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Improving Family Food Security through the Implementation of Budikdamber at Balai Sakinah Aisyiyah (BSA) Treko Village, Magelang Regency

Ika Afifah Nugraheni [a,1]*, Dinar Mindrati Fardhani [a,2]

[a] Department of Biotechnology, Universitas 'Aisyiyah Yogyakarta, Yogyakarta, Indonesia
[1] ikaafifah@unisayogya.ac.id*; [2] dinar@unisayogya.ac.id
* Corresponding Author

ABSTRACT

The COVID-19 pandemic that has occurred throughout the world, including Indonesia, has affected all areas of people's lives. Family food security is one of the areas affected due to restrictions on activities in the community. One of the efforts that can be made to parse and improve family food security is to implement mindfulness which is carried out independently. This can be a solution for BSA members of Treko Village, Magelang Regency who are affected by the COVID-19 pandemic because they are able to help meet family food availability. The purpose of this service activity is to provide education and training to BSA members so they are able to strengthen family food security during a pandemic. The method of implementation is carried out in a blended manner, including (1) licensing and consolidation, (2) education and demonstrations, and (3) monitoring and consulting services. Kale plants and catfish are the choices cultivated by BSA members of Treko Village through Budikdamber. Partners get online education through social media groups about the benefits of budikdamber. In addition, offline training is conducted to provide direct education regarding the preparation of buckets for cultivation, planting media and how to care for budikdamber. Based on the results of the business analysis, members of the BSA Desa Treko who apply the budikdamber can save Rp. 448,000 per year on family expenses. This can help the family economy during the COVID-19 pandemic.

KEYWORDS
Budikdamber;
Family food security;
Sakinah Hall 'Aisyiyah;
COVID-19;

1. Introduction

The COVID-19 outbreak is a non-natural disaster that has occurred in several countries in the world, including Indonesia [1][2]. COVID-19 became a serious threat to the Government of the Republic of Indonesia in mid-March 2020 after previously making an outbreak and infecting Wuhan residents in China. The spread of this epidemic took place very quickly and spread to remote areas. The resulting impact is not only felt by urban communities but also felt by people living in rural areas. In addition, the transmission of COVID-19 does not look at layers or groups of people, both young and old, men and women, as well as individuals and groups, all of whom have the potential to receive the impact caused by the outbreak [3][4].

The impact of COVID-19 can affect all areas of human life. Based on this, the area that is most clearly affected is public health. This happened because the spread of COVID-19 was very fast and widespread in several areas. Other areas affected are the economy, social, culture, politics, education, and family food security [5][6][7]. These fields are a series that cannot be separated from one another. This means that if one field experiences problems, it will result in the emergence of problems in other fields.

Food security is one of the areas affected by the COVID-19 outbreak [8][9][10][11]. According to the Law of the Republic of Indonesia Number 18 of 2012, food security for households relates to the availability of food in sufficient quantity and quality, evenly distributed and distributed at affordable prices and safe for consumption for every citizen to be able to sustain daily activities in a sustainable manner. Based on this understanding, it is possible that food security will be difficult to achieve during

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the COVID-19 pandemic [12]. This can happen because the flow of distribution of food sources is hampered by the implementation of social restriction policies or activity restrictions in several areas. Another impact is the emergence of a decline in people's purchasing power due to rising prices of groceries or other foodstuffs.

The efforts needed to strengthen family food security in the midst of the COVID-19 pandemic must provide a solution in the form of food availability in sufficient quantity and quality and safe for consumption. One effort that can be done is the application of aquaponics with a combination of fish farming in buckets (budikdamber). This activity can be a solution to strengthening food security in the midst of the COVID-19 pandemic because each family can do it independently without requiring large areas of land. In addition, Budikdamber aquaponic activities are included in cultivation activities that are cheap and easy to do by anyone and anywhere. This activity is the right solution and quite safe to do because it can be done at home and avoids large crowds and direct contact with strangers.

