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Content Analysis of the Freshwater Aquaculture Cyber Extension Materials in Indonesia

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***Abstract*— This study aims to analyse the content of freshwater aquaculture cyber-extension materials presented on the MFCE website, which the Indonesian government controls. The research sample is all extension materials presented during 2013-2017, comprising of 183 titles of text, 29 titles of graphics, and 53 titles of video—sample selection by the census. The NVivo 12 Plus software was used to analyse the fish species, aquaculture management, extension material nature, and media element size presented on the website. The results showed that the three media (text, graphic, and video) presented all the six fish species of high economic value. The videos presented 58.49% about the nile tilapia (*Tilapia nilotica*) species, while graphics and texts presented more on catfish (*Clarias batrachus*), almost 60% on average. These media also presented all the seven aquaculture management elements. Graphics and texts presents more about pond preparation, while the videos presents more about fish feed management. The texts and graphics extension media size are quate ideal. Most of the text material are 700-1,700 words, and the graphic measures 380x285 pixels (two-thirds of the gadget screen). At the same time, the video duration is ideal (4.5 - 9 minutes), there are very few, only 33.96%. Most of the extension materials are in the form of recommendations, and not problem-solving. This research can there are a guide in designing a ideal content of aquaculture fisheries extension materials in Indonesia.**

***Keywords*— Content analysis; cyber extension; freshwater aquaculture; MFCE website.**

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I. INTRODUCTION

Freshwater aquaculture is an important sector to support the Indonesian economy. The fish production is 3,02 million tons per year with a value of USD 4,15 billion [1]. This sector is growing because Indonesia has a fertile and wide land area, 1.9 million km2 [2].

Aquaculture is a fish farming business at a certain location and time which applies business management principles [3], [4]. This activity is also defined as 'farming in the water', which raises animals (such as fish, shrimp, and shellfish), and plants (seaweeds). Fish farming business needs human intervention to help increase production, including finding fish-seeds, maintaining, providing food, and protecting fish from pests and diseases [5].

About four million Indonesian fish farmers are in this business. They raise fish in the ponds, floating net cages, rivers, lakes, and reservoirs [6], [7].

The Indonesian government fosters fish farmers through extension programs to increase fish production. Extension is non-formal education to increase the knowledge, attitudes, skills, and behaviour of fish farmers, so that they can solve their business problems [8], [9].

The Ministry of Marine Affairs and Fisheries (KKP) coordinates the national fisheries extension program in Indonesia. Before 2007, the ministry used conventional extension system, but now uses the cyber extension system following the development of information technology. To make it happen, KKP built the *Marine and Fisheries Cyber Extension* (MFCE) website.

The website contains various fishery extension materials to increase the knowledge and skill of extension workers and fish farmers in Indonesia [10]. However, in Riau Province only 20 percent fish farmers used the MFCE website [5]. They only used if the website content is useful for them. This make it is necessary to analyse the content of the extension material on the MFCE website.

II. Materials and Method

This research was conducted in June-August 2020, using mixed methods (qualitative and quantitative). Qualitative research emphasizes the in-depth understanding of a problem; it includes collecting and analysing data in text, images, audio, and video, which aims to understand concepts, opinions, and experiences. Quantitative research is an effort to investigate problems by collecting data, determining variables, and then measuring them with numbers so that applicable statistical procedures can carry out an analysis. The purpose of quantitative research is to help draw conclusions or generalize theory predictions correctly [11].

Primary data collected were aquaculture extension materials published on the MFCE website during 2013-2017, which consisted of data in text format (183 titles), graphic format (29 titles), and video format (53 titles). The census methods was used for data collection [11]. The data analysed were fish species, aquaculture management elements, extension material nature, and media element's size.

