A PROJECT REPORT

ON

DEVELOPMENT OF AN IOT BASED INTEGRATED WATER QUALITY MONITORING DEVICE FOR DOMESTIC FISH PONDS

BY

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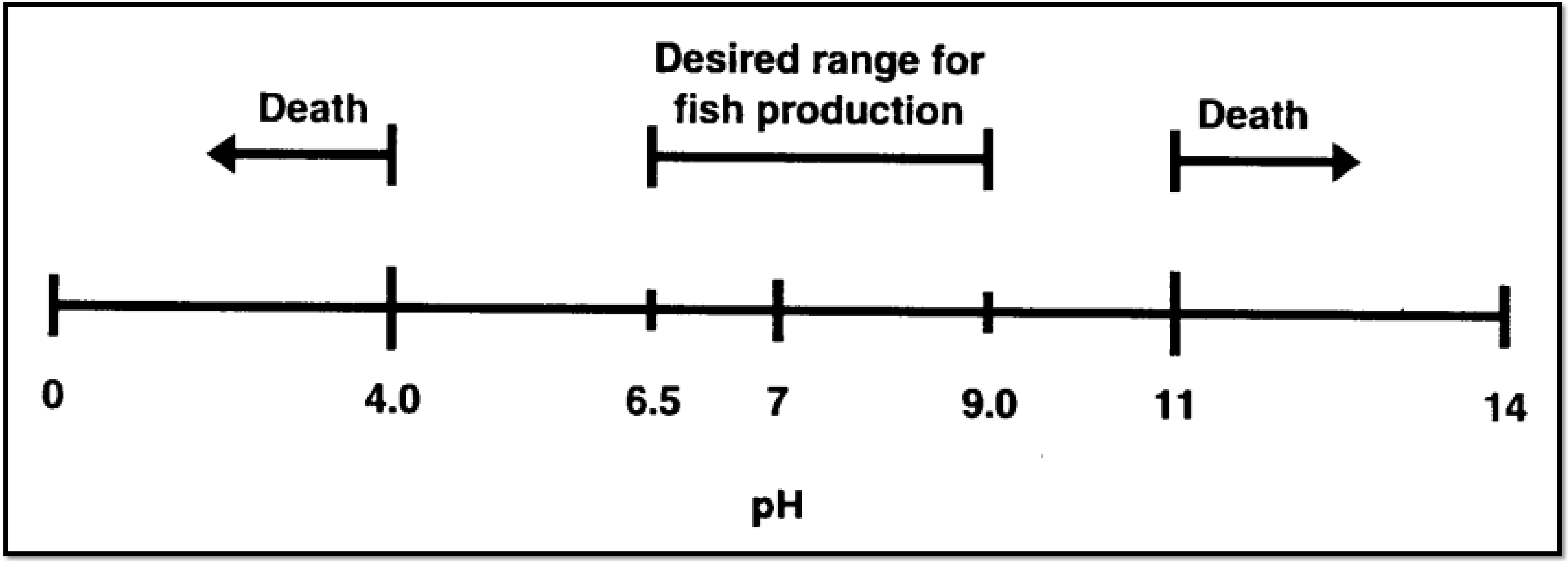
INTRODUCTION

Water is an inevitable substances to living things and its relevance to humanity can not be overemphasis.

Fish carry out all of their bodily functions in water such as; Breathe, Feed and Grow, Excrete waste, Maintain a salt balance, and Reproduce. However, understanding the physical and chemical properties of water is critical to successful aquaculture. Also, success or failure of an aquaculture operation is heavily influenced by water.