Budikdamber aquaponics can be done using catfish and green vegetables such as kale, pakcoy, and spinach [13][14]. Types of fish and vegetables can also vary depending on the volume of media or buckets used in the Budikdamber aquaponic system [15][16]. The cultivation of fish and vegetables was chosen because it can meet the needs of protein as well as vitamins and minerals for each family [17][18]. Fulfilling nutritional needs is very important, especially in maintaining body immunity during the COVID-19 pandemic as it is today. This type of catfish (Clarias batrachus) was chosen in the Budikdamber aquaponics application because it has properties that are resistant to high turbidity. So it does not require regular water changes and easy maintenance aspects. In addition, catfish is a type of fish with a fast growth rate, high adaptability to the environment, has a good taste and is rich in nutrition. The nutritional content of fish meat includes 15-24% protein, 1-3% carbohydrates, 0.1-22% fat, 66-84% water and 0.8-2% inorganic compounds. The Budikdamber aquaponic system is easy to do, from preparation, maintenance, to harvesting fish and vegetables [19][20]. This system is able to provide positive and productive activities for a family while staying safe and comfortable in their respective homes. Besides that, the aquaponic application of budikdamber can be a quite profitable business if it can be managed properly [21]–[23]. The principles of Budikdamber aquaponics include that it does not require large areas of land, does not require electricity, is more cost effective and is not complicated in its implementation.

Aquaponics has been researched by previous researchers to be used as a reference in this community service. Intelligent Automation Aquaponic Monitoring System was researched by Abdullah [24]. Evaluation of Water Quality and Agricultural Growth Benefits of Intelligence Aquaponic Systems was investigated by Huang [25]. The economic viability of small-scale aquaponic systems for self-producing food was investigated by Lobillo-Eguíbar [26]. Cultivating lettuce (Lactuca sativa L.) and rainbow trout (Oncorhynchus mykiss W.) in an aquaponic recirculation system was studied by Velichkova [27]. The environmental impact of adding antibiotics to an algae-bacterial based aquaponics system was investigated by Ji [28]. Halophyte Plants Cultivated in Aquaponics Have the Same Valorization Potential as Wild Congenital Species from Donor Sites studied by Marques [29]. Site Resource Inventory – The Missing Link in Information Flow of Circular Cities studied by Baganz [30]. The effect of fish stocking density on water quality and growth performance of European carp and leafy vegetables in a low-tech aquaponics system was investigated by Maucieri [31]. Nutrient management in aquaponics: A comparison of three approaches to the cultivation of lettuce, mint and herb mushrooms investigated by Nozzi [32]. Exploring Bacterial Communities in Aquaponic Systems was investigated by Eck [33].

This activity to increase family food security will be carried out at one of the Balai Sakinah Aisyiyah (BSA) which is located in a rural area in Treko Village, Mungkid District, Magelang Regency, Central Java Province. BSA is an organization formed by productive women under the auspices of the charity business 'Aisyiyah, a special autonomous organization of Muhammadiyah. BSA aims to develop knowledge and leadership skills to be able to reach out and advocate for the community. The majority of BSA members are housewives who are currently affected by the COVID-19 pandemic. Therefore, the contribution from the implementation of this service is expected to be able to provide education and training to BSA members so that they are able to strengthen family food security during a pandemic.

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2. Method

Methods of activities carried out to support the application of science and technology for the community at BSA Treko, include: licensing and consolidation, education and demonstrations, and monitoring and consulting services.

2.1. Licensing and Consolidation

Licensing in this case relates to the willingness of partners, namely BSA Treko, to be used as a place for implementing science and technology for community service regarding increasing family food security through the aquaponic Budikdamber application in the midst of the COVID-19 pandemic. While consolidation is intended to coordinate activities based on the agreement that was made at the time of licensing. Consolidation includes discussing the implementation of community service with partners, including methods and participants who will be invited to offline activities.

2.2. Budikdamber Education and Demonstration

2.2.1. Education Stage

At this stage, education and outreach to partners is carried out regarding increasing family food security through the aquaponic application of Budikdamber and the various benefits derived from these activities [34][35][36][37][38].

2.2.2. Demonstration stage

The demonstration stage aims to provide partners with skills and training on the stages in cultivating catfish and vegetables using the Budikdamber aquaponics application. Stages of training include:

- Preparation of water spinach aquaponic media [39][40]
- Preparation of media for budikdamber
- How to care for budikdamber

2.3. Monitoring and Consulting Services

Monitoring was carried out after the budikdamber aquaponics demonstration activity. The purpose of monitoring is to ensure that the Budikdamber aquaponic installation is running well and to monitor the progress of plant and catfish cultivation. In addition, monitoring activities are also carried out by consulting services to help solve problems during vegetable and fish cultivation using Budikdamber.