For data analysis was used quantitative and qualitative content analysis methods, with the help of NVivo 12 Plus software [12]. Quantitative content analysis was used to measure the fish species, aquaculture management type, and media element's size. Seven categories of fish species are measured, comprising carp (*Cyprinus carpio* L.), giant gourami (*Osphyronemus gourami*), parotfish (*Pangasius sutchi*), catfish (*Clarias batrachus*), nile tilapia (*Tilapia nilotica* L.), tilapia fish (*Tilapia mossambica*) [13], [14], and "other fish". There are also seven categories of aquaculture management, consisting of pond preparation, water supply, fish seed handling, water quality management, fish feed management, fish pest & disease control, and fish harvesting & marketing activities [15], [16].

The size of text format extension materials is divided into three categories, including shorter text (less than 700 words), medium text (700 - 1,700 words), and longer text (more than 1,700 words). Graphic format extension materials consist of three categories, thet is small size (380 x 214 pixels/one-third of a gadget screen), medium size (380 x 285 pixels/two-thirds of the gadget screen width), and large size (1204 x 903 pixels) or wide as the gadget screen. Video format extension materials consist of three categories, including short duration (less than 4.5 seconds), medium duration (4.5 - 9 seconds), and longer duration (more than nine seconds) [17]. Meanwhile, the qualitative content analysis was used to measure the extension material nature, which consists of two categories, that is problem solving and recommendation [18].

III. Result and Discussion

A. Text Format of Aquaculture Cyber Extension Materials

The analysis results of the text format extension materials showed that the *ikan* (fish) word size in the word cloud visualization look is bigger than the other word size (except the conjunctions), as shown in Fig.1.

Fig. 1 The word cloud visualization for text format extension materials

This means that fish is the word that appears most often in the materials. The word "ikan" occurs 3,193 times (2.56% of the 100 most occurring words). The ten common words that appear are fish, water, pond, feed, catfish, aquaculture, seed, mother, nile, and species, as shown in Fig 2.

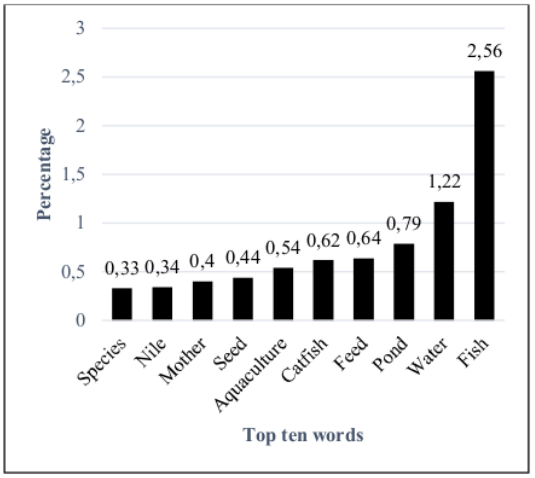

Fig. 2 Top ten words in the text format extension materials

The analysis results show that the six fish species of high economic value are discussed in the text format extension materials published on the MFCE website. Catfish is the fish species most served, 99 out of 183 materials titles (55.10%), as shown in Table I. While tilapia fish the least (28.42%). But, the discussion about nile tilapia, giant gourami, carp, and parrotfish is quite a lot, an average of more than 32%. The "other fish" categories also appeared in quite a large number, 96 titles (52%). However, it is not significant because this category consists of 12 fish species, so the average number is small (4.4%). Those fish are wallago attu (*Wallago leeri*), arowana (*Scleropages formosus*), hoven's carp (*Leptobarbus hoeveni*), climbing perch (*Anabas testudineus*), kissing gourami (*Helostoma themminckii*), betta fish (*Betta splendens*), green catfish (*Hemibagrus nemurus*), swamp eel (*Monopterus albus*), eel (*Anguilla marmorata*), featherback (*Chitala bornensis*), silver barb (*Barbonymus gonionotus*), and koi (*Cyprinus rubrofuscus*).

