Global Scientific JOURNALS

GSJ: Volume 10, Issue 2, February 2022, Online: ISSN 2320-9186
www.globalscientificjournal.com

POTENTIAL AND APPLICATIONS FOR DEVELOPING INTEGRATED BUCKET FISH FARMING AS A FAMILY FOOD PROVIDER IN WEST JAVA

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KeyWords
Integrated fish farming, local community, pandemic, West Java

ABSTRACT

In the current era of the COVID-19 pandemic, various economic activities among the community are experiencing obstacles. Ironically, the price of food, which is a basic human need, tends to increase as a result of regional restrictions which consequently hamper distribution and supply. One form of activity to be able to produce food independently at the family level as well as at the individual level is integrated fish farming in buckets which served as a solution to meet basic family food needs. Based on a survey conducted in several areas in West Java, it was found that 36% of the people agreed that this method was easy to implement, even 25.8% strongly agreed with this. However, the lack of knowledge about this method is one of the causes that this method was not still well grasped in the community. In addition, the inadequate time that the community has is one of the causes of the lack of community interest in doing this method at home. Hence, that information about this method must be actively conveyed, as a result local communities can apply it efficiently and are familiar with the knowledge of integrated bucket fish farming.

INTRODUCTION

Since entering the COVID-19 pandemic era, various public economic activities have experienced obstacles, some of which have even come to a complete halt. This is owing to the limited social interaction between individuals during this pandemic. As a result, there is a decrease in the number of economic activities, causing a decline in the income and purchasing power of most people. In the graph below, you can see the plunge in per capita expenditure of Indonesian people and its growth in 2020 as a result of declining purchasing power since entering the COVID-19 pandemic [1]. The Covid-19 pandemic has resulted in a 6.2 percent reduction in food production in the agriculture sector. Focusing on the issue of food sufficiency and agricultural production, one solution is proposed: returning to a subsistence farming style. An agricultural system whose major purpose is for family members to meet their own food needs [2].

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Figure 1. Adjusted Expenditure per Capita and Adjusted Expenditure Growth per Capita, 2010-2020 (yellow lines represent per capita expenditure (in thousand Rupiah); blue lines represent expenditure growth per capita (in percent))

Ironically, the price of food, which is a basic human need, tends to increase as a result of regional restrictions that hinder distribution and reduce its supply [3]. The decline in income and the increase in food prices are factors that cause a significant decline in food security at the family and individual levels. Thus, a solution is needed in overcoming the decline in food security that recently occurs, namely by producing these food commodities themselves. One form of activity that can be carried out at the family level or at the individual level so they can produce food independently is integrated bucket fish farming. The definition of this method according to [4] is an environmentally friendly fish cultivation technique that combines fish and vegetable cultivation by using a bucket as a container for fish cultivation and utilizing water for cultivation media used for the growth and development of vegetable crops. The integrated fish farming activity can be a solution for individual and family food availability because it is quite simple in initial assembly, easy to perform, and inexpensive in financing. This activity also does not require a large area of land, does not require electricity, and does not require fertilizer for plant preservation.

On a small piece of land, this micro aquaponics called integrated bucket fish farming or locally termed as *budikdamber* model mixes fish and vegetable cultivation at the same time [5]. This approach is appropriate for use in the event of a pandemic. The advantages or strengths of this strategy are that it does not necessitate a vast plot of land, a large sum of money, difficulty in obtaining the necessary tools and materials, and ease of execution on a local level. Furthermore, the farmers will reap certain benefits (profits). First, in the midst of the Covid-19 pandemic, the chance to fulfill nutrition and family food security while also offering new business prospects [6].

METHODS

The first step to accomplish in this method is to provide the tools and materials in advance, specifically a bucket with a lid, plastic cups, planting media (can be husk, cotton, or charcoal), fish seeds, plant seeds, and soldering iron to create holes in the plastic material later on. The second step is to fill 4/5 of the bucket with water, then let it sit for 1-2 days. Next, put in the fish seeds to the bucket, then let it rest for 1-2 days. The next step is to make a hole in the bucket lid according to the size and number of plastic cups available, then attach the lid to the bucket. Afterward, make holes in the diameter of a pencil at the bottom of the plastic cup. Subsequently, put the planting medium into the cups, followed by inserting the plant seeds. Finally, place the cups in the holes in the bucket lid. The last step is to do maintenance by feeding the fish 2-3 times a day. Fish can then be harvested in about 2 months.