INTRODUCTION Cont"d.



pH chart standard for fishes according to Nigeria National Aquaculture Strategy

AIM AND OBJECTIVE

The aim of this proposed design is the Development of an IOT Based Integrated Water Quality Monitoring Device for Domestic Fish Ponds, and the specific objectives are, to:

i. Develop a low-cost and user-friendly Internet of Things (IoT)-based water quality monitoring device for domestic fish ponds.

ii. Implement wireless connectivity to permit remote monitoring and control of water quality parameters via a mobile application or web interface.

iii. Integrate an alert system that notifies proprietors or caretakers of fish ponds of critical changes in water quality parameters, allowing them to take immediate corrective action.

iv. Validate the device's performance and dependability in a variety of domestic fish pond environments and climates through rigorous field-testing.

v. Evaluate the system using Sensitivity, Specificity, and Accuracy.

STATEMENT OF PROBLEM

Aquaculture farmers face significant losses due to insufficient understanding of water pH's impact on fish ponds. In Nigeria, this lack of knowledge leads to financial instability, bankruptcies, and debt. National Aquaculture Strategy data highlights pH's crucial role, with an optimal range of 6.5-9.5 for fish culture success. To address this, an IoT-based Water Quality Monitoring Device for Domestic Fish Ponds was developed, aiming to mitigate such detrimental effects.

LITERATURE REVIEW

- Shareef and Reddy. (2019) created a system for real-time water quality monitoring that uses widely dispersed wireless sensor components to send data back to the central control terminal.

- Jen-Yung et al. (2021) developed a system that incorporates dissolved oxygen, pH, and water temperature sensors in each water layer. The system returns the collected data using Modbus TCP/IP communication. Data is send via guided medium and this may however be limited to a certain range.

REVIEW: The limitation of the related works is that replacement of the concentrated pH water in a pond is done manually and with time taking during this process do affect the fishes. Also, Data sent via a guided medium is mainly limited to a certain region.

