact of aquaculture cyber extension on fish farmers' attitudes and behavior in Riau, Indonesia

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Abstract. The purpose of this survey is to see how the aquaculture cyber extension materials on the MFCE (Marine and Fisheries Cyber Extension) website affect the attitudes and behavior of freshwater fish farmers in Riau Province, Indonesia. Using Isaac and Michael's table, a sample of 259 fish farmers who used the MFCE website was used. The data and information were gathered via a closed questionnaire that was purposive proportionally distributed to respondents in ten districts. With the help of SPSS 25 software, the data were analyzed using the Paired Sample T-Test. The findings concluded that the MFCE website's cyber aquaculture extension content was able to change the attitudes of fish producers in Riau Province. This is possible because the extension materials are engaging, simple to comprehend, and tailored to their specific needs. Results also showed that the extension materials do not change their behavior regarding how a freshwater aquaculture business is managed. This may be happen because the material presented is not in accordance with the needs of fish farmers, especially fish species, water quality management, feed management, and fish marketing.

Key words: freshwater aquaculture, media impact, MFCE website, non-formal education.

Introduction. Aquaculture is an important sector that supports the Indonesian economy with 4,15 billion USD per year (Ministry of Marine Affairs and Fisheries Republic of Indonesia 2018). Aquaculture is a human economic activity that utilizes and converts natural resources into commodities of value to society, such as fish, shrimp, shellfish, and other aquatic environmental organisms (Kautsky et al 2000). Freshwater aquaculture activities are carried out in rivers, lakes, reservoirs, and swamps (Lesa 2020).

The government continues to develop this sector, among others, through fisheries extension programs. The extension is non-formal education (Sadono 2010) or education for adults, which involves someone conveying information to help audiences make the right decisions (Ban & Hawkins 1999) so that aspects of their life change to be better than the existing conditions (Riadi 2020). The extension purpose is to change the knowledge, attitudes, and behavior of the audience for the better (Oakley & Garforth 1985; Ibrahim et al 2003; Amanah 2007).

To achieve the maximum results, the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia (MMAF-RI) has implemented an internet-based extension system (cyber extension) since 2017. The ministry created the *Marine and Fisheries Cyber Extension* (MFCE) website to disseminate extension materials to extension workers and fish farmers in the regions (Marine and Fishery Extension KKP-RI 2018). The MFCE website display is shown in Figure 1.

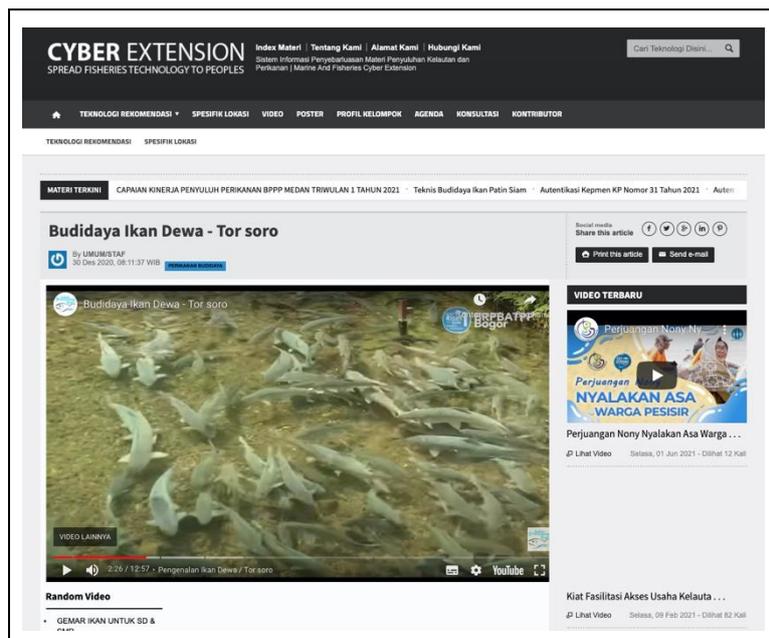


Figure 1. The display of MFCE website.

