Intelligent System of Automatic Shrimp Feeding

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Abstract. Feeding on shrimp culture is important to the shrimp growth process so that the expected yields are achieved. Feeding must be balanced and timely, there are no advantages or disadvantages in feeding because all the feed provided is not necessarily completely consumed by shrimp, therefore it is necessary to have technology that can control shrimp feeding. Automatic shrimp feed technology can be a solution to the problem of feeding to support the productivity of shrimp culture. Automatic shrimp feeder is built using an arduino microcontroller module, RTC module (Real Time Clock), and feed throwing system. The shrimp feeding method with the working principle of shrimp feeder is shrimp feed thrown horizontally due to centrifugal force. With the influence of the centrifugal force from the propeller spreader, the feed will be thrown throughout the surface of the pond. Feeding is controlled using Arduino by setting the time. Shrimp feeding is done every 4 hours and the appliance is on for 7 minutes to spread 10 kg of feed for the number of shrimps 1,500 and the width of kolan 400 m2 with a minimum throwing distance of feed 1 meter and a maximum of 7 meters

1. Introduction
Shrimp is one of the fisheries commodities that provide a significant contribution in increasing local revenue. Aceh is one of the provinces that is very rich in marine and fisheries potential resources. The maritime and fisheries sector will be a leading sector that can be relied on in terms of economic and political strength in lifting the dignity and dignity of the people of Aceh to achieve the welfare they aspire to when utilized optimally. One of the fisheries sectors that can be utilized is shrimp ponds. The large number of shrimp ponds in Aceh makes people think about how to increase the productivity of shrimp harvests and minimize failure in harvesting shrimp.

Langsa City is one of the cities in Aceh, Indonesia. Langsa City is a former part of East Aceh Regency. Located approximately 400 km from the city of Banda Aceh. Langsa City Area 262, 41 Km2. Langsa City is a coastal city which has a coastline of 16 km. A very heterogeneous population - Aceh, Java, Malay, Gayo Batak, and Karo - is only 246 km from Medan City. In the field of marine and fisheries, Langsa City has the potential to be developed. Based on data from the Aceh Marine and Fisheries Service, in 2016 the productive pond area in Langsa City reached around 4,647 Ha, producing 112.5 tons of Windu shrimp. Therefore, development is needed to increase shrimp production in the town of Langsa which is also one of the raw materials in making shrimp paste which is already very well known.

One effort to increase shrimp production in intensive cultivation (intensification) systems is feeding. Feeding system by manually spreading without controlling and paying attention to the level of feed that has been given will be fatal for the survival of shrimp. Feed can be an ‘enemy’ if it is not managed properly because the feed given is not entirely consumed, the remnants of the food that is not consumed will experience decomposition and decay. Feed spoilage can pose a risk of disease so that it can reduce
shrimp production. In addition to disease risk, economically the feed consumes the highest budget in shrimp farming if it is not properly and efficiently controlled. Therefore, it is very necessary to control the shrimp feeding system automatically which can determine the amount of feed in and out.

2. Water Quality Parameters

Water quality parameters of the media must be at optimal conditions. The parameters that influence the cultivation are pH, dissolved oxygen, ammonia, temperature, salinity, and nitrite. Optimum level and range of water quality that can be accepted by vannamei shrimp (Table 1)

| No | Water parameters | Optimum value         |
|----|------------------|-----------------------|
| 1  | Temperature      | 28.5 – 31.5 °C        |
| 2  | Salinity         | 15 – 25 ppt           |
| 3  | Brightness       | 30 – 45 cm            |
| 4  | Dissolved oxygen | >3.5 mg/l             |
| 5  | pH               | 7.5 – 8.5             |
| 6  | CO₂              | < 25 mg/l             |
| 7  | Ammonia          | <0.01 mg/l            |
| 8  | Nitrite (NO₂)    | 0.01 mg/l             |

3. Feed thrower design

This feed thrower design considers the efficiency of shrimp feeding. The aim is to produce technology that can help farm workers in providing shrimp feed consistently, on time and in a measurable manner. To answer this question, the design of an automatic shrimp feeder was produced, which consisted of a feed container, a timer using RTC (Real Time Clock), an accumulator (battery), a food thrower and a microcontroller as the control center and control of feeding automatically. The main block of the feed thrower can be seen in Figure 1.