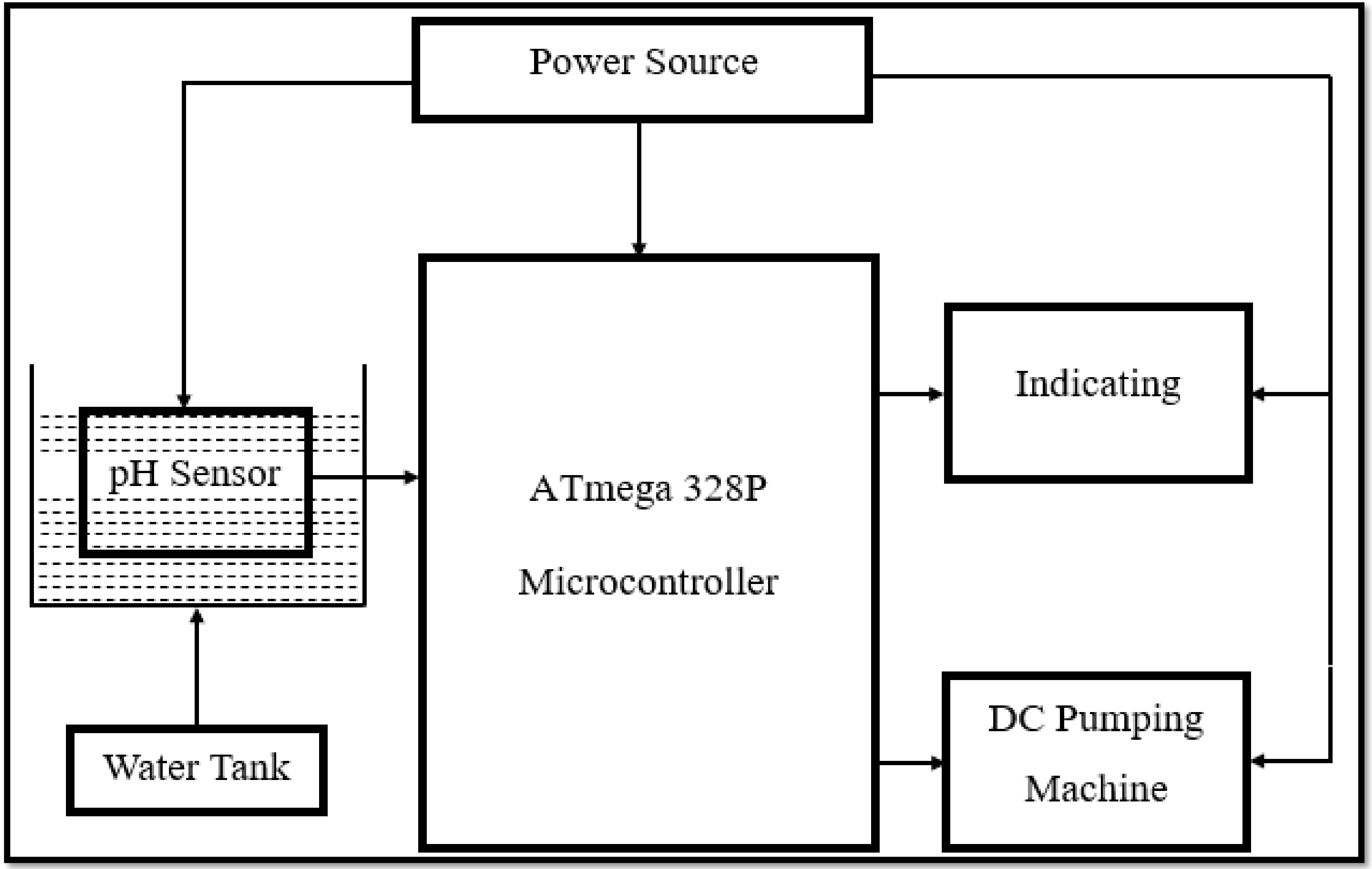
METHODOLOGY

The sensor unit comprises an integrated circuit module such is the pH sensor that will place inside the pond. The integrated circuit will be powered using a 5-volt Dc power source. A signal is sent to the microcontroller at each increase in the pH of the pond and necessary actions are taken based on the program written on the microcontroller. The power source obtained from a 12-volts adapter which is regulated using the DC-to-DC regulator The microcontroller and other digital integrated circuit used 5-voltage for their operation. The block diagram of the design is shown in **Figure on The Next Slide.**