TABLE I
VARIABLE ANALYSIS RESULTS OF TEXT FORMAT EXTENSION MATERIALS

Variables	Categories	Number of Titles	Proportions of 183 Titles (%)
Fish Species	• Catfish	99	55.10
	• Other fish	96	52.46
	• Nile Tilapia	70	38.25
	• Giant Gourami	65	35.52
	• Carp	64	34.97
	• Parrotfish	60	32.79
	• Tilapia Fish	52	28.42
Elements of Aqua-culture Manage-ment	• Pond Preparation	34	18.58
	• Fish Seed Handling	33	18.03
	• Water Quality Management	28	15.30
	• Feed Management	26	14.21
	• Fish Harvesting & Marketing Activities	17	9.29
	• Water Supply	16	8.74
	• Fish Pests & Disease Control	10	5.46
Media Element Size	• Short Text (less than 700 words)	54	29.51
	• Medium Text (700 – 1,700 words)	122	66.67
	• Long Text (more than 1,700 words)	7	3.83
Nature of Extension Materials	• Problem-solving	89	48.63
	• Recommendation	131	71.58

So, text format extension materials, presented all species of fish, have high economic value. There are six species of freshwater fish with high economic value developed in Indonesia, including carp, giant gourami, parrotfish, catfish, nile tilapia, and tilapia fish. According to [19], the effectiveness of agricultural extension (including fisheries) will be easily achieved if the material is following the needs of the audience.

All aquaculture management categories are presented in the text format extension materials. Four of the seven categories (fish feed management, water quality management, fish seed handling, and pond preparation) are very much presented (averaged more than 14%). Pond preparation is the category most presented in 34 titles (18.58%). Meanwhile, the other three categories (harvest handling & marketing, water supply, and fish pests & disease control) presented less than 10%. According to [20] and [21], the aquaculture extension materials must be complete, so that fish farmers can fully understand the issues being discussed.

Almost all text format extension materials are medium text (700 - 1,700 words) and shorter text (less than 700 words). Medium text extension materials were the most presented, 122 out of 183 titles (66.67%). Meanwhile, short text extension materials (less than 700 words) reached almost 30%. The ideal size of a text material is between 400 – 1,700 words.

Most of the extension materials in text format are recommendations, 131 out of 183 titles (71.58%). Problem-solving material are only 89 titles (48.63%). This figure shows that several titles cover both categories at once. The MFCE website only presents a few problem-solving materials. According to [22], good extension materials help solve problems faced by fish farmers.

Pearson correlation analysis was used to see the correlation between variables/categories/indicators in text format extension materials. The relationship is strong if the Pearson correlation coefficient (r) value is greater than 0.5 [11]. If the r-value is close to 1, the relationship is very strong. The analysis results show that 37 variables/categories/indicators are strongly related, as shown in Table II.

TABLE II
COEFFICIENT OF PEARSON CORRELATION VARIABLES/CATEGORIES/INDICATORS OF TEXT FORMAT MATERIALS

No	Code A	Code B	r
1	Nodes\\Extension Materials Nature\Recommendation	Nodes\\Media Element Size\Short Text	**0.959163**
2	Nodes\\Extension Materials Nature\Recommendation	Nodes\\Media Element Size\Medium Text	0.914027
3	Nodes\\Extension Materials Nature\Problem-solving	Nodes\\Media Element Size\Short Text	0.870521
4	Nodes\\Extension Materials Nature\Recommendation	Nodes\\Extension Materials Nature\ Problem-solving	0.853755
5	Nodes\\Extension Materials Nature\Recomendation	Nodes\\Element Media Size\ Medium Text	0.762803
…	…	…	…
…	…	…	…
37	Nodes\\Fish Species\Tilapia Fish	Nodes\\Element Media Size\ Long Text	0.511241

The strongest relationship was between "recommendation" and "short text" extension materials (r = 0.959163). The relationship visualization illustrated in Fig. 3.

