

## Development of Aqua-loader for Fish Farming

T.S. Marliza<sup>1,\*</sup>, A.D. Kupo<sup>1</sup>, S. Rimba<sup>1</sup>, L.Rameli<sup>1</sup>, N.U. Arang<sup>1</sup>, A.A. Habari<sup>1</sup> and W.N.Z.Z. Abdullah<sup>1</sup>

<sup>1</sup>Department of Basic Science and Engineering, Faculty of Agriculture and Food Science, Universiti Putra Malaysia, Bintulu Campus, 97008 Bintulu, Sarawak, Malaysia

\*Corresponding author. Tel.: +6086-855430, Email:t\_marliza@upm.edu.my

### Abstract

*Aqua-loader is a multifunction machine that use for harvesting, grading, weighing, and packing the fish. This prototype has been developed in order to conduct a better management in aqua farming that consume cost and time. The objectives of this project are to reduce the time taken in the management of fish farming, to save cost in handling of the fish farming and to suggest a better management to the whole fish farming that can reduce a lot of management errors. Aqua-loader offer valuable benefits to the farmers, which is reducing the cost of labour, to enhance the quality of the product and increase productivity. Aqua-loader also offer a proper and good management for aquaculture and fish industry.*

Keywords: aqua, fish farming, multifunction machine, cost, management

### Introduction

The industry of aquaculture is growing nowadays since it is one of the main sources of food. Therefore, the development of technology for aquaculture industry purposes was also increased. However, the aquaculture industry still needs more advance technology to fit the capacity and also to make the management more organized with the usage of more efficient technology or machinery (Jena et al., 2017). Therefore, Aqua-loader was developed to fulfil the industry needs.

Major type of aquaculture yield cultivated including fish, crab and prawn. Those species required a very proper management that sometimes cannot be fulfilled by using current methods and technologies to control the quality (Kelleher and Weber, 2006). This is because some of the process of harvesting are supposed to be done quickly within a very short period of time to maintain the freshness (Summerfelt et al., 2009). For example, in order to control the freshness of barramundi species, those fishes must be located inside the ice tank before they die off (Towers, 2010). So, a machine that can perform many tasks at the same time is needed to shorten the period of harvesting process.

The Aqua-loader has been developed by combining a few functions that supposed to be done in a short period of time to maintain the quality and freshness of the aquaculture yield. The Aqua-loader has been designed to perform harvesting, grading, weighing, and packing the fish.

### Methodology of the prototype

The aqua-loader was designed by hand drawing. The design sketched included the component of the aqua-loader. After the designed was released, the materials that will be used to make the prototype

were determined and process for the making of the prototype begin.

### Materials

The main materials used to make the prototype is Styrofoam board. The real net was used as a fish net and the bamboo stick skewer was used in the hydraulic system on the aqua-loader. The basic requirement such as hot glue gun, scissors, cutter, glue stick was needed. All the requirement materials used to make the aqua-loader prototype were purchased from nearby local suppliers.

### Method

After all the basic requirements and the design was ready, the Styrofoam board was cut into a piece base on the part of the aqua-loader designed. After that, the piece of the Styrofoam board was combined using a hot glue gun to form the body of aqua-loader. When the body was ready, each compartments were combined to the body such as the netting, platform and the driving area. The prototype of aqua-loader is shown in Figure 1.



Figure 1: Aqua-loader

### Functions

The first function of Aqua-loader is to harvest the fishes collectively. Aqua-loader has been design with a giant net at the front side. The net's radius was adjustable so that the opening can be adjust

according to the size of pond and the routes. The front net was connected to the main body using a hydraulic connections to make it movable.

Aqua-loader was also designed to perform grading process. After the fishes trapped inside the net, the net will be lifted then the fishes will go inside a tunnel-like part which is located underneath the body of the machine. At the end of the this part, a few grates with different hole sizes will sort the fish according to their size. Inside the vertical grading tank, the grates will separate and create some spaces in between. The grate placed from the smallest at the bottom and biggest at the top. Small fishes will go down first then followed by the bigger one. Hence, the size of the fishes will be graded according to the different size of grates. Aqua-loader also designed to perform packing process. After the fish was graded inside the grading tank, the fishes will be taken out through a conveyer to be placed into fish boxes that located on top of the weighing scale. , this process make the fishes stored in box in a short time after it was harvested.