The data analysis method used in this research is descriptive analysis method with a quantitative approach in the form of data collection by questionnaire. Collecting data with this questionnaire is relatively fast and efficient because the form filling activities is determined by the respondent individually according to their opinion and time availability. During pandemic, this technique is considered safer for both parties, thus the researcher who collect data from the respondents will not need their direct presence.

RESULT AND DISCUSSION

As previously explained, this study adopted the method of filling out a questionnaire to explore the potential and application of developing integrated fish farming in buckets activities as a provider of family food in the West Java region. This questionnaire consists of four parts, namely participant profile, comprehension, application, and interest. The results of the discussion will be presented based on these sections. The profiles of 677 participants have been summarized and classified into the following Table 1.

Table 1. Distribution of respondents participating in research activities through questionnaires

Variables		Frequency	Percentage
Gender	Female	402	59.4%
	Male	275	40.6%
Year of birth	1941-1950	2	0.3%

	1951-1960	4	0.6%
	1961-1970	34	5.0%
	1971-1980	88	13.0%
	1981-1990	57	8.4%
	1991-2000	207	30.6%
	2001-2010	285	42.1%
Education	Elementary School	2	0.3%
	Junior High School	9	1.3%
	High School	171	25.3%
	Bachelor	469	69.3%
	Master	22	3.2%
	Doctoral	4	0.6%
Occupation	Students	399	58.9%
	Private sector employee	78	11.5%
	BUMN employees	35	5.2%
	Entrepreneur	64	9.5%
	Civil Servant	19	2.8%
	Housewife	52	7.7%
	Teacher	11	1.6%
	Others	19	2.8%

The difference between female and male respondents' responses was not too one-sided. Women contributed 59.4% to this study. Meanwhile, male respondents reached 40.6%. The author categorizes the respondents into seven age groups based on the year of birth. Most of the respondents fall into the categories of birth years 1991-2000 and 2001-2010. All respondents came from the West Java region. 69.3 percent or 469 respondents stated that they had the final level of education or were enrolled in a bachelor's degree. Judging from the majority of respondents who are in the age category of 12 to 31 years, therefore most of the respondents are known to be students.

Data collection was continued by assessing the respondent's knowledge about integrated fish farming by answering the five questions presented and having the aim of knowing the respondent's knowledge. The first question asked about the existence of fishing activities around the respondents, with a total of 677 respondents who participated and 37.4% stated that there were fishery activities around the respondents and 62.6% stated that there were no fishery activities nearby. This question is explored again with the next question where respondents are asked to state what forms of fishing activities are around them, if any. The results from the respondents varied greatly, but it can be concluded that the answers we received the most were aquaculture ponds and fishing ponds. It seems that these two types of fishing activities are the most popular for people in West Java.

