

**WATER POLLUTION FROM AGRICULTURAL ACTIVITIES (BY
PESTICIDES AND FERTILIZER), AND ITS IMPACT ON HUMAN
HEALTH AND THE ENVIRONMENT**

DURGAPUR, RAJSHAHI

BY

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This Thesis Report Presented in Partial Fulfilment of the Requirements for
the Degree of Bachelor of Science (B. Sc) in Environmental Science and
Disaster Management (ESDM)

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APPROVAL



This thesis report titled “**Water Pollution from Agricultural Activities (by pesticides and fertilizer), That Impact on Human Health and the Environment**”, submitted by Mst. Farhana Haque to the Department of Environmental Science and Disaster Management (ESDM), Daffodil International University (DIU), has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science (B.Sc.) in Environmental Science and Disaster Management (ESDM) and approved as to its style and contents. The presentation has been held on 03 January, 2022.

A handwritten signature in black ink, which appears to read "M. Parveen", is written over a horizontal line.

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DECLARATION

I hereby declare that this research project has been done by me under the supervision of Dr.Mahfuza Parveen, Assistant Professor, Department of Environmental Science and Disaster Management (ESDM), Daffodil International University (DIU). I also declare that neither this research project nor any part of this research project has been submitted elsewhere for the award of any degree.



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DEDICATION

My Respected Teachers

Dr. A. B. M. Kamal Pasha, PhD

Md. Azharul Haque Chowdhury

Dr. Mahfuza Parveen

Md. Sadril Islam Khan

and

to the loving memory of my beloved seniors, juniors, coordination officers and staffs from the Department of Environmental Science and Disaster Management (ESDM), Daffodil International University (DIU) with whom I was spent a single second of my undergrad life in last four year (10th January 2018 to 03th January 2022).

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ABSTRACT

Bangladesh is a major agricultural country, more than 70% of the population is dependent on the crops produced by rural farmers. Rural farmers are facing various problems while growing crops for the people. When farmers apply pesticides and fertilizers on the land, it has a serious effect on their health for example: eye and skin irritation, headache, inhalation and many more. Moreover, pesticides and fertilizers used in crops are mixing with rain water and entering the pond water. This is polluting the water. Biodiversity of aquatic plants and animals is being lost. On the other hand, the use of this water is causing various health problems to the villagers such as; dermatitis, allergies, skin diseases and other. we have collected water from ponds which infested with pesticides and fertilizer. Has collected water from two sides of this pond and upstream zone. The waters are then tested in lab and comparatively higher values of ph-acidity, EC, TDS and Total Harness etc. Water contains a lot of acid which is relatively harmful to everyone. This polluted water is having a devastating effect on ecosystem and biodiversity diversity and with the user health risks are increasing day by day. So, the damage of farmer health and other local people. And environmental balance increasing day by day. We need to work together to protect environmental health, human health, biodiversity and ecosystems. Because these are very important elements of the environment.

TABLE OF CONTENTS

Contents	Page
Approval	ii
Declaration	iii
Dedication	iv
Acknowledgement	v
Abstract	vi
Table of Contents	vii
List of Tables	x
List of Figures (Image, Map, Flow Chart and Illustration)	xi
List of Symbols	xiii
CHAPTER 1: INTRODUCTION	1
1.1. Problem Statement	1
1.2. Background	2
1.3. Objectives of this study	3
CHAPTER 2: LITERATURE REVIEW	4
2.1. Water Pollution from Agricultural Activities	4
2.2. Pesticides and Fertilizers Use on Agricultural Land	5

2. 3. Negative Impact of Pesticides and Fertilizers	9
2.3.1. Human Health	9
2.3.2. Agricultural Land	12
2.3.3. Biodiversity and Ecosystem	13
2.3.4. Insects and Parasites	13
2.3.5. Fisheries	14
2.3.6. Trees and Environment	14

CHAPTER 3: METHODOLOGY	16
3.1. Study setting and design	16
3.1.1. Study participants	16
3.2. Data collection techniques of the study	17
3.2.1. Quantitative survey	17
3.2.2. Water quality assessment	17
3.2.3. Water test	17
3.2.4. Water sample collection	17
3.2.5. Ethical consideration	18
3.3. Data analysis	19
3.3.1. Laboratory Experiment	19
3.3.2. Instrumental techniques	20

CHAPTER 4: RESULT AND DISCUSSION	22
4.1. Study Finding	22
4.2. Survey Result	
4.2.1. My Survey Question	22
4.2.3. Laboratory based	39
4.2.3.1. pH	39
4.2.3.2. EC	41
4.2.3.3. TDS	42
4.2.3.4. Salinity	44
4.2.3.5. Acidity	44
4.2.2.6. Total Hardness	45
4.3. Discussion	47
CHAPTER 5: RECOMMENDATIONS	
AND CONCLUSION	51
5.1. Recommendation	51
5.2. Conclusion	52
REFERANCES	53

LIST OF TABLES

Table No.	Name of the Table	Page
Table 01:	Estimated percentage losses of potential crop yield	7
Table 02:	Pesticides use and yields of major crops in certain countries and area	8
Table 03:	The value of the pesticides markets in 1985	9
Table 04:	Hospital admissions and deaths to pesticides poisoning in Srilanka 1975-1996	10
Table 06:	Used Instruments to conduct the study	20
Table 06:	Major Characteristics of the Instruments	21
Table 07:	Number of Gender	24
Table 08:	Age	25
Table 09:	Total Education Number	26
Table 10:	Number of Occupation	27
Table 11:	Family Member	28
Table 12:	Fertilizer Name	29
Table 13:	Pesticides Name	30
Table 14:	Response	31
Table 15:	Response	32
Table 16:	Crops Name	33
Table 17:	Animals Name	34
Table 18:	Health Problem	35
Table 19:	Use of Daily Life	36
Table 20:	Diseases Name	37

Table 21:	Response	38
Table 22:	pH Level	39
Table 23:	Hardness Measurement	46

LIST OF FIGURES (IMAGE, MAP AND FLOW CHART)

Figure No.	Name of the Figure	Page
Figure 1:	Use of pesticides	6
Figure 2:	Use of fertilizer	6
Figure 3:	Location Durgapur upazila under Rajshahi Division (map)	16
Figure 4:	Water sample collection	18
Figure 5:	Acidity test of water sample	20
Figure 6:	Gender	24
Figure 7:	Age of the farmer	25
Figure 8:	Education level	26
Figure 9:	Occupation	27
Figure 10:	Member is there in your household	28
Figure 11:	Farmers are use fertilizer most of the crops	29

Figure 12:	Farmers are use pesticides most of the crops	30
Figure 13:	Water pollution by fertilizer	31
Figure 14:	Water pollution by pesticides	32
Figure 15:	Pesticides and fertilizers use most of the crop	33
Figure 16:	Damage of the animal's life	34
Figure 17:	Health problems	35
Figure 18:	Contaminated water is that purpose	36
Figure 19:	The diseases that occur when using contaminated water	37
Figure 20:	Damage to the environment use of excess pesticides and fertilizers	38
Figure 21:	pH level	40
Figure 22:	EC level	41
Figure 23:	EC bar chart	42
Figure 24:	TDS level	43
Figure 25:	TDS data entry table and bar chart	43
Figure 26:	Acidity level	45
Figure 27:	Total hardness (Bar chart)	46

LIST OF SYMBOLS

Symbol or Unit	Name of the Symbol or Unit
'	Second
O	Minute
oC	Degree Celsius
$\mu\text{S/cm}$	Micro Siemens Centimeter
mS/cm	Milli Siemens Centimeter
dS/cm	Deci Siemens Centimeter
ppt	Parts Per Thousand
ppm	Parts Per Million
m	Meter
m^2	Meter Square
km	Kilometer
sq.km	Square Kilometer

CHAPTER 1: INTRODUCTION

1.1. Problem Statement

More than 70% of the population depends on agricultural land dedicated to growing crops. Since everyone depends on agricultural work, farmers are using different types of chemical pesticides and fertilizer to increase the production of land. These pesticides are mixing with the nearby ponds and lakes through rain water and polluting them. As a result, organisms such as fishes, insects, human and other animals living in these water bodies are being affected. It is having a detrimental effect on ecosystems and biodiversity. Moreover, the villagers use the water of these ponds for their daily necessities. As a result, they have various problems such as skin diseases, Allergic, Eye itching, diarrhea and many more. And this problem is increasing day by day. As a result, the health problems of the people are increasing day by day and Due to these environmental disasters are coming down. Farmer take no precautions when using liquid pesticides, this causes them various problems such as; Irritation of hands and feet and eye, Headache, Dry throat, inhalation problem and many more. This causes serious damage to the health of the farmer. As a result, the environment is losing its balance day by day. Pesticides effectively control many insects, diseases and weeds. However, to be effective, pesticides have to target the crop or animal of interest. Spray drift is one of the biggest concerns regarding the movement of pesticides to non-target organisms. Off-target losses can range from 50 % to 70 % of the applied pesticide because of evaporation and drift (Pimentel 2005). Drift from aerial applications is greatest and that from ground applications is least. There are several ways to reduce drift. One way is to use spray additives that affect the drop size of sprays by increasing the number of large droplets and decreasing the number of small droplets. This can reduce the problem a bit.

1.2. Background

Bangladesh is a major agricultural country; there are many sources of agricultural pollution including fertilizers and pesticides applied to row fields. The average utilization rates of fertilizers and pesticides are 33% and 35%, respectively, 15% to 30% lower than utilization rates in developed countries. The common pesticides and fertilizer such as; Herbicides and insecticides, Nitrogen, Phosphorus, and Potassium. Long-term application of fertilizers can cause rivers, lakes. More than 70% pesticides and 50% fertilizer use in Bangladesh. The fertilizers and pesticides used have polluted the water in many countries/areas, with disruptive effects on the environment and on human beings and caused health hazards including deaths. The amount of agricultural pollution is increasing day by day and impact on public health and environment. So we have to work together without increasing this pollution and protect our environment. The farmer external cost of using pesticides and fertilizers is much higher. Despite the high cost, farmers are increasingly using pesticides. As a result, farmers are suffering from various diseases due to exposure to these pesticides and fertilizer. Pesticides and fertilizer Contain large amounts of harmful chemicals that are harmful to farmers health. Different Surveys show that despite the increasing cost, they still use these harmful pesticides and fertilizers. The population is growing at an increasing rate and the use of pesticides and fertilizers for crop protection is increasing based on the need for food. If the use of pesticides and fertilizers increases in this way thinking of increasing food production, it will have a negatives impact on the environment. **(Grube *et al.*, 2011)**

Rural farmers can use large quantities of pesticides and fertilizers, the end result of which is detrimental to the environment and human health. **(Williamson, 2003)**. Many people come in contact with pesticides professionally which causes many problems in their public health. As a result, 250 to 370,000 people die every year. **(Peter, Sudarsan and Moran, 2014)**. Pesticides is chemicals that are used on agricultural land and for other purposes.

1.3. Specifics objectives of this study:

- To understand-how the pesticides or fertilizer used in agricultural land contaminates nearby water bodies.
- To examine the water quality of the water bodies near agricultural fields.
- To understand perceived effect of pesticides-related water pollution on human health.