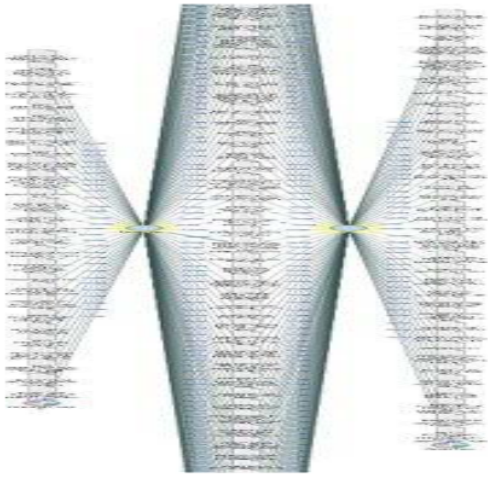

Fig. 3 Correlation visualization of "recommendation" and "short text" in text format extension materials

It shows that extension materials of "recommendation" and "short text" are the most discussed variables/categories/ indicators compared to others.

B. Graphic Format of Aquaculture Cyber Extension Materials

The analysis results of the graphic format extension materials showed that the word size of *"ikan"* (fish) in the word cloud visualization, look is bigger than the other word size (except the conjunctions), as shown in Fig. 4.

Fig. 4 The word cloud visualization for graphic format extension materials

This means that fish is the word that appears most often in the materials. The word of *"ikan"* (fish) occurs 83 times (6.37% of the 100 most occurring words). The ten common words appear are fish, aquaculture, media, information, sized, water, species, catfish, fresh, and pond, as shown in Fig 5.

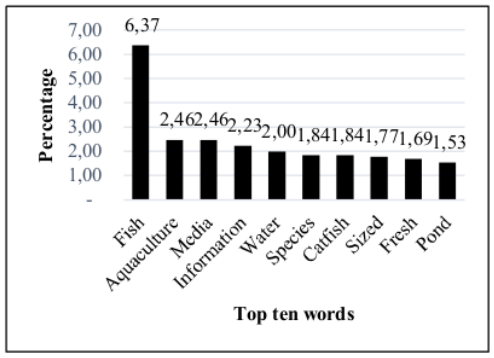

Fig. 5 Top ten words in the graphic format extension materials

The analysis results showed that the six freshwater fish species with high economic value were presented in graphic format extension materials on the MFCE website, more than 34 percent on average. Catfish is the fish species most served, 17 out of 29 titles (58.52%), as shown in Table III. Although the presentation of "other fish" is more than catfish, 19 titles (65.52%), but this category consists of six fish species, so the average percentage per fish species is small (10%). The six fish species are eel (*Anguilla marmorata*), featherback (*Chitala bornensis*), koi (*Cyprinus rubrofuscus*), sultan fish (*Leptobarbus hoeveni*), climbing perch (*Anabas testudineus)*, and kissing gourami (*Helostoma themminckii).*

TABLE III
VARIABLE ANALYSIS RESULTS OF GRAPHIC FORMAT AQUACULTURE EXTENSION MATERIALS

Variables	Categories	Number of Titles	Proportions of 29 Titles (%)
Fish Species	• Other fish	19	65.52
	• Catfish	17	58.52
	• Carp	12	41.38
	• Nile Tilapia	12	41.38
	• Giant Gourami	11	37.93
	• Parrotfish	10	34.48
	• Tilapia Fish	10	34.48
Elements of Aquaculture Management	• Pond Preparation	8	27.59
	• Fish Harvesting & Marketing Activities	6	20.69
	• Fish Seed Handling	6	20.69
	• Water Supply	5	17.24
	• Feed Management	5	17.24
	• Water Quality Management	5	17.24
	• Fish Pests & Disease Control	3	10.34
Media Element Size	• Medium Size (380x285 pixels)	23	79.31
	• Large Size (1240x903 pixels)	6	20.69
	• Small Size (380x214 pixels)	0	0.00
Nature of Extension Materials	• Recommendation	29	100.00
	• Problem-solving	9	31.03

The seven categories of aquaculture management were discussed in graphic format extension materials. The most discussed category was "pond preparation", found in eight of the 29 material titles (27.59%). While the least is "fish pests & diseases control", only in three titles (10.34%). But, the other five categories were discussed quite a lot, between 5-6 material titles (average above 17%). This finding is quite encouraging because the materials on aquaculture management are presented on the MFCE website. According to [23], complete aquaculture management information can help fish farmers improve business quality.