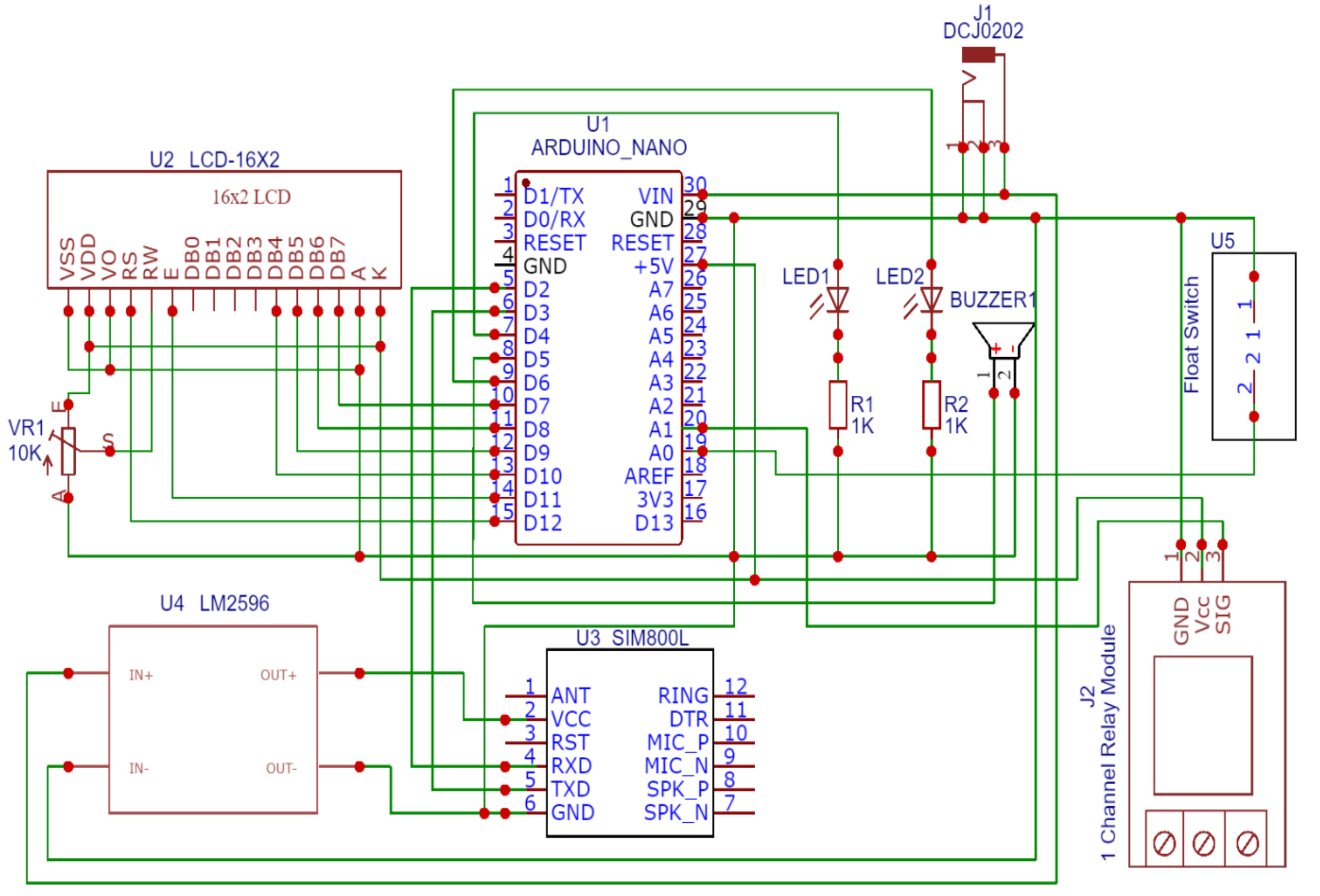
BLOCK DIAGRAM OF THE DESIGN

The block Diagram Consist of the;