CHAPTER 2: LITERATURE REVIEW

I will write about four sections in literature review. This chapter discusses the Ponds water pollution, Impact and uses the pesticides and fertilizer use of agriculture land.

2.1. Water Pollution from Agricultural Activities

Agriculture is an important role in the economic development of Bangladesh. Since the population of the country is high, therefore agriculture is being enriched to provide adequate food. Then pesticides and fertilizers need to be continuously increased to maintain high yields. Excessive use of pesticides and fertilizer is reducing soil fertility on the one hand and increasing water pollution on that other. Plants and animals living in the water are being harmed as well as adversely affecting human health. **(Kosankar, 2020)**

Water pollution is now spreading not only Bangladesh but all over the world, which is upsetting the balance of the environment. Water in the reservoir is being polluted due to the discharge of pesticides and fertilizers used in the agricultural land. Contamination of the pond water is increasing day by day due to the use of pesticides and fertilizer around the agricultural lands. These pesticides and fertilizers used in agriculture are discharged for the rain water and mixing with the pond water for the reservoir. AS a result, the amount of water pollution in the pond is increasing day by day. On the pond ecosystems services has been affected and the other hand the balance of the environment is constantly being damaged **(Grube et al., 2011)**. No one has yet fully analyzed water pollution by agriculture activities. Different types of contaminants or harmful materials mixing in the water bodies than the water is pollution. So, this pollution is man-made pollution. If we all reduce the use of chemical pesticides and fertilizer used on agricultural land and use the organic fertilizer then the amount of pollution can be reduced. Many infectious diseases of animals and humans are water-borne **(Özkara, Akyıl and Konuk, 2016)**.

2.2. Pesticides and Fertilizers Use on Agricultural Land

The use of pesticides and fertilizers on agricultural land are used to protect the crop from various types of insects, weed and all other diseases. In the last five decades, pesticide usages increased the quantity. Thousands of chemicals produced in different areas are up on the market every year. One of these chemical substance groups are pesticides. This reduces crops losses and increases crop production. The main reason for using pesticides and fertilizer used on agricultural land is to increase the crop production. Different types of insects are attack the crops for different reasons. This causes severe damage to the trees and even the trees died. As a result, the farmers failed to produce their desired crops from that land. In this way, on the one hand the crops are damaged and on the other hand the farmers are also financially damaged. So they have to protect the crops from harmful insects then constantly using different types of pesticides and fertilizers on the agricultural land. Farmers are using different types of pesticides and fertilizers on different crops. Bangladesh is an agriculturally dependent country. Since it is an agriculturally dependent country, they are use different types of harmful pesticides and fertilizers use to increase the crops production .In this review the use of pesticides and fertilizers in this land, in our country they are used comparatively loss. **(Özkara, Akyıl and Konuk, 2016)**

According to Aspirin (1997) the worldwide consumption of pesticides has reached 2.6 million metric tons. Of this, 85 percent is used on agricultural land. However, most of the pesticides and fertilizers are used in developed countries. Pesticides and fertilizers used in our country contain high levels of organophosphates and carbamates. Which is very harmful to human health? If we know the proper use of pesticides and use kidney pesticides and fertilizer then we can be protected from these threats **(Özkara, Akyıl and Konuk, 2016)** . This will maintain the balance of the environment **(WRI, 1999)**.



Fig (1): Use of pesticides.



Fig (2): Use of fertilizer.

Pesticide organ phosphors compounds were made in Germany during World War II. In 1945 the first carbamate pesticides of the United Kingdom were discovered. A few days

later the carbamate was made in Switzerland. More new pesticides were introduced in the 1970s and 1980s. Pesticides are made for use on agricultural land. (Herrero *et al.*, 2021)

Many crops are damaged due to various pesticides and weeds. Which affects both quantitative and qualitative? Various chemical pesticides are made to control pests and weeds to reduce the damage. Organ chlorine pesticides are now used in all developed and developing countries. Organ chlorine works quickly to control pesticides and weeds. In addition, there are many other pesticides that are used to control weeds. The main pest is locusts. Rats cause a lot of damage to crops. Insects affect the quantitative yield of the crop. In Japan and Africa, the use of pesticides per unit land is 85 a where Bangladesh is more.

Table: 01
Estimated percentage losses of potential crop yield

Crop	South America	Africa	Asia
Wheat	31	42	30
Rice	28	36	57
Maize	44	75	42
Sugar cane	44	67	71
Potatoes	44	62	49
Vegetables and pulses	30	39	36
Coffee	47	56	43
Cocoa	48	52	38
Soya beans	32	42	40
Copra	34	30	50
Cotton	42	45	36

^a Source: Edwards (1986). Reproduced by kind permission of the publisher.

Table: 02

Pesticides use and yields of major crops in certain countries and areas

Country or area	Pesticide use (kg/ha)	Rank	Crop yield (tonne/ha)	Rank
Japan	10.8	1	5.5	1
Europe	1.9	2	3.4	2
United States of America	1.5	3	2.6	3
Latin America	0.22	4	2.0	4
Oceania	0.20	5	1.6	5
Africa	0.13	6	1.2	6

^a Source: Edwards (1986). Reproduced by kind permission of the publisher.

Damage to the ecosystems may in itself lead to reduced agricultural production, decreased quality of the environment and also economic losses outside of agriculture. Farmers are constantly using many toxic pesticides and fertilizers to control pests and weeds (**Herrero *et al.*, 2021**).

Farmers are constantly using many toxic pesticides and fertilizers to control pests and weeds. (Green *et al.*, 1977). Pesticide sales doubled between 1972 and 1950. The amount of use has increased a lot. It is estimated that the use of pesticides increased by about three million tons in 1985.

Table: 03

The value of the pesticides market in 1985 (million U\$)

Area	Herbicides	Insecticides	Fungicides	Others	Total
USA	3100	1090	330	330	4850
Western Europe	1475	850	1100	400	3825
East Asia	775	1300	785	90	2950
Latin America	485	655	250	60	1450
Eastern Europe	625	450	230	95	1400
Other ^a	615	655	105	50	1425
World total	7075	5000	2800	1025	15900

^a Source: Wood McKenzie Agrochemical Service (personal communication).

2.3. Negative Impact of Pesticides and Fertilizers

Excessive use of pesticides and fertilizers is disturbing the water balance of the reservoir. These reservoirs are having a detrimental effect on the life of the living plants and animals. The villagers use the water of all ponds for daily necessities and negative impact on their health. Pesticides and fertilizers are closely involved in agricultural land. These pesticides and fertilizers contain toxins. Those harmful substances are very harmful to the health of the people. There are many people who live near agricultural land which is more harmful for them.

2.3.1. Human health

Agriculture affects the economic development of a country. Farmers are using chemical fertilizers and pesticides to produce more food to provide adequate food to the people. Pesticides and chemicals fertilizer that are used to kill crop pests. Safety Max does not use other protective substances when farmers spray pesticides to kill pests. As a result, pesticides enter the blood stream through inhalation. Then impact on the eyes, skin and respiratory system. Many times the throat becomes dry (**Sharma and Singhvi, 2017**).

The use of chemical pesticides and fertilizers is constantly harming human health and the environment. Moreover, it is having an adverse effect on the animal and plant world. As a result, there is a negative impact on agricultural production and the sustainability of agriculture is declining. Pesticides and fertilizers contain high amounts of carbonate and organophosphate. Which is very harmful to human health (WRI, 1999)? Due to this the average life expectancy of people is decreasing day by day.

In addition to the short-term and long-term illnesses arising from exposure to pesticides, exposure to pesticides during handling and spraying on the farms also result in many deaths. 1975-1996 As shown, the number of deaths from pesticide poisonings in Sri Lanka are around 1,500 a year. The number of these diseases is much higher in developed countries than in developed countries.

TABLE: 04
HOSPITAL ADMISSIONS AND DEATHS DUE TO PESTICIDE POISONING IN SRI LANKA, 1975-1996.

Year	Total Pesticides Deaths	Total Pesticides Admission	Deaths per 100,000 Population	Rank Oder
1975	938	14,653	-----	-----
1976	964	13,778	-----	-----
1977	938	15,591	-----	-----
1978	1029	15,504	-----	-----
1979	1045	11,372	-----	-----

1980	1112	11,811	-----	-----
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1981	1205	12,308	-----	-----
1982	1376	15,480	-----	-----
1983	1521	16,649	-----	-----
1984	1459	16,085	-----	7 th
1985	1439	14,423	-----	4 th
1986	1452	14,413	-----	6 th
1987	1435	12,841	8.8	6 th
1988	1524	12,997	9,2	6 th
1989	1296	12,763	7.7	6 th
1990	1275	10,783	8.8	6 th
1991	1667	13,837	11.3	4 th

1992	1698	15,636	-----	4 th
1993	1682	16,692	9.5	5 th
1994	1421	14,979	8.1	5 th
1995	1581	15,740	9.5	6 th
1996	1850	21,129	-----	

				6 th
--	--	--	--	-----------------

Source: National Poisons Information Centre, General Hospital, Colombo, Sri Lanka, 1997.

(Kosankar, 2020) .

Pesticides such as Organ Chlorine, Organ Phosphate and Carbamate are highly toxic. These harmful pesticides are used more farmers in their crops. The health is damage increasing day by day. Trifluralin and pendimethalin are widely used in this group of pesticides. These pesticides show high toxicity to aquatic organisms and they can impair the thyroid gland and liver. **(Zheng *et al.*, 2016)**

Besides, when nursing mothers and pregnant women are exposed to pesticides, their children may also be exposed. Some pesticides can pass through the placenta to the developing fetus in the womb and through breast milk to the nursing infant **(Wilson and Tisdell, 2001) .**

2.3.2. Agricultural Land

Soil is an important element of the environment. Soil health is very important for increasing agricultural production and protecting biodiversity. We are constantly using different types of fertilizers and pesticides in the land to increase agricultural production. Fertilizers and pesticides last a long time in the soil. Nutrient living on the ground are being damaged. Resulting in damage to soil health. And these nutrients help in the growth of plants. Farmers are using more fertilizers and pesticides than they need to grow more crops, which is adversely affecting the soil. Soil nutrition and beneficial viruses and bacteria living in the soil are being destroyed. As a result, soil fertility is losses. This increases the pH, acidity, alkalinity, etc. of the soil. Furthermore, it has been pointed out that pesticides can adversely affect paddy. There are some pesticides that stay in the ground automatically for more than 10 weeks. This results in loss of soil fertility. **(Wilson and Tisdell, 2001)**

2.3.3. Biodiversity and Ecosystem

Ecosystems are widely known for its several important environmental or ecological functions. Such as nutrient cycling, a habitation for the floral and faunal species and soon **(Fretwell et al., 1996)**.

Water quality is lost due to fertilizers of pesticides and fertilizers in the pond water. So, when the habitats of an ecosystem will become eroded than the biodiversity of that surrounding will decline automatically **(Duan, 2016)**.