Almost 80% of the graphic format extension materials are presented in the medium size (380x285 pixels) or two-thirds the width of the gadget screen. The rest are of the large size (1204 x 903 pixels) or as wide as the gadget screen.

The analysis results also show that all graphic format extension materials are in the form of recommendations, in all of the material titles (100%). While the problem-solving material is only presented in nine titles (31.03%). This means several material titles cover both categories at once. So, it can be concluded that the MFCE website does not provide sufficient graphic extension materials that are problem-solving.

Pearson correlation analysis was used to see the correlation between variables/categories/indicators in graphic format extension materials. The analysis results show that six variables/categories/indicators are strongly related (r-value > 0.5), as shown in Table IV.

TABLE IV
COEFFICIENT OF PEARSON CORRELATION
VARIABLES/CATEGORIES/INDICATORS OF GRAPHIC FORMAT MATERIALS

No	Code A	Code B	*r*
1	Nodes\\Extension Materials Nature\ Recommendation	Nodes\\Element Media Size\ Medium Size	**0.981828**
2	Nodes\\Extension Materials Nature\ Problem-solving	Nodes\\Element Media Size\ Large Size	0.889355
3	Nodes\\Extension Materials Nature\ Problem-solving	Nodes\\Element Media Size\ Medium Size	0.790124
4	Nodes\\Extension Materials Nature\ Recommendation	Nodes\\Element Media Size\ Large Size	0.745834
5	Nodes\\Aquaculture Management\ Fish Seed Handling	Nodes\\Fish Species\ Other Fish	0.541691
6	Nodes\\Aquaculture Management\Water Quality Management	Nodes\\Fish Species\ Other Fish	0.502602

The strongest relationship was between "recommendation" and "medium size" extension materials (r-value = 0.981828, or close to 1). The relationship visualization illustrated in Fig. 6.

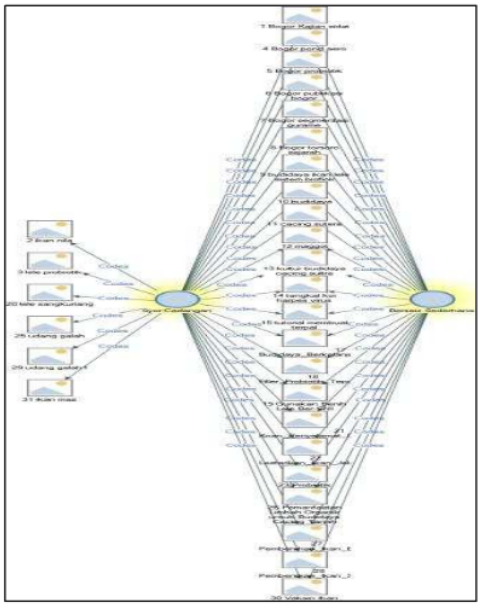

Fig. 6 Correlation visualization of "recommendation" and "medium size" in graphic format extension materials

It shows that extension materials of "recommendation" and "medium size" are the most discussed variables/categories/ indicators compared to others.

C. Video Format of Aquaculture Cyber Extension Materials

The analysis results of the video format extension materials showed that the *"ikan"* (fish) word size in the word cloud visualization look is bigger than the other word size, as shown in Fig. 7.

Fig. 7 The word cloud visualization for video format extension materials

This means that fish is the word that appears most often in the materials. The word of *"ikan"* (fish) occurs 88 times of the 100 most occurring words (3.45%). The ten common words that appear are fish, aquaculture, water, information, pond, feed, system, quality, species, and fresh, as shown in Fig. 8.