Riau Province is one of the centers of freshwater aquaculture in Indonesia. Fish farmers in Riau are the target of MFCE cyber media (Hendri et al 2018). Almost all areas in Riau develop freshwater aquaculture. Aquaculture was developed in 10 of the 12 regencies/cities, namely, Kampar, Pekanbaru, Rokan Hulu, Pelalawan, Kuantan Singingi, Indragiri Hulu, Indragiri Hilir, Rokan Hilir, Bengkalis, and Siak. It is not developed in Dumai, and Meranti Islands. The aquaculture in Riau is carried out in ponds, reservoirs, rivers, and swamps. This business involves 28,962 fish farmers who can produce 97.910 tons of fish a year (Dinas Perikanan dan Kelautan Provinsi Riau 2019). A total of 5,792 fish farmers used the MFCE website to find information about good freshwater aquaculture techniques (Hendri et al 2018).

The aquaculture cyber extension material on the MFCE website is expected to improve the attitudes and behavior of fish farmers in Riau Province. Attitudes are defined as psychological constructs, mental and emotional entities that are attached to or characterize a person (Perloff 2016). A person's predisposition to act, think, and feel his best while dealing with ideas, situations, or objects is sometimes referred to as attitude. People, locations, ideas, and situations in groups can all be objects (Rakhmat 2012).

While behavior is a series of actions made by individuals, organisms, systems, or artificial entities in relation to themselves or their environment (Hemakumara & Rainis 2018). Behavior is a response to various internal or external stimuli, conscious or subconscious, overt or covert, and voluntary or involuntary (Minton & Khale 2014). There are five stages of audience acceptance of an extension or innovation material: knowing, being interested (wanting to learn more), assessing (evaluating and contemplating), trying, and putting the innovations presented into practice (Riadi 2020). Attitude refers to one's level of interest and judgment, whereas behavior refers to one's willingness to test and execute new ideas. However, so far, the extension material impact on the fish farmers' attitudes and behavior in Riau is not known. Research like the present one need to be done to fill in this gap.

The main material of an aquaculture extension presented on the MFCE website is the seven principles of aquaculture management (*Sapta Usaha Budidaya Perikanan*) adopted by the ministry. The material consists of pond preparation, water supply, handling fish seed stocking, water quality management, feed management, fish pest control, and harvest/post-harvest activities/and fish marketing (Agustina 2018; Zaelani 2018). Thus, aquaculture extension aims to change the attitudes and behaviour of fish farmers regarding the application of the seven principles of aquaculture management towards a better direction than before.

Several studies have shown that aquaculture extension materials have a significant impact on public attitudes. Sugiharto et al (2019) proved that extension materials had a significant effect on improving the attitudes of members of the freshwater fish farmer group in Samarinda, Indonesia. Mustaqim & Nuraini (2019) also stated that Fishery extension materials improved the attitude of fishery business actors by 75.6% in developing their businesses for the better.

Several studies highlighted the impact of the extension material on fish farmer's behaviour. Studies indicated that the extension materials given to fish farmers can change their behaviour, namely, carrying out aquaculture activities according to the guidelines for extension materials. According to Andiski et al (2017), freshwater aquaculture extension had a significant impact on the behaviour of the "Sejiwa" fish farmer group member in Pasaman, West Sumatra, Indonesia. Rosiah et al (2018) also explained that freshwater aquaculture extension materials had a significant effect on the behaviour of fish farmers in aquaculture. Once they knew the extension materials provided, they begun to apply them to their business.

However, the impact of the cyber extension materials presented on the MFCE website on the attitudes and behaviour of fish farmers in Riau is unknown. For that, this research needs to be done.

Material and Method

Description of the study sites. This study was conducted from August - October 2020 in the Province of Riau, Indonesia, using a quantitative descriptive approach. Descriptive research is collecting measurable data to describe the situation as precisely as possible (DeFranzo 2020; Robson & McCartan 2016). In exchange, the quantitative approach is the process of finding knowledge using data in the form of numbers as a tool to analyze information about what you want to know (Kasiram 2010).

The unit of analysis is the fish farmer who uses the MFCE website in Riau. The population consists of 5,792 fish farmers (Hendri et al 2018). The respondent sample size is 259 fish farmers, determined based on Isaac and Michael's table (Sugiyono 2019). They are spread across 10 cities/regencies: Pekanbaru (16 respondents), Kampar (78), Rokan Hulu (35), Rokan Hilir (13), Bengkalis (5), Pelalawan (40), Kuantan Singingi (15), Indragiri Hulu (25), Siak (25), and Indragiri Hilir (7 respondents), as shown in Figure 2. Respondents were selected by a purposive proportional method (Creswell 2009). Data collection was done by distributing questionnaires with open-ended questions to respondents (Bandhari 2020).