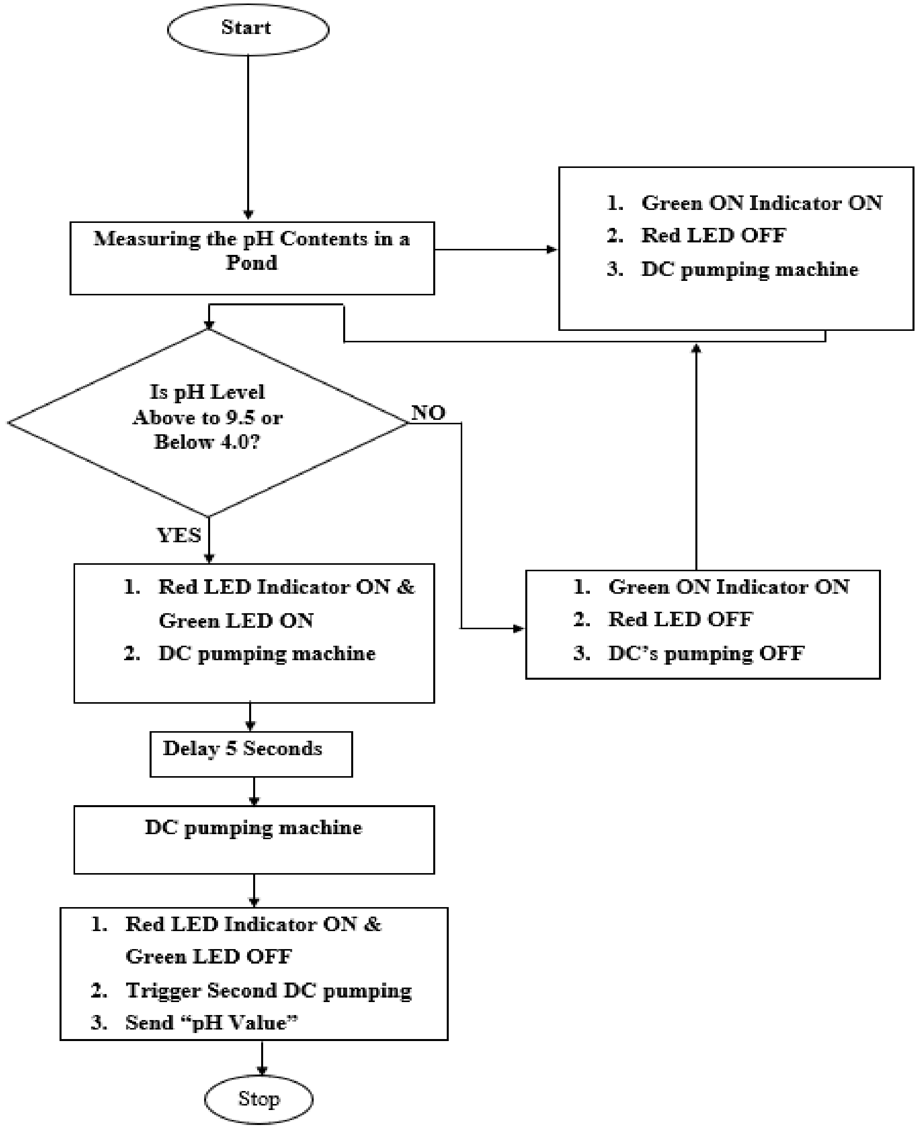
- ❑ Power Supply Unit
- ❑ Microcontroller Unit
- ❑ Indicating Unit
- ❑ Dc Water Pump unit
- ❑ pH Detection Unit



CIRCUIT DIAGRAM OF THE DESIGN



CIRCUIT DIAGRAM OF THE DESIGN



PARAMETER OF EVALUATION OF THE DESIGN

The following parameters will be used for evaluating this developed system:

- **False Detection (FD), True Detection (TD), Unable to Detect (UD), Sensitivity (SE), Specificity (SP), and Accuracy**

$$\text{Sencitivity} = \left(\frac{Td}{Td+Ud}\right) \quad (3.1)$$

$$\text{Specificity} = \left(\frac{Td}{Td+Fd}\right) \quad (3.2)$$

$$Accuracy = \left(\frac{Td}{Td+Fd} / \frac{Td}{Td+Ud} \; x\, 100\right) \quad (3.3)$$

Table 4.1: Result of test on low pH of water.

Attempts	TD	FD	UD	Ph Value	Number of Response
1	1	0	0	3.97	1
2	1	0	0	3.80	1
3	1	0	0	3.59	1
4	1	0	0	3.86	1
5	1	0	0	3.97	1

Table 4.2: Result of test on low pH of water.