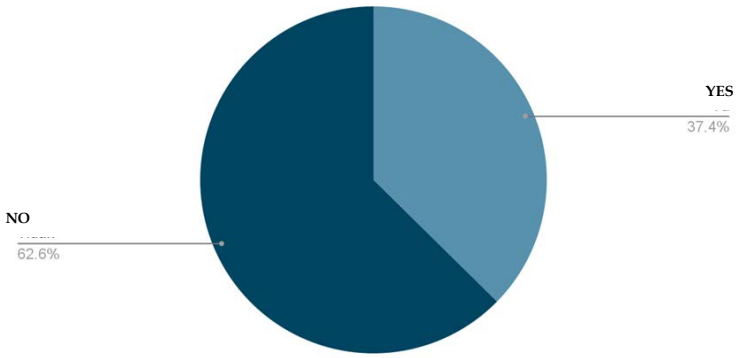


Figure 2. Fishery activities around the community chart

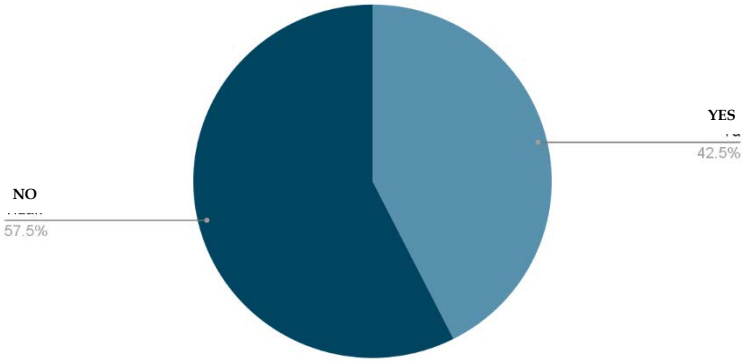


Figure 3. Public knowledge and insight about integrated fish farming in a bucket

This section is continued by exploring the community's knowledge about integrated fish farming which is categorized into yes and no. The results obtained from these questions are that there are 288 respondents who say yes and 389 respondents who say no. The question was continued with basic knowledge about integrated bucket fish farming which required respondents to express their knowledge about what fish and plants can be cultivated in this method activity. The results obtained are very diverse, but it can be concluded that water spinach is the type of plant most stated by respondents with a percentage of 43.3%. Meanwhile, 38% said that they do not know at all what types of vegetables can be cultivated using this method. Water spinach, in addition to being a plant commodity in this approach, can also act as a biofilter, absorbing nitrogen in the form of ammonium and thereby lowering nitrogen levels in the water. The more kale is utilized and the larger it is, the more effective it is at reducing ammonia [7]. Catfish became the most common type of fish mentioned by respondents, reaching 52.6%. Meanwhile, 34.9% of respondents did not recognize the types of fish that can be cultivated in buckets. Because its body is protected by mucus, the usage of catfish (such as Clarias sp.) is safer because it can be utilized in high density. The fish's body will be protected by the mucus because it lowers friction between them, preventing friction wounds. [8, 9] are a couple of examples.

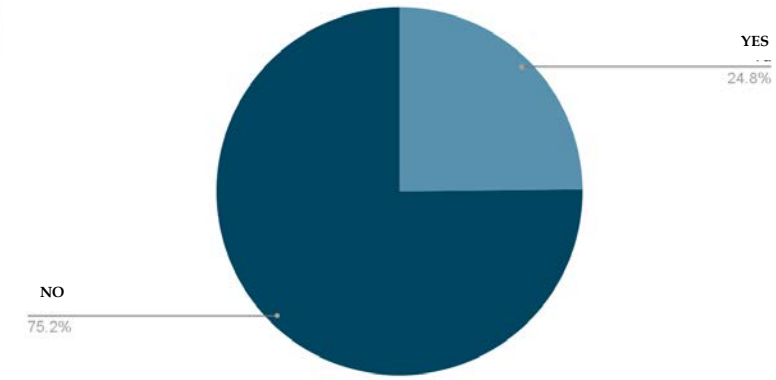


Figure 4. The number of applications for integrated bucket fish farming activities in the community

To further explore the application of fishery activities using this method in the West Java community, seven questions were asked to the respondents. Of the 677 respondents, only 24.8% (168 people) stated that there are communities around them who carry out this method activities either individually or in groups. Of the 168 people, 32.7% of them stated that their activities did not run efficiently. When explored further, it was revealed that most of these failures occurred due to limited knowledge about integrated fish farming method (56.4%). The second most common reason is time constraints (23.6%). 7.3% reasoned that it was hampered by costs and 5.5% was hampered by environmental factors. There were three respondents who included special inhibiting factors in their environment, namely the lack of community cohesiveness, undersized cultivation media, and the inefficient amount of cultivated produce. Meanwhile, another respondent admitted that he did not know the factors that hindered the success of the activity.