3. Results and Discussion

This service activity is carried out in a blended manner, where educational activities are carried out online through the Whatsapp group considering that the local area is currently in the PPKM (Implementation of Restrictions on Community Activities) period. Offline activities are carried out on a limited basis, only representatives of 6 BSA members to practice how to prepare and maintain budikdamber.

3.1. Providing Budikdamber Education and Counseling

Partner education and outreach activities regarding the cultivation of vegetable and fish plants in the Budikdamber manner are carried out online through the Whatsapp group (Figure 1). The basis for choosing to use social media is because partners are familiar and often use this type of social media. Even though it's online, partners are very interested in learning about Budikdamber starting from how to prepare the Budikdamber installation, how to nurse kale plants, and how to raise catfish.

The digital era makes it easier for people with the presence of social media. The existence of social media can cut the distance of communication between individuals (8). This includes sharing information and education. Because the condition of the COVID-19 pandemic requires us to reduce the intensity of meetings with the general public.

3.2. Budikdamber Demonstration Activities

The budikdamber demonstration was held offline at BSA Treko with limited participants due to PPKM policies during the COVID-19 pandemic. The health protocol is still being enforced during the implementation of this community service activity which includes all partner members present who are

required to wear masks, keep their distance, and wash their hands using soap or handsanitizer. In addition, demonstration activities were carried out in the yard so that they could keep their distance from each other (Figure 2). This is in accordance with Indonesian government regulations regarding health protocols in order to prevent the spread of COVID-19 (9).

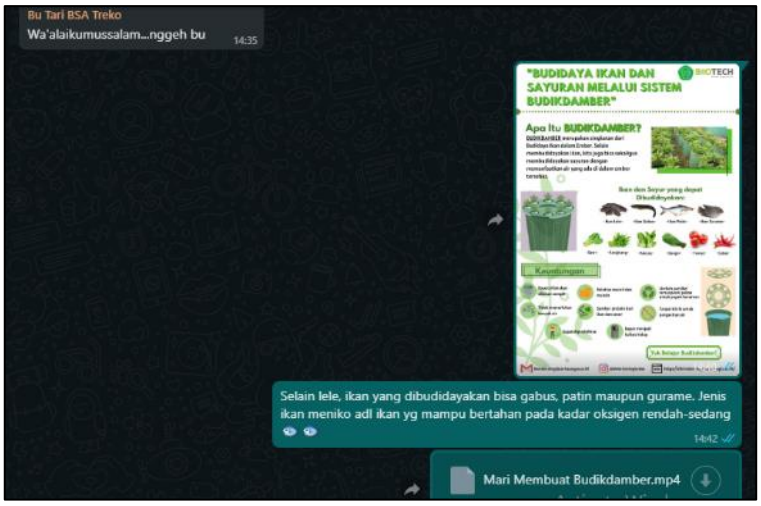

Fig. 1. Providing online Budikdamber education

Fig. 2. Budikdamber demonstration activities at BSA Treko

3.2.1. Bucket preparation for budikdamber

The bucket used to make the Budikdamber installation is an 80 liter bucket. The size of the bucket used will affect the number of catfish seeds that are stocked. The bucket cover is perforated as a place for planting media containers and gaps to provide fish feed (Figure 3). There are 8 holes made around the lid of the 80 Liter bucket. The center of the bucket is also perforated for a place to feed and given gauze to prevent fish from getting out of the bucket.

Before being used as a budikdamber container, the bucket is washed first using rice husk. This aims to eliminate the smell of chemicals that emerge from the bucket. This treatment is expected to increase the percentage of catfish life that is stocked in buckets.

3.2.2. Preparation of planting media for kale cultivation

The planting medium used for vegetable cultivation through the Budikdamber system is wood charcoal. Aside from being a planting medium, wood charcoal also functions to filter water in the

bucket. Wood charcoal acts as an activated carbon capable of absorbing various dissolved compounds and aromatic compounds that inhibit the growth of vegetable and fish plants (10). Wood charcoal is put into a plastic container, then placed into the planting hole in the lid of the bucket (Figure 4).