![Figure 1. Block Design of an automatic feed thrower](image)

4. Feed Algorithm

Motor drive, and feeding schedule stored on the eprom. The algorithm as shown in Figure 5 starts the RTC time setting and the feeding schedule. Every time the microcontroller will read the time from the RTC then compare it to the schedule stored in the eprom. If the RTC time and schedule are the same, the feed throwing process starts with a duration of 70 seconds for 1 kg of feed. The process will be recorded continuously every 4 hours.
5. Component Assembly
This research, automatic shrimp feeder device is designed from start to finish, supporting components are needed to design the tool so that it can work according to their respective functions. The following are the components of an automatic feed tool.

![Component Assembly Diagram]

Figure 2. Block diagram of automatic feeding algorithm

6. Results and Discussion
Based on the results of research conducted, it is obtained the results of an analysis that the manufacture of automatic shrimp feed equipment has been successfully made and tested manually to ensure the tool can rotate properly or not. After the first test is done on the instrument traced error in the rotary propeller which is stuck by a pile of feed pellets so that the motor movement becomes slow. For this error, the rotary propeller is reopened and then repaired so that it functions and can rotate properly and feed can come out through the holes in the rotary propeller. The finished tool is then installed a system that is able to work in real time to control the feeding time of the shrimp automatically so that the work will be more efficient because the feeding works automatically at the specified time. In Figures 4 and 5 are shown tools that have been assembled shrimp feed.

![Figure 4. Shrimp feed equipment](image)

![Figure 5. Test tool](image)

In the picture it is explained that the devices that have been assembled are always in the program to be able to work automatically using Arduino controls. All components that have been put together can work according to their functions, so that the automatic feed tool has been completed and the results can be applied to shrimp ponds. In table 2, it is explained how the tool works in removing feed.

| Table 2. Working sizes of automatic feeders |
|-------------------------------------------|
| Time on  | Time off  | Pool area (M³) | amount Feed In (Kg) | amount Feed Out (Kg) | amount of Shrimp (tail) | Time (seconds) | Throwing distance (meters) |
|---------|-----------|----------------|---------------------|---------------------|------------------------|---------------|--------------------------|
| 07.00.00 | 07.00.07  | 400            | 40                  | 10                  | 1500                   | 70            | 1 3 7                    |
| 11.00.00 | 11.00.07  | 400            | 30                  | 10                  | 1500                   | 70            | 1 2 5                    |
| 16.00.00 | 16.00.07  | 400            | 20                  | 10                  | 1500                   | 70            | 1 2.5 6.5                |
| 20.00.00 | 20.00.07  | 400            | 10                  | 10                  | 1500                   | 70            | 1 1.5 6                  |

In table 2 is a working size chart of the automatic feeder tool, the tool works regularly at a predetermined time. The appliance starts at 07.00 and dies at 07.00.07 seconds. At 11.00 the appliance is on and at 11.00.07 the appliance is dead, and so on. In table 2 the size of the pond, the amount of feed coming in and going out, the number of shrimps in the pond, the number of seconds and the throwing distance of the feed varied, but the minimum distance of the feed was thrown at 1 meter and a maximum of 7 meters. This may change depending on the tools and propellers used, the area of the pond is proportional to the number of shrimps stocked.

7. Conclusion

The position of the tool is placed in the middle of the pond so that when the tool rotates the feed does not come out of the pool area, the tool rotates for 70 seconds, every 4 hours the tool rotates to release as much as 10 kg of food, automatic shrimp feeder equipment makes it easy for the farm owner to feed on time and automatic shrimp feeding device is completed designed and working Real Time Clock (RTC)

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