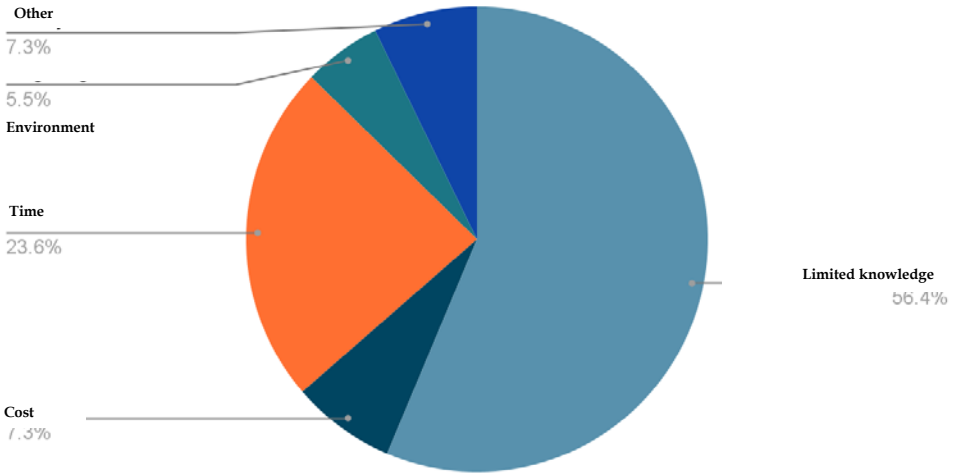


Figure 5. Factors causing the failure of integrated bucket fish farming

When people's interest in implementing this method at home was measured, the results showed an almost equal number of interested and uninterested responses (48% and 52%, respectively). After that, it is followed by questions to investigate the reasons for people's disinterest. Of the 352 people who said they were not interested, the majority of them gave the reason that they had limited time (49.4%). The second most popular answer is the limited knowledge of the procedures for carrying out this method (27.8%). Several respondents said that the feeling of being lazy and uncomfortable with the smell caused by this method was the reason for their disinterest. Therefore, we also want to know whether there are any benefits that can be felt by the respondents through the integrated fish farming activities. 315 respondents answered that the advantage of this method is that this activity can be a solution for providing food in limited land. 158 respondents felt that this method could be one of the positive activities that could be done during the pandemic and 120 others felt that integrated fish farming could help meet protein needs in the family. Interestingly, four respondents felt that there was no benefit from this method activities.

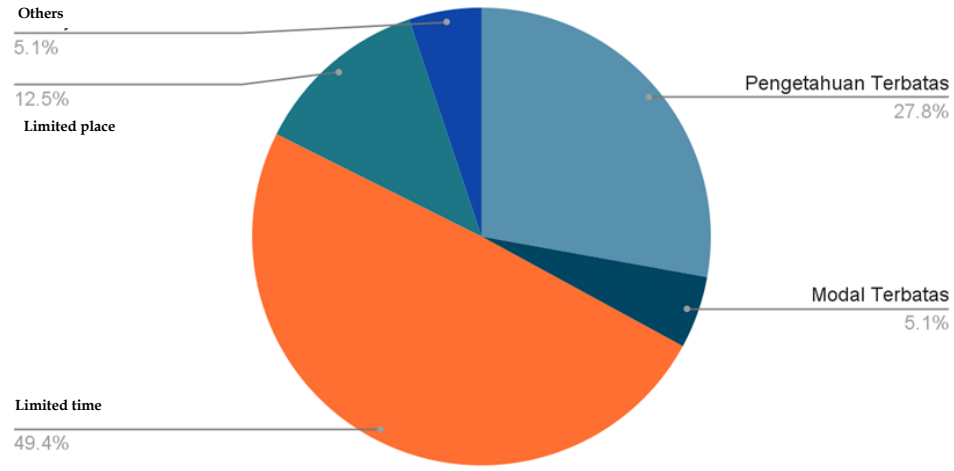
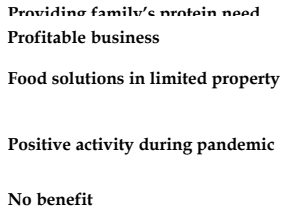


Figure 6. The reason for the public's disinterest in implementing integrated bucket fish farming