2.3.4. Insects and Parasites

The decline in the number of beneficial insects and parasites has led to an increase in the number of harmful insects in agriculture. The main reason for the decline of beneficial insect parasites is the harmful insect parasites **(Özkara, Akyıl and Konuk, 2016)** . There are many more species that are destroying natural predators. This is causing severe damage to crops **(Kosankar, 2020)**.1970s, 1980s and the 1990s in Asia causing millions of hectares of rice to be destroyed. **(Williamson, 2003)** Some harmful wolves cause great damage to spiders and other parasitic rice weeds. This reduces the production of paddy **(Özkara, Akyıl and Konuk, 2016)**.Many species are being harmed by the use of these pesticides and fertilizers, This is especially true of the food chain. Due to the use of more pesticides and fertilizers, the beneficial insects are disappearing day by day. Reducing the use of pesticides and fertilizers will increase the number of beneficial insect parasites. As a result, the beneficial insects will victim the harmful insects. If this reduces the number of harmful insects, then the number of beneficial insects will increase. As the number of beneficial insect's increases, crop production will increase. Then the farmers will use adequate amount of pesticides and fertilizers in the land. This will maintain the balance of the environment **(Kosankar, 2020)** .

2.3.5. Fisheries

In addition to environmental and agricultural land damage, pesticides and fertilizers are now having a direct impact on other crops. One is fish production. The use of pesticides and fertilizers is adversely affecting fish production (**Grist, 1986**). There is increasing evidence for this from India as well as Bangladesh. Fish production is declining day by day. Insecticides and fertilizers used in agricultural lands are being blamed for this decline in production. One of the significant reasons is the rain water. When these pesticides and fertilizers enter the pond water due to rain water, the pond water becomes contaminated. This is reducing fish production. And fish are having different diseases (**Dalgleish et al., 1984**) / (**Grube et al., 2011**). Fish production is declining. Thus, if fish production continues to decline, the food chain will be adversely affected. This will have a detrimental effect on economic development. (**Özkara, Akyl and Konuk, 2016**)

2.3.6. Trees and Environment

Soil, water, tree and air are important components of the environment. Due to use of pesticides and fertilizers in the land, the level of heavy metals is increasing in the soil (**Atafar et al. 2010**). When farmers spray pesticides on crops, these pesticides mix with the air and pollute the air. These pesticides in the air have a detrimental effect on the environment. When people breathe in air, it has a serious effect on their health. By doing this, on the one hand, human health is being harmed and on the other hand, our environment is being ruined. So the environment is losing its balance day by day. Little by little the elements of the environment are being destroyed. Pesticides and fertilizers are polluting everything in our environment.

The use of pesticides and fertilizers is causing chronic pollution to the environment and its pollution is increasing day by day. These pesticides and fertilizers have a profound effect on plants. The farmers do not follow appropriate safety precautions with regard to pesticide application, large amounts of pesticides are inappropriately used by these farmers, leading to several human health disease, polluting our air, land, water. Introduce environment friendly farming system which is good for human health (**Dubey, Sarvaiya and Seshadri, 2013**).

Excessive use of pesticides and fertilizers in the land results in falling of leaves at a young age. If the number of plants decreases day by day then there will be lack of oxygen in the environment. As the temperature of the environment increases, the measurement of rainfall will decrease and the death rate of people will increase. Trees directly benefit people and indirectly benefit the environment. The intensive use of pesticide leads to an increased risk of contamination of the environment and harmful effects on biodiversity, food security, and water resources. More than 500 different pesticide formulations are being used in our environment, mostly in agriculture. Although pesticides are directly applied in soils and plants. Azevedo ASON: Assessment and simulation of atrazine as influenced by drainage and irrigation. An interface between RZWQM and ArcView GIS (Doctorate thesis Iowa State University, Ames, Iowa, 1998. There are two pathways for pesticide transfer between the plants and their planted soils. First, most of pesticides could shift or fall onto the soil when pesticide is applied onto plants. Next, most of the deposited pesticides on the plant could be washed off by rainfall to the soil. (Nicolopoulou-Stamati *et al.*, 2016)

CHAPTER 3. METHODOLOGY

3.1. Study settings and design

I have conducted a quantitative study in a rural village setting located within one of the Unions of Durgapur Upazila under Rajshahi Division of Bangladesh. The area of the Upazila is 195.03 sq km and it is located between 24.3745° north latitudes and 88.6042° east longitude.

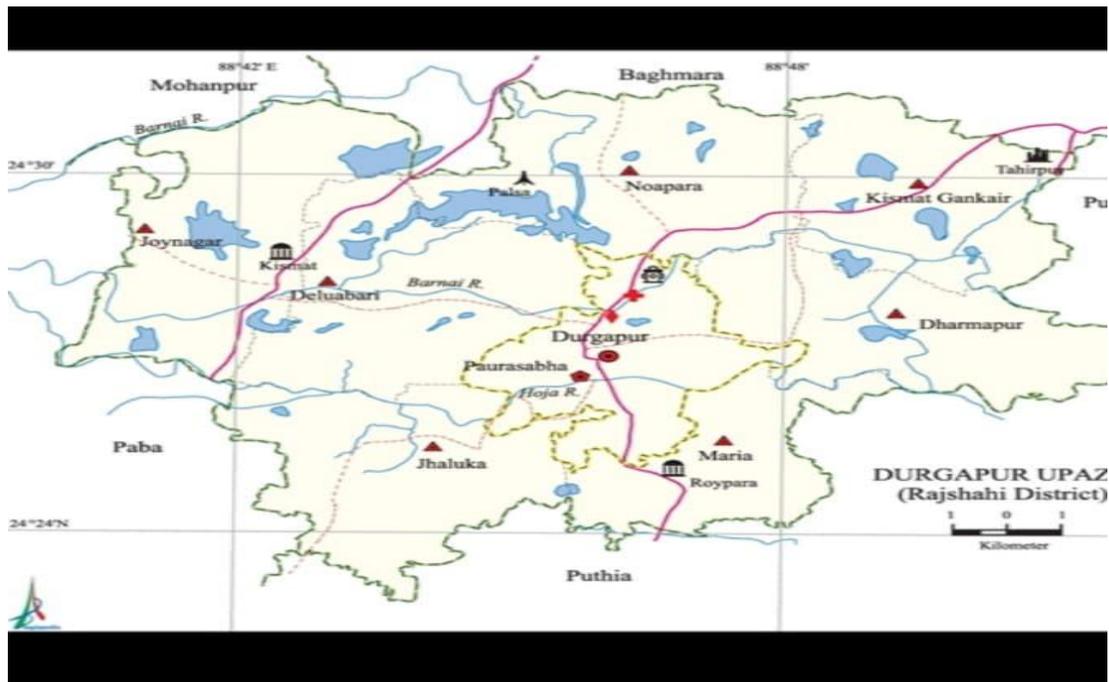


Fig (3): Location Durgapur Upazila under Rajshahi Division (map).

Durgapur Upazila consists of seven unions. I have worked in one of the seven Unions of the Upazila named Maria Union (Union No.6). Maria union consists of 16,077 sq km.

3.1.1. Study participants

The study has been conducted among agricultural farmers. The participants were selected conveniently within the selected village visiting the farmers while they were working in the field.

3.2. Data collection techniques of the study

3.2.1. Quantitative survey

A total of 200 structured interviews have been conducted using printed structured questionnaire to collect quantitative survey data. The survey was conducted to collect respondents' demographic information, mostly used fertilizer and pesticides for common crops, crop for which maximum fertilizer or pesticides are used, self-reported effect of excessive use of fertilizer and pesticides on human health and on animal. Quantitative data analysis Quantitative survey data has been analyzed manually to provide descriptive statistical information for question asked.

3.2.2. Water quality assessment

I have collected and tested water samples from the nearby water bodies from the farming land areas where the respondents were working during the data collection interviews. A total of 10 water samples were collected.

3.2.3. Water test

All most five location totals of 10 water samples were collected and tested in Daffodil International University laboratory situated in Savar Campus of the University. The water samples were tested and analyzed to. Here are the names of my water tests such as: pH, acidity, alkalinity, salinity, EC, TDS, Total Hardness and other.

3.2.4. Water sample collection

Ten water samples have been collected from five locations in a three-kilometer area of Maria Union in Durgapur Upazila. Four water samples have been collected from the first one to four kilometers, two from the second one kilometer and two from the third one kilometer. The main reason for collecting water is that the pesticides and fertilizers used in the agricultural lands in the surrounding ponds enter the ponds through rain water. The villagers use this water in their daily necessities. As a result, they have various health problems such as: Dermatitis, itching, allergies, and other. The main cause of the problem

is the pesticides and fertilizer in the water. The pH, acidity, alkalinity, etc of the water increases.



Fig(4): Water sample collection

3.2.5. Ethical consideration

The study objectives were clearly stated to the respondents while asking them to participate in the survey data collection. I have informed them that their participation is voluntary and they can withdraw their participation anytime. I have also quoted that the study was carrying out only for academic purposes and will not be used anywhere else and no one outside the student (me) and her supervisors. I ensured that no name will be used in report from this study. Finally, I have commenced for taking interview only when I could secure verbal consent from each of the respondents.

3.2.6. Direct conversation of local people and farmer

I conducted directly to the farmers. Most of the farmers were between the ages of 45 and 65. The excessive use of fertilizers and pesticides is harmful to the environment and health. Potassium is one of the fertilizers that irritate the hand during spraying. They also have various problems when they spray pesticides on the land. They also have the idea that the water in the pond is constantly polluted due to pesticides and fertilizers. They manage their lives in this way all the time. Despite knowing so many problems, they are

managing their lives in this way. They have become accustomed to it. They say agriculture is the driving force behind their livelihood. Depending on how they survive, with the money earned from agriculture, they meet the needs of their families.

3.3. Data analysis

We measured the ponds water pollution, collected water Samples. Two part of data collection proceeded; primary data and secondary data. Primary data related to survey and sample collection. Secondary data already discuss the literature review. So, the collected data have been analyzed according to the following framework.

Analysis and interpretation of data have been done through the following steps constructed by **(Taylor & Renner, 2003)**, that are:

- i. Explore the knowledge of the data.
- ii. Give focus on the analysis of the data.
- iii. Compile and categorization of the information.

3.3.1. Laboratory Experiment

Samples are collected to find out if the water in the pond is being polluted due to pesticides and fertilizers used in the land. Samples were collected from five locations to determine the extent of water contamination. Ten samples were collected from five locations. And each of the ten samples will be analyzed separately. This experiment was taking place in the Environmental Science and Disaster Management (ESDM) Laboratory of Daffodil International University (DIU), Ashulia, Savar. HANNA Ph/EC/TDS/Temperature Meter (HI9814) used to measure the TDS value of the 10-water sample separately. HANNA EC Tester (HI98304) used to measure the EC value of the 10-water sample separately. Moreover; acidity, alkalinity, salinity, hardness and total hardness.



Fig (5): Acidity test of water sample

3.3.2. Instrumental techniques

To the successful completion of this study, we used various materials. We used four separate instruments to measure the water salinity, pH, total dissolved solids, and electrical conductivity. We used one Google product for mapping. We used a tool to identify the geographical position of the places.

Table: 05

Used Instruments to Conduct the Study.

Category	Parameters	Name or Model
1. Instruments	Water Salinity	Portable Salinity Refractometer
2. Instruments	TDS	HANNA Ph/EC/TDS/Temperature Meter (HI9814)

3. Instruments	pH	HANNA pHep Tester
4. Instruments	EC	HANNA EC Tester (HI98304)

So, these are the materials that we used during our study to collect, measure and analysis of the collected data.