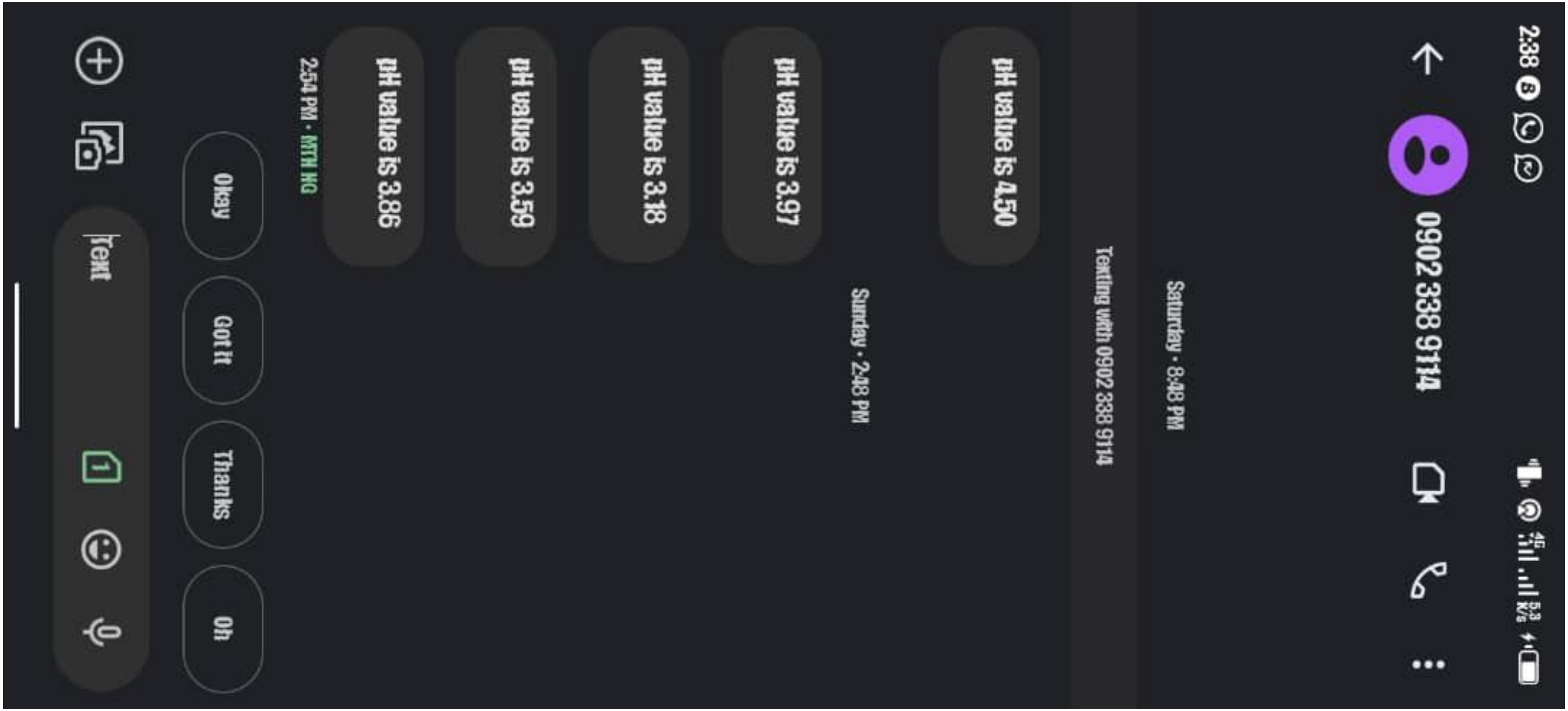
Attempts	TD	FD	UD	Ph Value	Number of Response
1	1	0	0	3.76	1
2	1	0	0	3.55	1
3	1	0	0	3.89	1
4	1	0	0	3.88	1
5	1	0	0	3.98	0

Table 4.3: Result of test on High pH of water.

Attempts	TD	FD	UD	Ph Value	Number of Response
1	1	0	0	9.51	1
2	1	0	0	9.53	0
3	1	0	0	9.53	1
4	1	0	0	9.53	1
5	1	0	0	9.57	1

Table 4.4: Result of test on normal water

Attempts	TD	FD	UD	Ph Value	Number of Response
1	1	0	0	7.04	1
2	1	0	0	8.12	1
3	1	0	0	7.22	1
4	1	0	0	7.77	1
5	1	0	0	6.98	1


2:38
0902 338 9114
Saturday · 8:48 PM
Texting with 0902 338 9114
pH value is 4.50
Sunday · 2:48 PM
pH value is 3.97
pH value is 3.18
pH value is 3.59
pH value is 3.86
2:54 PM · MTN NG
Okay
Got it
Thanks
Oh
Text

THANKS FOR LISTENING