In the present study, attitudes and behaviours of fish farmer were investigated. The attitude is related to his strong desire to implement all the recommendations included in the extension materials on the MFCE website. For example, the desire to breed other types of fish that they have not breed before, but are presented on the website; and the desire to carry out certain fish farming management actions, such as using technology for fish feeding. The behaviour of fish farmers is related to the actions of carrying out aquaculture activities as a consequence of reading the messages presented in the extension materials posted on the website.



Figure 2. Map of research location in Riau Province, Indonesia.

Statistical analysis. Instrument validity and reliability tests were carried out using SPSS 25 software to ensure all data were valid and reliable. The validity test was carried out by looking at the Pearson Correlation coefficient (r). If the value of r -statistics $>$ r -table, then all questionnaire items are considered valid (Sugiyono 2019). Meanwhile, the reliability test was carried out by looking at the value of the Cronbach's Alpha coefficient. According to Hinton et al (2014), if the coefficient value is between 0.50 and 0.70, then, all items in the questionnaire are considered moderately reliable.

Furthermore, the Kolmogorov-Smirnov test (KS test) was applied to analyze the normality of data regarding attitudes and behavior of fish farmers before and after using the MFCE website. If the value of KS-statistics $>$ KS-table, then the data is considered to be normally distributed (Ghasemi & Zahediasl 2012), so that the next analysis, Paired-Sample T-Test, can be carried out. According to Akbar (2020), Paired-Sample T-Test can only be done if the research data is normally distributed. This analysis is used to see the impact of extension materials on the attitudes and behavior of fish farmers can be seen from differences in levels before and after using the MFCE website.

Paired Sample T-Test method with SPSS Statistics 25 software was performed to analyze the difference before-after. According to Creswell (2009), if the significance value (Sig.) $<$ 0.05, it can be said that there is a statistically significant difference before and after using the MFCE website regarding fish farmers' attitudes or behavior. Otherwise, if the value of Sig. $>$ 0.05, the difference between farmers' attitude/ behavior before and after using the website is not statistically significant.

Two hypotheses were proposed in this study:

H1 = There is an average difference between the attitudes measured before and after using the website. This means freshwater aquaculture cyber extension materials presented on the MFCE website can improve the attitude of fish farmers in Riau Province.

H2 = There is an average difference between the behavior measured before and after using the website. This means freshwater aquaculture cyber extension materials presented on the MFCE website can improve the behavior of fish farmers in Riau Province.

If the value of Sig. (2-tailed) $<$ 0.05, then the hypothesis is accepted. If the value of Sig. (2-tailed) $>$ 0.05, then the hypothesis is rejected (Sugiyono 2019).

Results and Discussion

The impact of cyber extension materials on the attitude of fish farmers. The validity test results showed that the r -statistic value of the fish farmers' attitudes before and after using the MFCE website ranged from 0.127 to 0.440. Values of r -statistic $>$ r -table are 0.113 (with $df=257$ at a significance level of 0.05). This means that all statement items about the attitude in the questionnaire are valid. The reliability test

results showed that Cronbach's Alpha coefficient value was 0.793, which is higher than the required threshold of 0.7. In other words, all statement items in the questionnaire are reliable. Furthermore, the normality test results showed that the KS-statistical values of the fish farmers' attitude before and after using the MFCE website were 0.200, a value higher than the KS-table value of 0.05. This means that all data about attitudes are normally distributed.

Thus, the next analysis, Paired Sample T-Test, can be performed. The Paired Sample Test output table shows that the value of Sig. (2-tailed) is $0.000 < 0.05$ (Table 1), then H1 is accepted. It can be concluded that there is an average difference between the attitudes of fish farmers before and after using the MFCE website. In other words, there is an impact of aquaculture extension materials presented on the MFCE website in improving the fish farmers attitude in Riau Province to a better direction.

Table 1

Paired samples T-Test output for attitude of fish farmers

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	AttBeforeMFCE – AttAfterMFCE*	3.57196	10.23844	0.63619	2.31918	4.82474	5.615	258	0.000

*AttBeforeMFCE = Attitude level of fish farmers before using the MFCE website; AttAfterMFCE = Attitude level of fish farmers after using the MFCE website.

These results are in line with the research of Ahmed et al (2018) which states that aquaculture extension has succeeded to improve the fish farmers' attitude in Bangladesh. The extension was able to improve the attitude of most of them (61.11%) to a moderate level. Meijer et al (2015) also revealed that innovative extension materials about agro-industry (including aquaculture) affect the attitudes of small-scale fish farmers in sub-Saharan Africa. In line with this, Pramitasari et al (2015) discovered that extension of local wisdom improved the fishermen's attitude toward fish conservation in the Mae Klong River in Songkram, Thailand.