Table: 06

Major Characteristics of the Instruments.

Instruments	Characteristics Category: Rang	Characteristics Category: Resolution
HANNA pH/EC/TDS/Temperature Meter (HI9814)	0 to 3999 ppm	10 ppm

HANNA EC Tester (HI98304)	0.00 to 20.00 mS/cm	0.01 mS/cm
Portable Salinity Refract meter	0 to 100 %	20 %

CHAPTER 4: RESULT AND DISCUSSION

This chapter broadly discusses the findings and results of our study in a different form. At the beginning of this research project, we have assumed three different objectives and we worked on it. Here, in this chapter, we tried to get a well-organized understanding of the objectives by analyzing the collected data and findings in different ways. So, this chapter of result and discussion Section.

4.1. Study Findings

In this section, we tried to show all our findings and results that we observed from the beginning to the end of this research study. Here we tried to demonstrate the status of salinity, pH, acidity, and total hardness measured TDS and EC from the water samples that were collected from the sampling locations of the study area.

4.2. Survey Result

Survey is important part of the research paper. My survey area is Rajshahi division, Durgapur upazila, maria union. I do this work 3 km area of maria union.

Survey has been done with an area of 3 km. 200 people were surveyed in an area of 3 km. Each person was asked 15 questions. Moreover, water has been collected from five ponds locations.

4.2.1. My Survey Question

1. What is your name/ Gender?

.....

2. How old are you?

A. under 20 years B. 20-35 years C. 35-45 years D. 45-55 years

3. What is your education level?

A. Primary B. secondary school C. Higher secondary D. None Educated

4. What is your occupation?

A. Student B. Farmer C. Businessman D. Other

5. How many members are there in your household (who eat together)?

A. 3-4 person B. 4-5 person C. 5-7 person D. 7-8 person

6. Which fertilizer do you or other farmers use for most of the crops?

A. Di-ammonium phosphate (DAP)/TSP B. Potash C. Salfar D. Nitrogen (uria)

7. Which pesticides do you or other farmers use for most of the crops?

A. Cypermethrin B. Lambda-cyhalothrin C. Organic pesticides D. Others

8. Can water be polluted by the fertilizers used in crops?

A. Yes B. No

9. Can water be polluted by the pesticides used in crops?

A. Yes B. No

10. For which crops do you use the most fertilizer and pesticides?

A. Onion B. Eggplants C. Potato D. Rice

11. The use of pesticides and fertilizers is causing the most damage to which of the animals in the environment mentioned below?

A. Fish B. Cow C. Insects D. None of them

12. What types of health problems happen due to the use of pesticides and fertilizer in the crops? (Multiple select)

A. Inhalation problem B. Headache C. Eye or skin Irritation D. Diarrhea

13. This contaminated water is mostly used by the villagers for any purpose?

A. In cooking B. Take a bath C. Washing clothes D. Washing dishes

3. What is your education level?

- A. Primary
- B. Secondary school
- C. Higher secondary
- D. None Educated

Answer

- A. Primary.....57
- B. Secondary school40
- C. Higher secondary22
- D. None Educated 81

Table: 09 (Total Education Number)

Number	Education level	Total
A	Primary	57
B	Secondary school	40
C	Higher secondary	22
D	None Educated	81

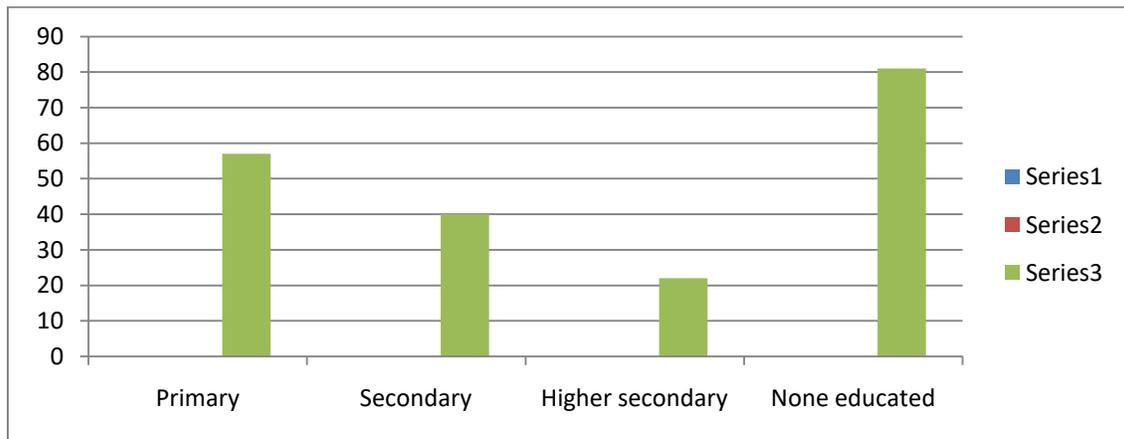


Fig (8): Education level.

4. What is your occupation?

- A. Student B. Farmer C. Businessman D. Other

Answer

- A. Student 15
 B. Farmer 172
 C. Businessman00
 D. Other..... 13

Table: 10 (Number of Occupation)

Number	Occupation	Total
A	Student	15
B	Farmer	172
C	Businessman	00
D	Other	13

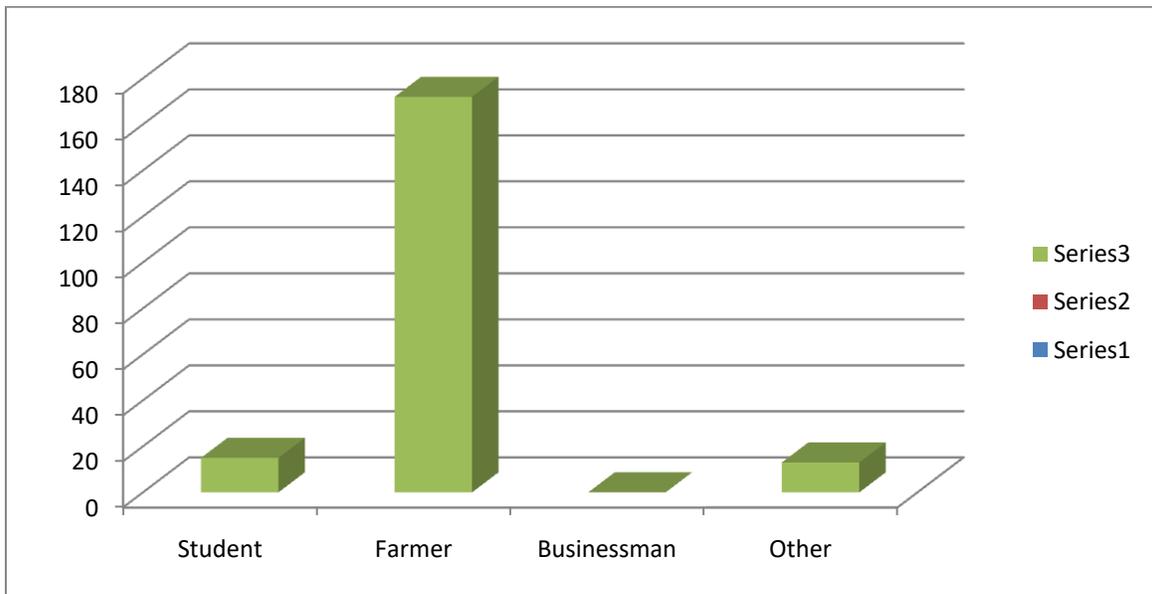


Fig (9): Occupation

05. How many members are there in your household (who eat together)?

- A. 3-4 person B. 4-5 person
 C. 5-7 person D.7-8 person

Answer

- A. 3-4 person45
 B. 4-5 person..... 58
 C. 5-7 person..... 64
 D.7-8 person.....33

Table: 11 (Family member)

Number	Member	Total
A	3-4 person	45
B	4-5 person	58
C	5-7 person	64
D	7-8 person	33

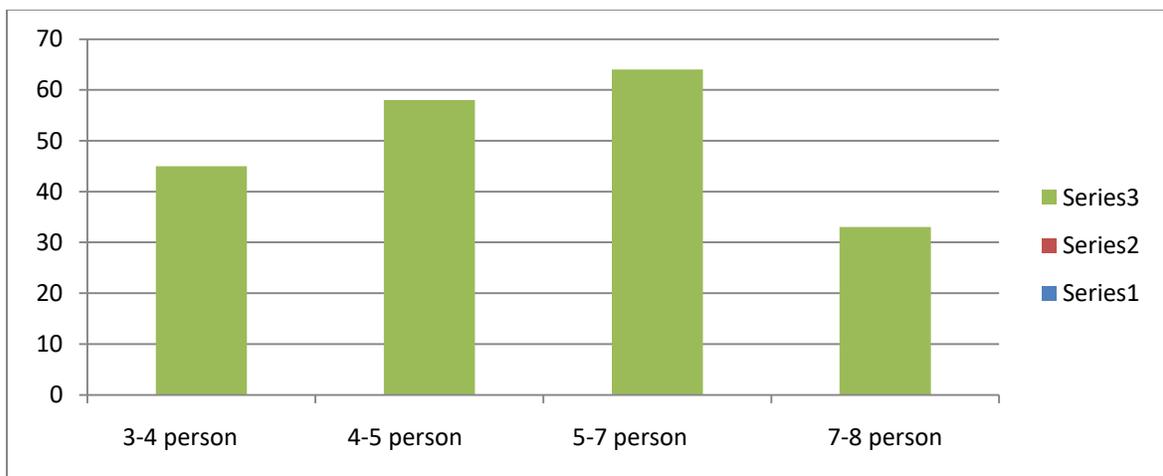


Fig (10): Members are there in your household

06. Which fertilizer do you or other farmers use for most of the crops?

- A. Di-ammonium phosphate (DAP)/TSP B. Potash C. Salfar D Nitrogen (uria)

Answer

- A. Di-ammonium phosphate (DAP)/TSP.....136
- B. Potash34
- C. Salfar02
- D. Nitrogen (uria).....28

Table: 12 (Fertilizer Name)

Number	Fertilizer name	Farmers use
A	Di-ammonium phosphate (DAP)TSP	136
B	Potash	34
C	Salfar	02
D	Nitrogen (uria)	28

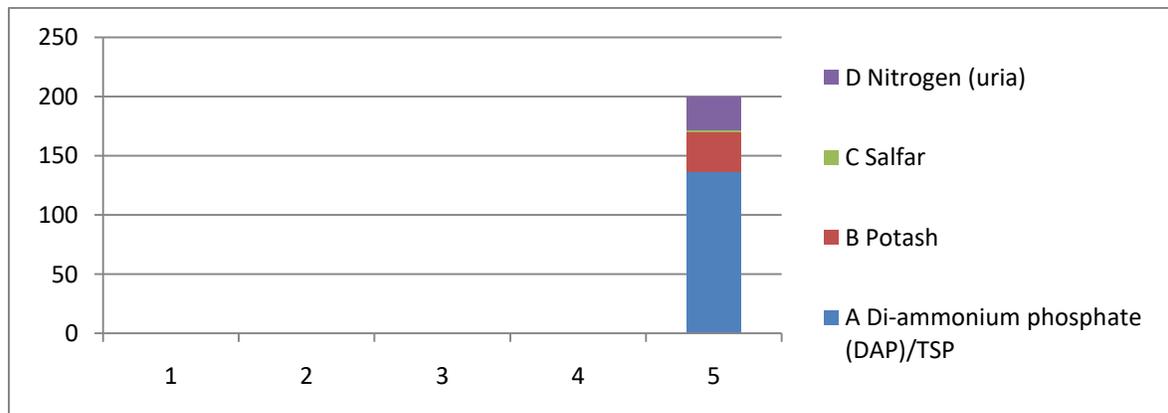


Fig (11): farmers are use fertilizer most of the crops.