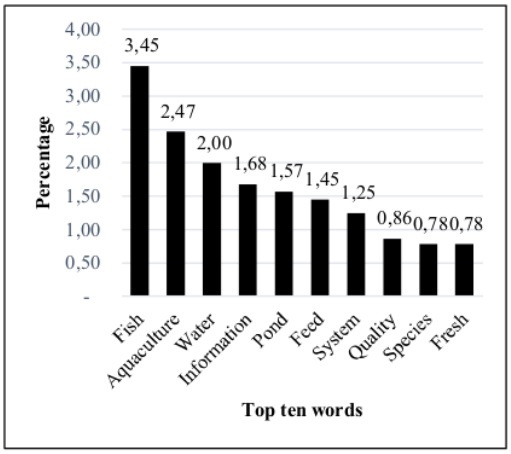

Fig. 8 Top ten words in the video format extension materials

The analysis results show that the video format extension materials discuss all the six fish species with high economic value. The material title number that discusses, it is almost the same, an average of more than 34% for each fish species.

Nile tilapia is the fish species most served, 31 out of 53 titles (58.49%), as shown in Table V. Although the presentation of "other fish" category is more than nile tilapia, 38 titles (71.70%), but this category consists of ten fish species, so the average percentage per fish species is small (7.1%). The ten fish species are wallago attu (*Wallago leeri*), hoven's carp (*Leptobarbus hoevenii*), climbing perch (*Anabas testudineus*), kissing gourami (*Helostoma themminckii*), green catfish (*Hemibagrus nemurus*), swamp eel (*Monopterus albus*), eel (*Anguilla marmorata*), featherback (*Chitala bornensis*), barb (*Barbonymus gonionotus*), and koi (*Cyprinus rubrofuscus*).

TABLE V
VARIABLE ANALYSIS RESULTS OF VIDEO FORMAT AQUACULTURE EXTENSION MATERIALS

Variables	Categories	Number of Titles	Proportions of 53 Titles (%)
Fish Species	• Other fish	38	71.70
	• Nile Tilapia	31	58.49
	• Giant Gourami	30	56.60
	• Catfish	29	54.72
	• Parrotfish	27	50.94
	• Tilapia Fish	25	47.17
	• Carp	24	45.28
Element of Aquaculture Management	• Feed Management	18	33.96
	• Pond Preparation	18	33.96
	• Fish Seed Handling	16	30.19
	• Fish Harvesting & Marketing Activities	13	24.53
	• Water Quality Management	12	22.64
	• Water Supply	6	11.32
	• Fish Pests & Disease Control	5	9.43
Media Element Size	• Long Duration (>9 minutes)	19	35.85
	• Medium Duration (4.5 – 9 minutes)	18	33.96
	• Short Duration (<4.5 minutes)	16	30.19
Nature of Extension Materials	• Recommendation	45	84.91
	• Problem-solving	17	32.08

All aquaculture management categories are discussed in video format extension materials. The most covered are fish feed management, pond preparation, and fish seed handling, an average of more than 15 titles (30%). While the least is "control of fish pests & diseases", only five titles (9.43%).

This finding shows that the video material on aquaculture management on the MFCE website is not discussed evenly. There are two elements of management with a small portion of the discussion, water supply, and fish pests & disease control. All elements should be discussed in equal portions because according to [24], these elements are interrelated with each other. The ideal length of video extension material is 4.5 - 9 minutes. The analysis results show that there are only 18 out of 53 video titles (33.96%) with a duration of 4.5 - 9 minutes (medium duration). Thus, most of the length of the extension videos presented on the MFCE website is not ideal. According to [25], the extension video duration that is too long will look boring, thus disrupting the present of the message. Meanwhile, if the duration is too short, it cannot convey the complete message [26]. The analysis results show that most of the video format extension materials are only recommendations, almost 85% of all material titles. This amount is not ideal because fish farmers need problem-solving materials. Pearson correlation analysis was used to see the correlation between variables/categories/indicators in graphic format extension materials. The analysis results show that 10 variables/categories/indicators are strongly related (r-value > 0.5), as shown in Table VI.