Fig. 3. Modified bucket cover for budikdamber

Fig. 4. Wood charcoal as a planting medium for Budikdamber vegetables

Kale plants were chosen as vegetable plants for community service activities because they are easy to cultivate, both in the lowlands and highlands. In addition, kale plants can grow in hot and humid areas with sufficient nutrients. In the Budikdamber system, water spinach plants obtain nutrients from catfish culture water because it contains nitrogen, either in the form of NH4, NO2 or NO3. This condition is fluctuating. Water nitrogen levels will increase if the amount of catfish feed given is excessive.

3.2.3. Preparation of catfish seeds

The catfish seeds used for this activity are 10-12 cm in size. The bigger the catfish seeds used, the higher the survival rate. The stocking capacity used was 1 fish/liter of water. The density of fish seeds that are spread in the bucket has a significant effect on the growth rate of catfish.

Catfish is one of the fish that can survive in conditions of low, even unfavorable, water quality. Catfish can also live at low oxygen levels. This is because catfish have a breathing apparatus, an aborescant, which allows them to take oxygen directly to the surface. Apart from catfish, the types of

fish that can be cultivated using Budikdamber include tilapia, catfish, sepat, betok, cork, and carp. These fish have the same characteristics, namely being able to survive in low oxygen levels.

3.3. Budikdamber Monitoring and Maintenance

Feeding catfish is done every 2 times a day. Budikdamber water is also drained regularly to maintain the quality of the water in the bucket. Water quality plays an important role in catfish farming. Decreasing water quality can trigger a decrease in fish survival because it causes death, inhibits fish growth, reduces feed ratios and triggers fish disease. Catfish can be harvested after 2 months, with a fish length of more than 17 cm. In general, harvesting is not done simultaneously because the size of the fish is not uniform.

The maintenance of water spinach plants through Budikdamber is almost the same as conventional cultivation. The difference in cultivation, among others, lies in the planting medium used. In addition, the roots of the Budikdamber Kale plant generally have a longer size than conventional cultivation. The process of seeding and seedling can be done directly in the wood charcoal medium or can also be done separately. Kangkung from Budikdamber can be harvested at the age of 21-30 days after planting (DAP) (Figure 5). Harvesting is done by cutting the lower stem. In one planting, kale can be harvested 4 times.

Fig. 5. Growth of Budikdamber watercress aged 30 hst

3.4. Budikdamber Business Analysis

The number of catfish that we will breed is 60 tails. The average catfish feed for 1 bucket spends approximately 3.5 – 4 kg of feed until it is ready for harvest (6). Budikdamber production costs Rp. 36,000 to purchase catfish pellet feed. Budikdamber buckets are not counted as production costs because they receive assistance from the community service team, along with catfish seeds.

The life rate of the Budikdamber catfish ranges from 50-60%, varying depending on the quality of the fish seeds and the rearing process (6). So it is assumed that the number of catfish at harvest will be around 36 fish, 60% of the total fish seeds stocked. If 1 kg contains 8 catfish, then the catfish produced is 4-5 kg at the current selling price of IDR 23,000.

For kale plants, one harvest can produce about 2 bunches. So that in 4 harvests it can produce 8 bunches of kale with a selling price of IDR 2,500. Based on this analysis, the total sales of fish and kale crops obtained are:

- Sales of catfish:

  5 kg x IDR 23,000 = IDR 115,000

- Sales of kale:

  8 bundles x IDR 2,500 = IDR 20,000

- Then the income is as much as:

IDR 115,000 + IDR 20,000 = IDR 135.00

Net income from the results of budikdamber can be calculated by subtracting total income from production costs, namely:

• Production cost = IDR 23,000

• Income = IDR 135,000

• Total net income :

IDR 135,000 – IDR 23,000 = IDR 112,000

The total net income earned for 3 months after the maintenance of budikdamber is IDR 112,000 or can save household expenses of IDR 448,000/year.

4. Conclusion

Budikdamber is one of the efforts to increase food security during the COVID-19 pandemic because it can provide nutrition and nutrition for families. Kale plants and catfish are cultivated by BSA Treko partners using the Budikdamber system. The yields of water spinach and catfish are estimated to be able to save around IDR 448,000 per year in family expenses.

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Author Contribution

The implementation method is carried out in an integrated manner, including (1) licensing and consolidation, (2) education and disclosure of mindfulness, and (3) monitoring and consultation.

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Conflict of Interest

The authors declare no conflict of interest.

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