07. Which pesticides do you or other farmers use for most of the crops?

- A. Cypermethrin B. Lambda-cyhalothrin C. Organic pesticides D. Others

Answer

A. Cypermethrin78

B. Lambda-cyhalothrin..... 86

C. Organic pesticides..... 02

D. Other.....34

Table: 13 (Pesticide Name)

Number	Pesticides name	Farmers use
A	Cypermethrin	78
B	Lambda-cyhalothrin	86
C	Organic pesticides	2
D	Others	34

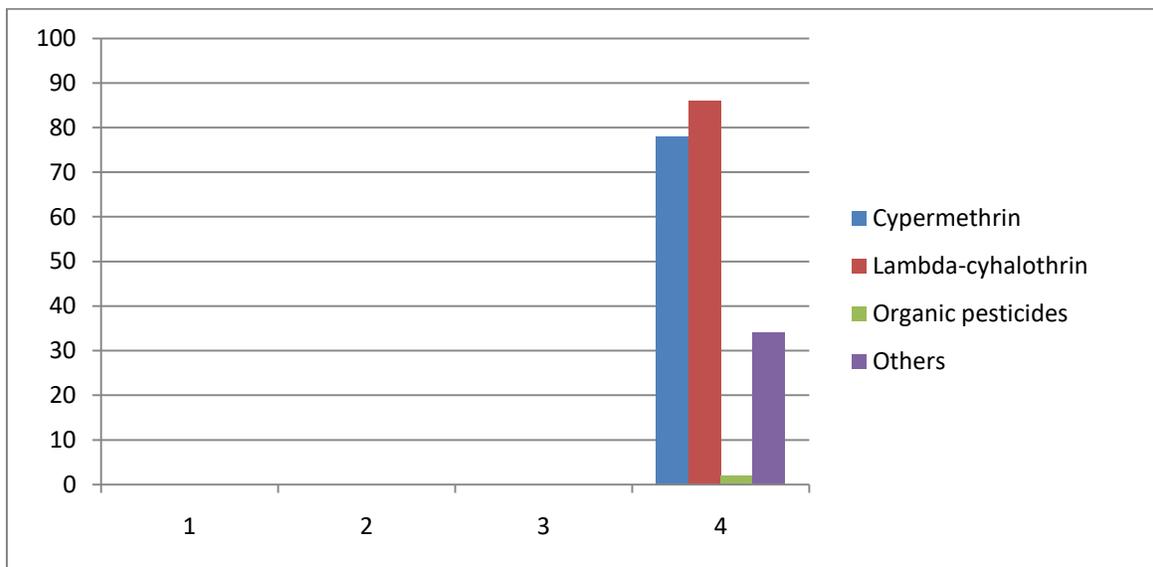


Fig (12): Farmers are use pesticides most of the crops

8. Can water be polluted by the fertilizers used in crops?

A. Yes

B. No

Answer

A. Yes.....185

B. No.....15

Table: 14 (Response)

Number	Response	Number of People
A	Yes	185
B	No	15

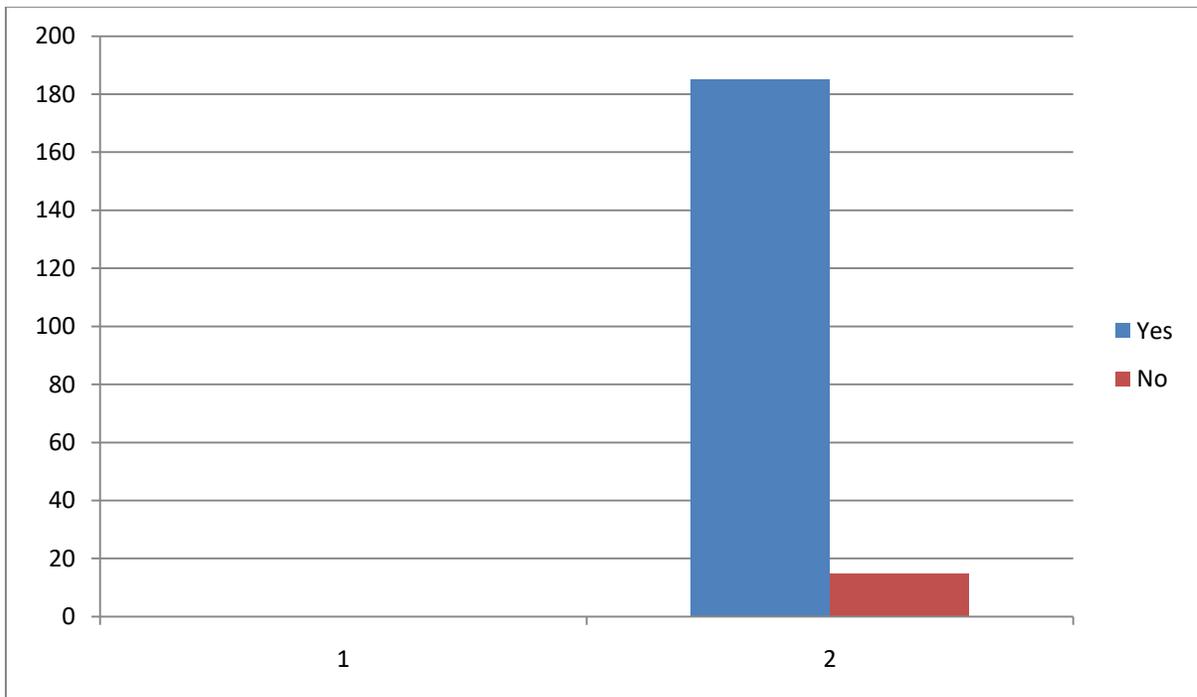


Fig (13): Water pollution by fertilizers.

9. Can water be polluted by the pesticides used in crops?

A. Yes

B. No

Answer

A. Yes.....175

B. No.....25

Table: 15 (Response)

Number	Response	Number of People
A	Yes	175
B	No	25

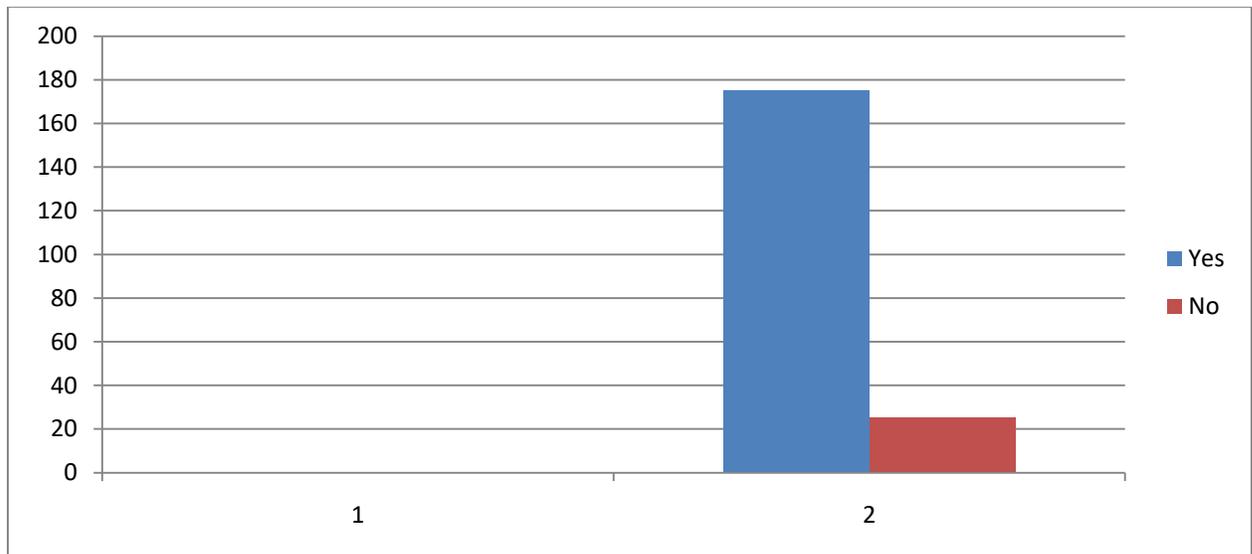


Fig (14): Water pollution by pesticides.

10. For which crops do you use the most fertilizer and pesticides?

- A. Onion B. Eggplants C. Potato D. Rice

Answer:

A. Onion.....120

B. Eggplants.....70

C. Potato.....00

D. Rice.....10

Table: 16 (Crops Name)

Number	Crops name	Use
A	Onion	120
B	Eggplant	70
C	Potato	00
D	Rice	10

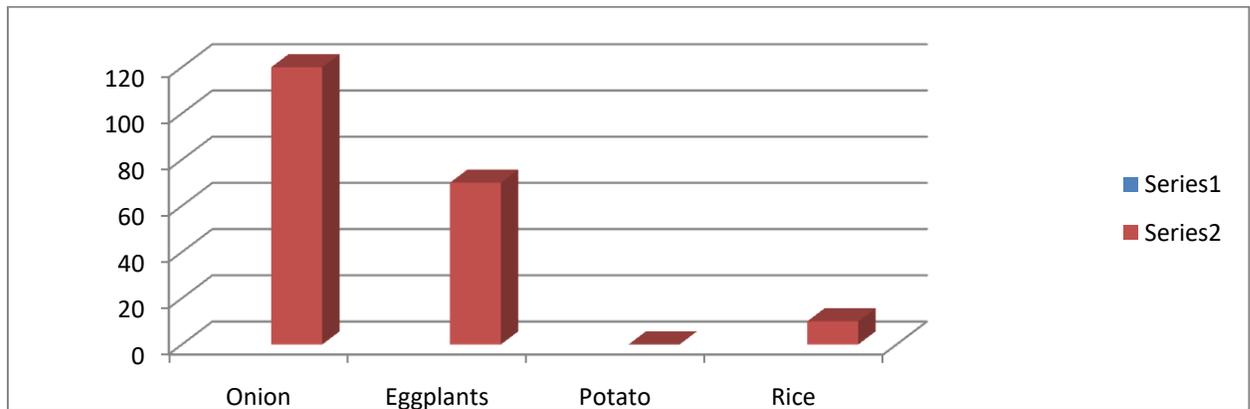


Fig (15): pesticide and fertilizers use most of the crop.

11. The use of pesticides and fertilizers is causing the most damage to which of the animals in the environment mentioned below?