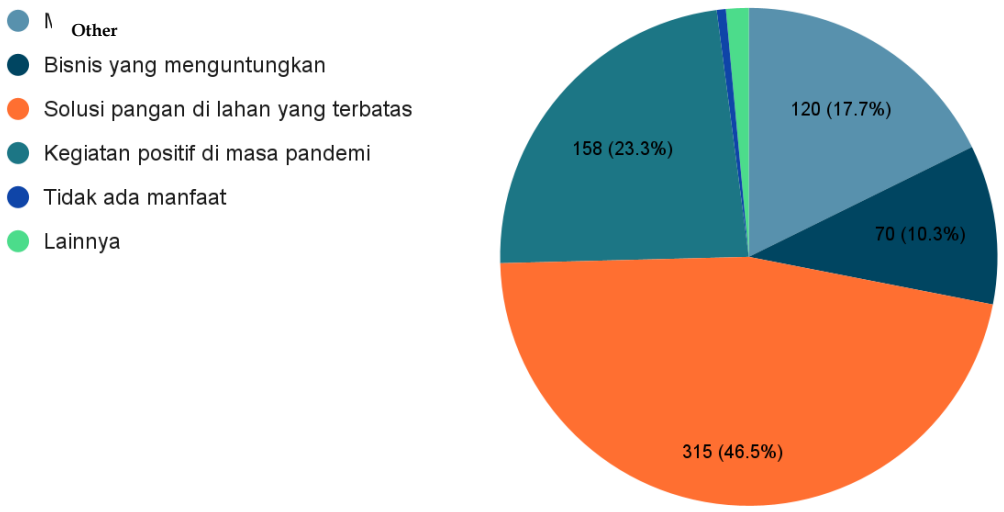


Figure 7. The benefits of integrated bucket fish farming in the community's view

The measurement of interest has the aim of exploring the public's interest in integrated fish farming in a bucket activities. There are seven questions in this assessment with the result that the majority of the community (49.2%) strongly agree that this method activity is very useful to carry out. Followed by another 39.7% who agreed with the statement and followed by a small percentage (10.2%) who gave a neutral answer, 0.6% disagreed and 0.3% strongly disagreed with the statement. Reinforced by the finding that 36.5% agree and even 47.1% strongly agree that this method can help meet protein needs in the family. The majority of respondents also agreed that this method is one of the positive activities that can be done during this pandemic (64.8%).

Only 1.3% and 2.5% of the total respondents strongly disagree and agree, respectively, that this method can be a very profitable business. 33.2% agree and 53.5% strongly agree that this method is a solution for providing food in limited properties. There is a finding that 36% of respondents agree that integrated bucket fish farming is quite easy to implement. 25.8% even of them strongly agree with this and 32.8% give a neutral answer. Despite these findings and after participating in this research, there are still many people who are hesitant to start implementing this method activities. This is evidenced by the finding that the majority of respondents gave neutral answers to statements regarding their interest in implementing this method at home (32%) in fact, 17.3% stated that they were not interested and 3.7% were not very interested in implementing it.

Conclusion

Data collection for the questionnaire was successful with a total of 677 valid responses. To summarize the findings, the authors have listed the key findings from the questionnaire as follows:

1) Public insight regarding fishery activities, especially the cultivation of integrated bucket fish farming method, is still minimal. Through this research, it can be concluded that more people do not know this method.
2) The number of applications of integrated bucket fish farming in the community is still relatively low.
3) 32.7 percent of the people who have applied integrated bucket fish farming admitted that the activity did not run smoothly. The majority is due to limited knowledge about this method.
4) More than fifty percent of respondents are not interested in implementing this method at home. The most common reason was due to time constraints.
5) Most people strongly agree that integrated bucket fish farming is one of the positive activities that can be tried during this pandemic.

After this research was completed, the authors identified great potential for future research. The author would like to propose some inputs so that the next service activity can be carried out better. The following suggestions are formulated from this research:

1) Pilot testing should be carried out before distributing the questionnaire to avoid ambiguous questions and eliminate potential problems. This stage includes evaluating question words, detecting unclear questions, and reviewing the methods used by researchers to collect data. This is recommended because there are many responses that must be eliminated because they are not valid.
2) Counseling and socialization regarding the benefits, procedures for making and maintaining integrated bucket fish farming method must be intensified. Together with the Ministry of Maritime Affairs and Fisheries as a channel of capital in the form of a package of assistance for facilities and infrastructure for cultivation activities and the Center for Freshwater Aquaculture (BPBAT), the community can work together to promote sustainable aquaculture in the wider community to improve com-

munity welfare and meet household protein needs.

Acknowledgment
The authors would like to thank the Rector of Universitas Padjadjaran and the Directorate of Research and Community Service who have funded this activity through the Community Service Grant (PPM-KKN Integratif) January-February 2022.

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