TABLE VI
COEFFICIENT OF PEARSON CORRELATION VARIABLES/CATEGORIES/INDICATORS OF VIDEO FORMAT MATERIALS

No	Code A	Code B	r
1	Nodes\\Extension Materials Nature\ Problem-solving	Nodes\\Element Media Size\Medium Duration	**0.901 481**
2	Nodes\\Extension Materials Nature\ Recommendation	Nodes\\Element Media Size\Long Duration	0.881 531
3	Nodes\\ Extension Materials Nature\ Recommendation	Nodes\\Element Media Size\Medium Duration	0.877 053
4	Nodes\\ Extension Materials Nature\ Recommendation	Nodes\\Element Media Size\Short Duration	0.875 303
5	Nodes\\ Extension Materials Nature\ Recommendation	Nodes\\ Extension Materials Nature\Problem-solving	0.847 784
6	Nodes\\Extension Materials Nature\ Problem-solving	Nodes\\Elemen Media Size\Long Duration	0.808 967
7	Nodes\\Extension Materials Nature\ Problem-solving	Nodes\\Element Media Size\Short Duration	0.652 885
8	Nodes\\Element Media Size\ Short Duration	Nodes\\Element Media Size\Long Duration	0.633 222
9	Nodes\\Aquaculture Management\ Fish Feed Management	Nodes\\Fish Species\Catfish	0.525 601
10	Nodes\\Aquaculture Management\ Pond Preparation	Nodes\\Fish Species\Catfish	0.506 331

The strongest relationship was between "problem-solving" and "medium duration" extension materials (r-value = 0.901481, or close to 1). The relationship visualization illustrated in Fig. 9.

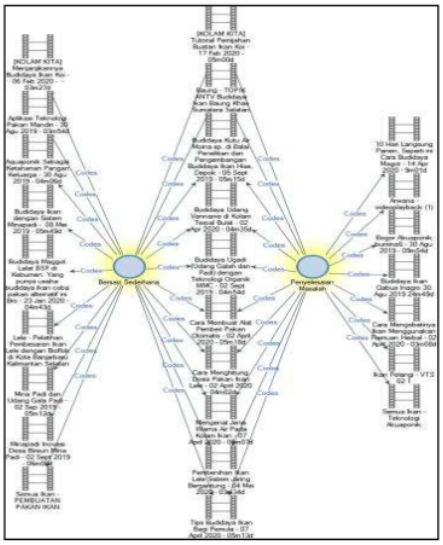

Fig. 9 Correlation visualization of "recommendation" and "medium size" in video format extension materials

It shows that extension material of "problem-solving" and "medium duration" is the most discussed variables/categories/indicators compared to others. Whereas, according to [27], problem-solving counselling materials are

needed to intervene in the minds of the public to improve the quality of their business.

IV. Conclusion

This study concludes that aquaculture cyber extension materials on the MFCE website are only presented in text, graphic, and video media formats. There are no other formats like animation and interactivity yet. The three media formats present all the six fish species of high economic value recommended by the Indonesian government. The video media presents more information about the nile tilapia species (58.49% of all titles of extension materials). While graphic and text media presented more materials on catfish, 58.52% and 55.10% each. The three media also present all the seven aquaculture management elements. Graphic and text media presents more content on management of pond preparation, 27.59% and 18.58% of all extension materials titles respectively. While the video media presents more information on fish feed management (33.96%). The text and graphics extension media size are ideal with most of the text material containing 700-1,700 words (66.67%) and graphic measuring 380x285 pixels (79.31%). The video duration that is ideal (4.5 - 9 minutes), very few, only 33.96%. Most of the extension material is for recommendations only and not problem-solving. The graphic media material are all (100%) recommendations, video media (84.91%), and text media (71.58%).

The MFCE website only has three media elements, includes text, graphics, and video. Meanwhile, the other three are audio, animation, and interactivity, were not present. In fact, those three media elements are potentially good for cyber extension programs. It is unknown why the website does not serve it. This is a challenge for future researchers to conduct more studies.

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