- A. Fish B. Cow C. Insects D. None of them

Answer

A. Fish.....65

B. Cow.....20

C. Insects.....60

D. None of them.....55

Table: 17 (Animals Name)

Number	Animals Name	Total
A	Fish	65
B	Cow	20
C	Insects	60
D	None of them	55

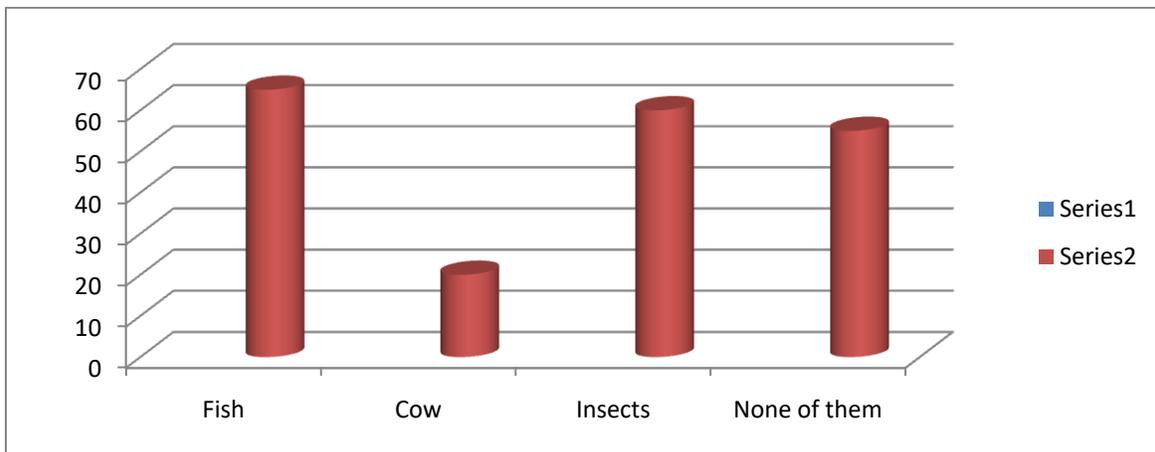


Fig (16): Damage of the animals' life.

12. What types of health problems happen due to the use of pesticides and fertilizers in the crop? (Multiple select)

- A. Inhalation problem B. Headache C. Eye or skin Irritation D. Diarrhea

Answer

- A. Inhalation problem..... 69
 B. Headache..... 50
 C. Eye or skin Irritation..... 75
 D. Diarrhea.....06

Table: 18 (Health Problem)

Number	Problem	Total
A	Inhalation problem	69
B	Headache	50
C	Eye or skin Irritation	75
D	Diarrhea	06

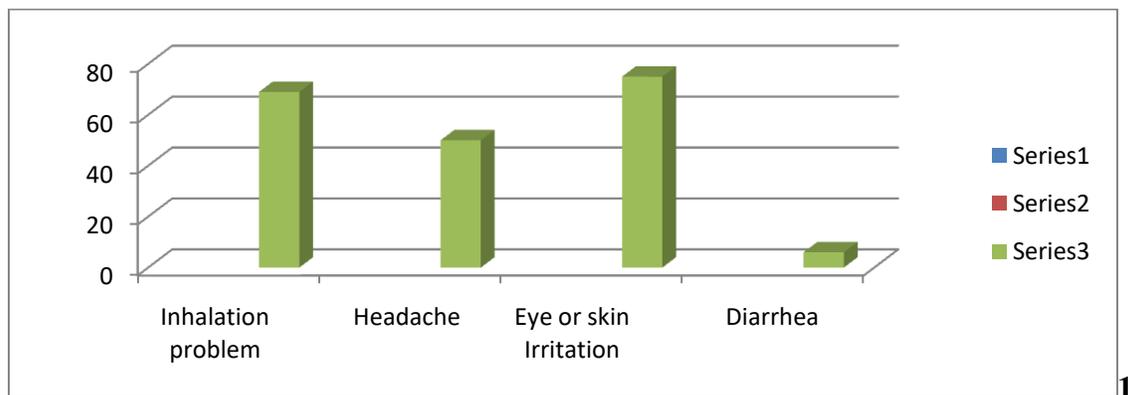


Fig (17): Health problems.

13. This contaminated water is mostly used by the villagers for any purpose?

- A. In cooking B. Take a bath C. Washing clothes D. Washing dishes

Answer

A. In cooking00

B. Take a bath.....85

C. Washing clothes.....62

D. Washing dishes.....53

Table: 19 (Use of Daily life)

Number	Use	Total
A	In cooking	00
B	Take a bath	85
C	Washing clothes	62
D	Washing dishes	53

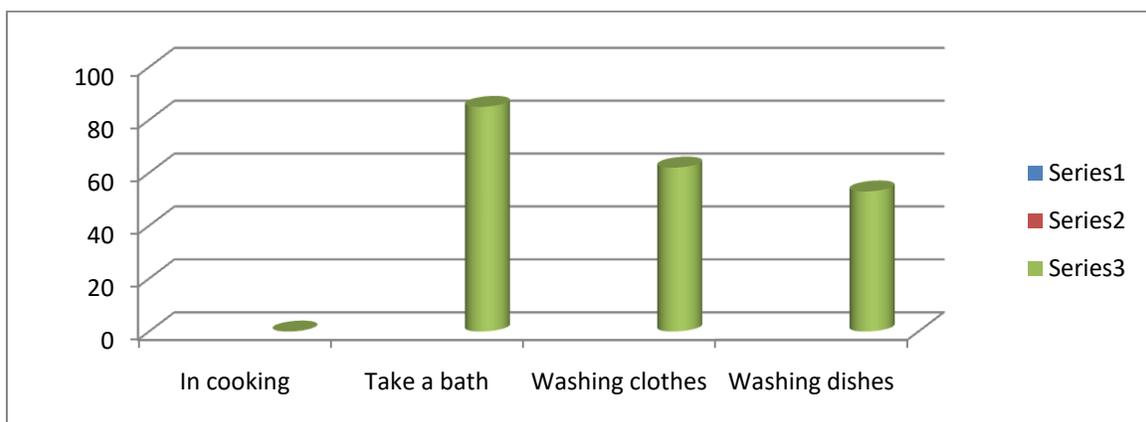


Figure (18): Contaminated water is used for that purpose.

14. The villagers are more prone to any disease when they use this contaminated water?

- A. Dermatitis B. Allergies C. Diarrhea D. Many more

Answer

- A. Dermatitis..... 58
 B. Allergies..... 62
 C. Diarrhea..... 40
 D. Many more.....40

Table: 20 (Diseases Name)

Number	Disease name	Total
A	Dermatitis	58
B	Allergies	62
C	Diarrhea	40
D	Many more	40

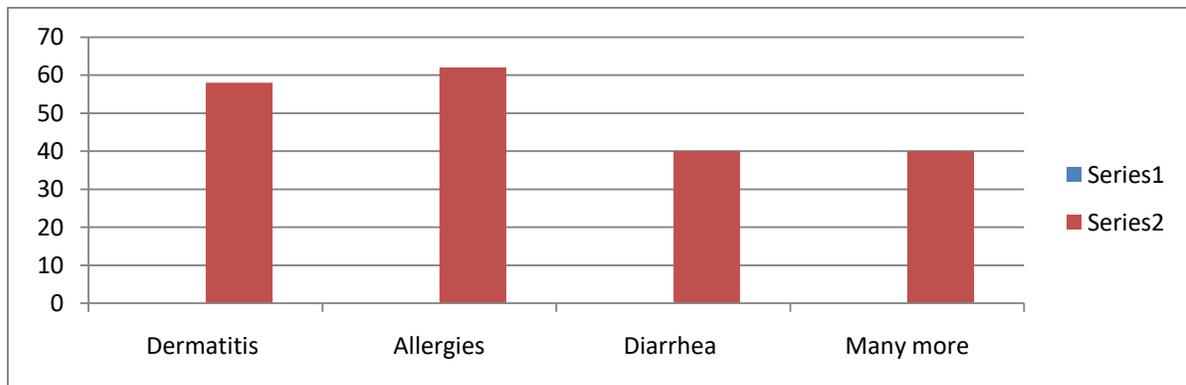


Fig (19): The diseases that occur when using contaminated water.

4.2.3. Laboratory based

My laboratory-based work is water sample test. I have collected and tested water samples from the nearby water bodies from the farming land areas where the respondents were working during the data collection interviews. A total of 10 water samples were collected.

4.2.3.1. pH

pH is “power of hydrogen”. A scale used to specify the acidity and alkaline. The range goes from 0 to 14, with 7 being neutral. PH of less than 7 indicates acidity, greater than 7 indicate alkaline. The pH of water is a very important measurement the water quality. According to the Environmental Protection Agency (EPA), water’s safe pH range 6.5 and 8.5. Waste water value 7 to 8.

Table: 22 (pH level)

Location	Sample	Parameters	Value
L1	S1	pH	4.9
	S2	pH	4.3
L2	S1	pH	3.2
	S2	pH	4.9
L3	S1	pH	4
	S2	pH	3.7
L4	S1	pH	3.2
	S2	pH	3.9
L5	S1	pH	3.3
	S2	pH	3.6

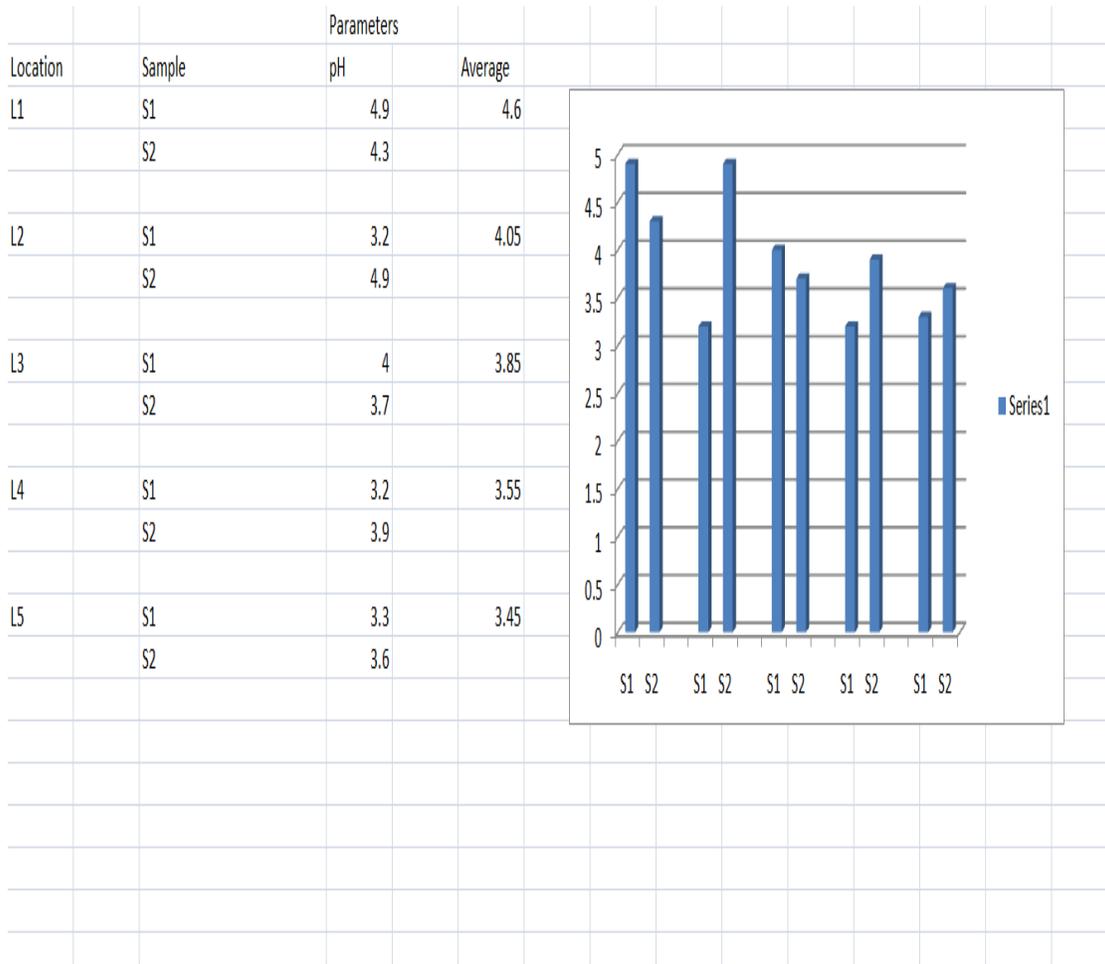


Fig (21): pH Level.