Besides that, Aqua-loader also perform weighing process. When the fishes enter the fish boxes, the weight of the box will be recorder by the weighing scale under the boxes. After the weight has been recorded, ice will be added and the conveyor bring the box to the storage area. The boxes are arranged properly in order to control the stability of the machine.

### ***Advantages***

Tractors have traditionally been used on farms to mechanise several agricultural tasks. These modern aqua-loader tractors are used for harvesting, grading, weighing and packaging the fish. Aqua-loader tractors offer benefits for large scale fish farming and provide proper and good management. This article discusses the various benefits of using aqua-loader tractors to mechanise aquaculture activity.

### ***Wide range***

Aqua-loader tractors are available in a wide range of options to suit specific tasks and requirements. Subcompact or compact tractors available in a horsepower range from 15hp to 40hp are ideal for heavy duty. Aqua-loader are designed to carry a task not only at the water, but also can move on the ground to ease the movement from one pond to another pond.

Aqua-loader also known as diesel tractors, utility tractors are recommended for mechanising complex farming tasks and come in different models with a horsepower range from 45 hp to 110 hp. A wide range of fish farming implements can be attached to utility tractors to help accomplish various jobs.

### ***Versatility***

Modern tractors are designed and manufactured to offer versatility in performing a wide range of tasks in fish farming. Compact tractors can accomplish tasks ranging from harvesting, grading the fish, weighing until the packaging automatically, with the ability to do more by attaching various implements such as front loaders or buoy to add their buoyant force.

### ***Power and durability***

Aqua-loader tractors are typically designed with powerful engines to run over in a pond and pull extremely heavy loads, making them effective in fish farming tasks. Aqua-loader tractors also come with cast iron front axles for extra strength and durability. It has been designed with a giant net at the front side.

### ***Ease of transmission and operation***

Modern tractors feature powershift transmission and hydraulic transmission to simplify the operation. These tractors are also equipped with power steering to make turning much easier, oil immersed brakes and high-speed gearbox. Advanced models help reduce operator fatigue with exclusive shift controls and an automatically responsive transmission.

### ***Proper Management***

During the process of harvesting the fish from the pond, problems may occur during harvesting until the packaging. Grading process usually done manually and always have an error. Aqua-loader will ease the process and the grading process can be done more accurate.

### ***Specification***

The development of this aqua-loader comes with a certain specification that needed to be considered for it to be well-function. One of the main specifications that needed to be considered in developing this machinery is the type of engine. For it to function as how it is designed to be, this Aqua-loader need to be supported by a four-stroke engine. This is because, a four-stroke engine is very suitable for a long life term condition so it can reduce the operating costs. Moreover, it is more reliable and faster in terms of speed and power and that make it stronger due to the bigger torque produce. Last but not least, a four-stroke engine needs a very little amount of lubricant consumption.

The other specifications that need to be considered in developing this machine is the size of the machine. This machine takes about 700 square feet for its sizing. This will affect the size of the pond that needed this machine to be well function as the pond has to be suitably sized for this aqua-loader. Last but not least, the horsepower of this machine

also needed to be consider. For this Aqua-loader, the most suitable horsepower that can be used is from 70 to 90 horsepower to work properly at the pond. This Aqua-loader has to produce a bigger power because it need to be used on the land or on the water.

### ***Conclusion***

To summarise, this Aqua-loader is very handy and useful in aquaculture industry. It can do four main functions which is harvesting, grading, weighing and packaging the aqua products. It is much recommended for the farmers to have this machine as it gives a very proper management to the whole aquaculture process that will be a lot easier and helpful for them. It is undeniably that this aqua-

loader consume costs and time saving that can satisfy its management.

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