The attitude of fish farmers in Riau revealed by the study proves that they already know the content and benefits of the extension materials presented on the MFCE website, so they want to try it. This may occur because the cyber extension materials available on the MFCE website are considered interesting and easy to understand.

According to Surya (2019), agricultural extension materials (including fisheries) on websites can have an impact on the user attitudes, if the material presented is interesting and easily understandable. According to the fish farmers, the extension materials on the MFCE website are quite easy, because they only consist of three content formats, namely, text, images/graphics, and video. Extension content in text format is understood easily if popular language is used, is not too long, and is not wordy (Hendri & Yulinda 2019).

The ideal text formatted content consists of 700 – 1,700 words (Miladi 2018; Sall 2013). Image/graphic content will be interesting if it is displayed in a large size, which is the size of a gadget screen (Minimatters 2020). Meanwhile, video content must have sharp images, clean sound, and a short duration. The ideal duration is 4-10 minutes (Bahrul 2019). However, fish farmers will practice the extension materials if useful for their business development (Hermawan et al 2017).

The impact of cyber extension materials on the behaviour of fish farmers. The validity test results showed that the r-statistic value of the fish farmers' behavior before and after using the MFCE website ranged from 0.126 to 0.492. Values of r-statistic $> r$

table are 0.113 (with $df=257$ at a significance level of 0.05). This means that all statement items about the behavior in the questionnaire are valid. The reliability test results showed that Cronbach's Alpha coefficient value was 0.597, which is poor, but still acceptable. This suggests that different questions should be used in the future. The normality test results showed that the KS-statistical values of the fish farmers' behavior before and after using the MFCE website were $0.200 >$ the KS-table value of 0.05. This means that all data about behavior are normally distributed.

The Paired Sample Test output table shows that the value of Sig. (2-tailed) is $0.351 < 0.05$ (Table 2), then H_2 is rejected. It can be concluded that there is no average difference between the fish farmers' behavior before and after using the MFCE website. In other words, the aquaculture extension materials presented on the MFCE website have no impact on improving the fish farmers' behavior in Riau Province.

Paired samples T-Test output for the behavior of fish farmers

Table 2

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	BehvBeforeMFCE – BehvAfterMFCE*	-0.34430	5.93418	0.36873	-1.07041	0.38181	-0.934	258	0.351

*BehvBeforeMFCE = Behavior level of fish farmers before using the MFCE website; BehvAfterMFCE = Behavior level of fish farmers after using the MFCE website.

These findings suggest that, while farmers have the willingness to try to implement all extension resources on the MFCE website, they do not do so right away. This may be due to the material presented on the website, which is not following the needs of fish farmers in Riau. According to Ardiyanti (2016) and Hakim & Eriyanti (2019), fish farmers will only practice the extension material if it suits their business needs. It is not yet known what the extension material content presented on the MFCE website should be, according to fish farmers' needs. However, several researchers stated that there were two types of fishery extension materials needed by fish farmers, namely, types of fish, and aquaculture management.

The freshwater fish species that are widely cultivated in Riau are catfish (*Pangasius* spp.), carp (*Cyprinus carpio* Linnaeus, 1758), Mozambique tilapia (*Oreochromis mossambicus* (Peters, 1852)), catfish (*Clarias batrachus* (Linnaeus, 1758)), Nile tilapia (*Oreochromis niloticus* (Linnaeus, 1758)), and giant gourami (*Osphronemus goramy* Lacepède, 1801). There are three of the seven aspects of aquaculture management that are needed by fish farmers in Riau, namely, water quality management, feed management, and fish marketing (Fauzi et al 2016). Water quality is a strategic issue in the freshwater aquaculture business in Riau, because the four major rivers in Riau (namely, Kampar, Siak, Rokan and Indragiri) are important sources of water for aquaculture (Siagian & Simarmata 2018). However, the Siak river has started to be polluted due to industrial waste along the river (Budijono et al 2021).

Conclusions. The findings of this study show that the MFCE website's cyber extension materials improve the attitudes of freshwater fish farmers in Riau Province, but have no impact on their aquaculture activity behavior. This may happen because the extension materials presented were not in accordance to fish farmers' needs, especially materials related to fish species, water quality management, feed management, and fish marketing.

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