Tests show that the amount of acid in the water is much higher. The height value range 4.6 and lower value 3.45.

4.2.3.2. EC (Electrical Conductivity)

During the laboratory experiment, we diluted 10 samples to get the value of EC within the range (0.00 to 20.00 mS/cm) of the used EC Tester (HANNA EC Tester– HI98304) (Corwin & Yumoto, 2017). We diluted the water samples.

=Sample requirement: 50 ml

=Unit :(ms/cm)

EC data entry in excel file

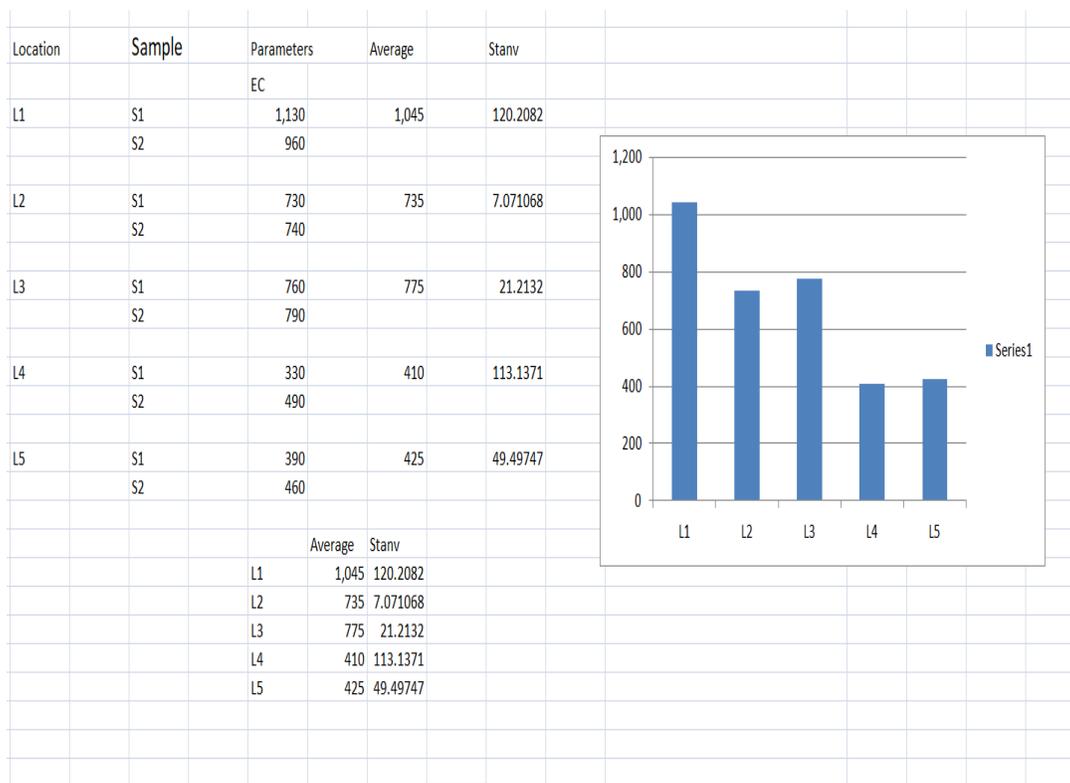


Fig (22): EC level.

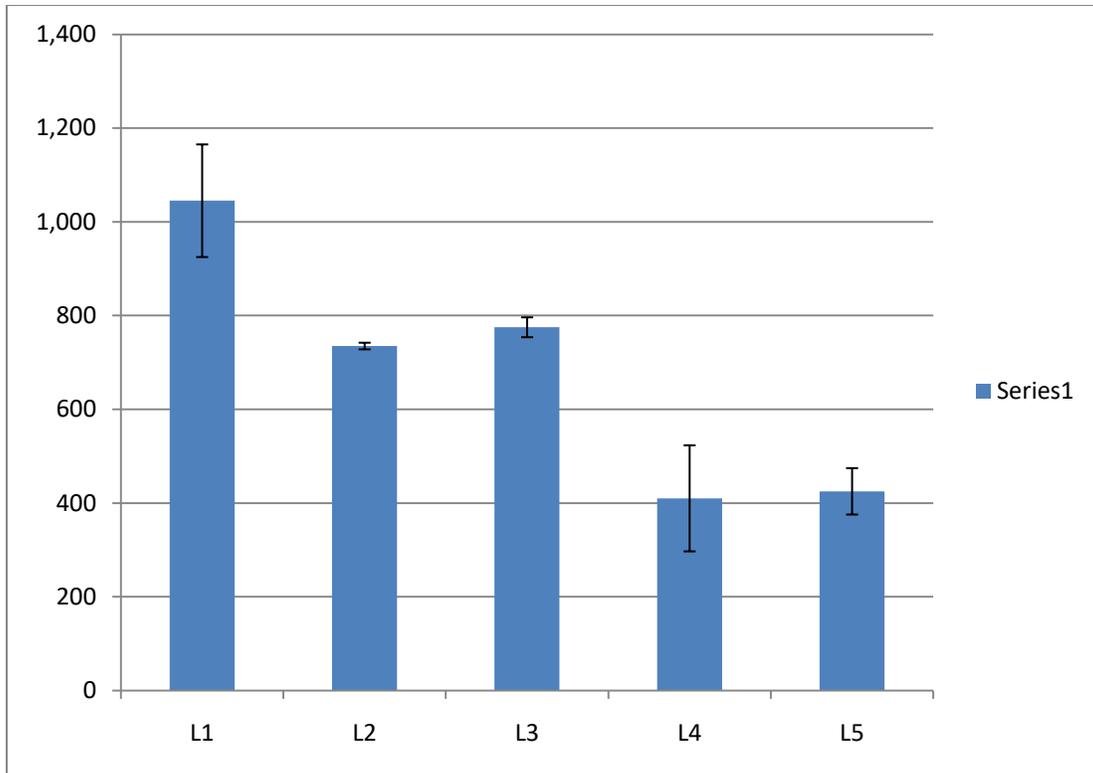


Fig (23): EC (Bar chart)

In the upstream zone, the EC increases with the increase of the upward. Here, the highest EC value is 1045 $\mu\text{S}/\text{cm}$ at and the lowest EC value is 410 $\mu\text{S}/\text{cm}$. So, like TDS, pH and EC the value higher in the upstream zone of the study area. In the upstream zone, measured ponds water salinity was zero (0) in every sampling point or location. Though, we measured the EC of the collected water samples from the sampling points of the upstream zone. So, in the measured EC values, all the values are almost the same or close to one another. But the fact is, EC decreases with the increase of upward distance from my area.

4.2.3.3. TDS (Total Dissolved Solid)

During the laboratory experiment we diluted 10 samples to get the TDS value within the range (0 to 850 ppm) of the used TDS Meter (HANNA Ph/EC/TDS/Temperature Meter - HI9814) (Corwin & Yemoto, 2017). The sampling locations are Maria union of the Bay Bengal. In the upstream zone, the TDS increases with the increase of the downward

distance from the ponds. Here, the highest TDS value is 850 ppm and lowest TDS value .So the value of TDS also higher in the upstream zone of the study area.

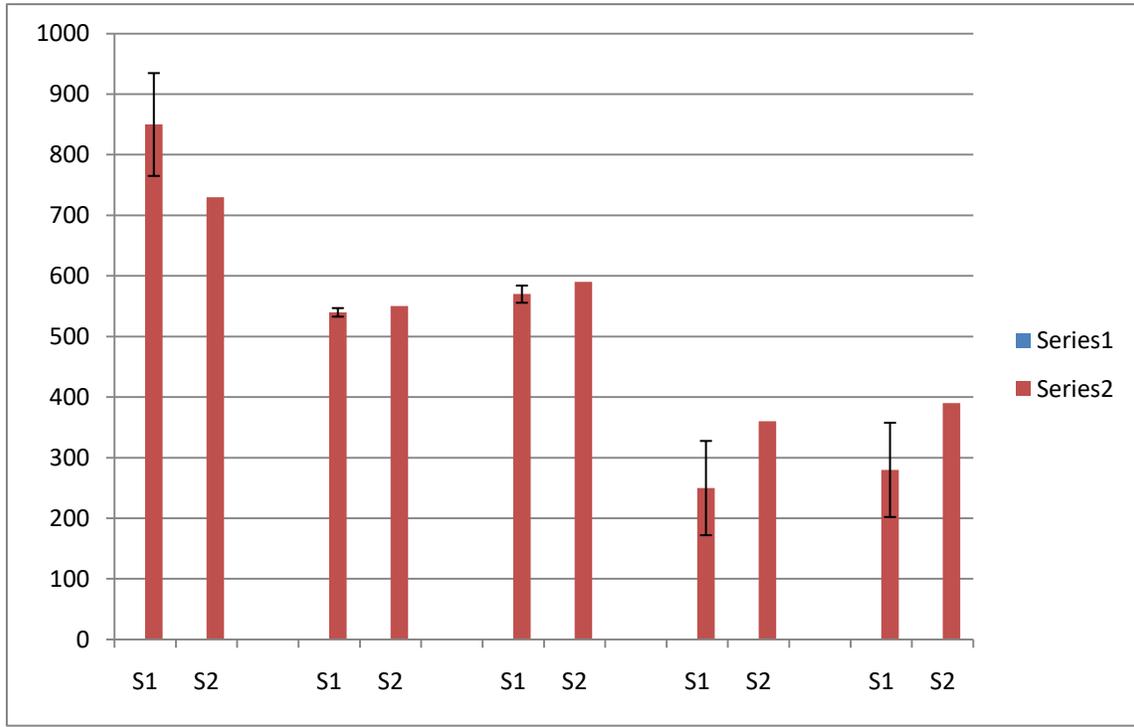


Fig (24): TDS level.

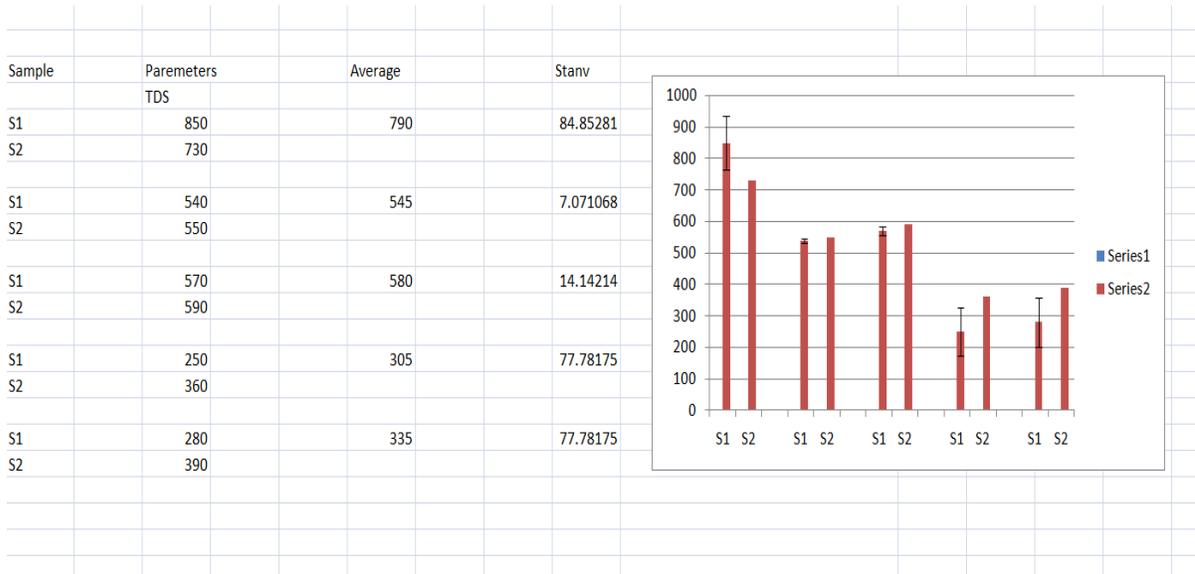


Fig (25): TDS data entry table and bar chart.

4.2.3.4. Salinity

In the downstream zone, river water salinity increases with the increase of downward distance in the upstream zone, measured ponds water salinity was zero (0) in every sampling locations of that zone. Though we measured the ponds water salinity in 10 sampling locations of the upstream zone, we were not finding any salinity in the water of that upstream zone So, ponds water salinity is much higher in the downstream zone and zero (0) in the upstream zone.

4.2.3.5. Acidity

1. Method: Titration.
2. Sample Requirement: 25 ml.
3. Reagent: Phenolphthalein Indicator (2 Drops)
5. Indicator: METHYL ORANGE (2 Drops)
6. Known Concentration (Titrant on Burette): NaOH (0.02)
7. End point (Color Change): YELLOW

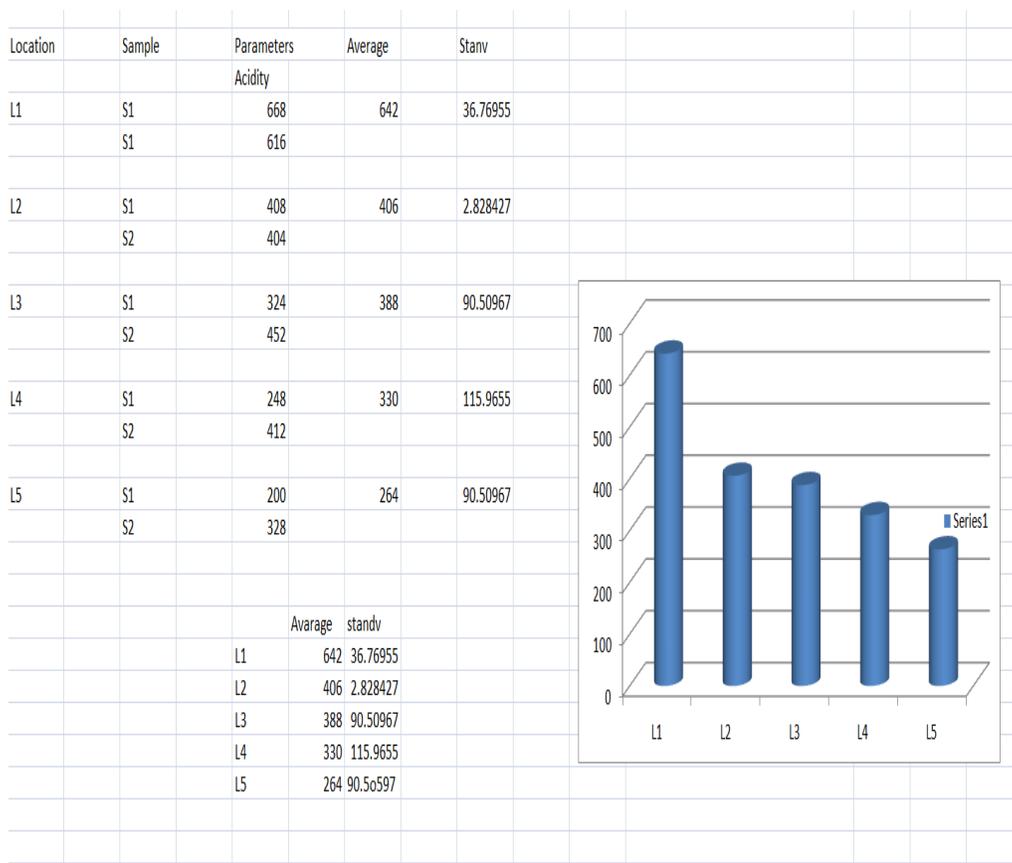


Fig (26): Acidity level.

4.2.3.6. Total Hardness

1. Method: Titration
2. Sample Requirement: 25 ml
3. Reagent: Phenolphthalein Indicator (2 drops)
4. Solution Given on Sample :(Na₂SO₄; 2 ml and Buffer Solution 10)
5. Known Concentration: EDTA (0.01)
6. End point color change: BLUE

Table: 23 (Hardness Measurement)

Location	Sample	Parameters	The value
L1	S1	Total Hardness	84
	S2	Total Hardness	184
L2	S1	Total Hardness	136
	S2	Total Hardness	168
L3	S1	Total Hardness	220
	S2	Total Hardness	314
L4	S1	Total Hardness	432
	S2	Total Hardness	712
L1	S1	Total Hardness	580
	S2	Total Hardness	630

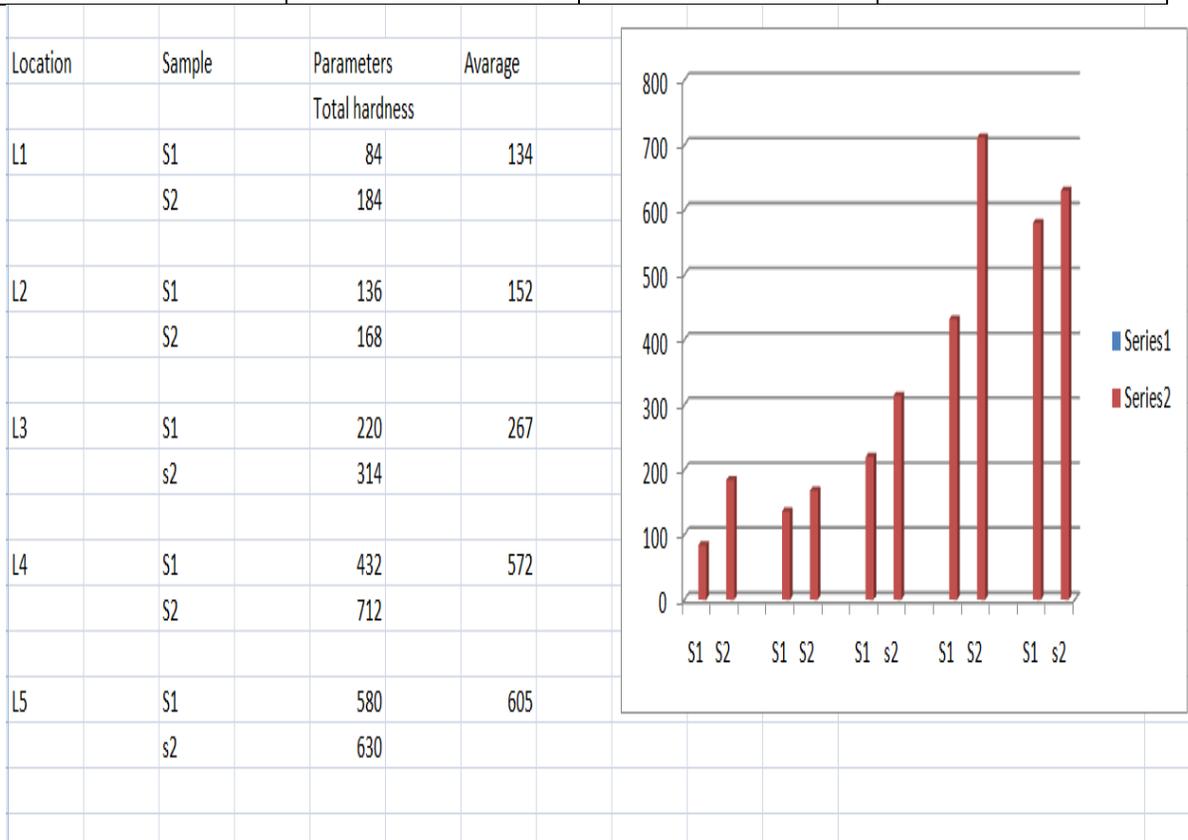


Fig (27): Total hardness (Bar chart)

4.3. Discussion

I have conducted a quantitative study in a rural village setting located within one of the Unions of Durgapur Upazila under Rajshahi Division of Bangladesh. The area of the Upazila is 195.03 sq km and it is located between 24.3745° north latitudes and 88.6042° east longitudes. I have done this work of three km area of Maria union and collected my 10-water sample of five locations. I have collected two samples from two sides in a pond. I within three-kilometer area and I have talked to all people and surveyed 200 people. Each person asked 15 question. Talked to people separately about each question. They all put forward their own opinions on each question. Farmers have given different views. Most of the farmers were uneducated. Each of their questions had to be explained in Bengali first and then they had to answer. The questions of the farmers were asked in Bengali. Then the farmers respond according to the problem they have and the fertilizer they use. Each question was explained to each of the 200 farmers and answers were obtained from them. Since the questions are in Bengali, there is no problem in answering them. However, you have to face various problems while doing the survey. We have to talk to them a lot about why we are doing these things and why they are doing these things. I had to talk a lot with everyone. A lot can be known by doing this survey. Their age, educational qualifications. Through this survey it is known which pesticides and fertilizers are most used by the farmers in the land. Farmers use DAP and TSP the most of the crops. They also use many more fertilizers including potash, nitrogen fertilizers. The problem faced by the farmers while applying potash fertilizer on the land is irritation in the hands. This causes them to itch. Itch, many people get skin inflammation again. Uria and Sulfur these fertilizers are used relatively less by the farmers. These damage crops. These rot the roots of the tree. As a result, the trees die and the fertility of the land is lost. If the fertility of the land is lost Then the farmers have to work hard to grow crops in that land, that means they have to prepare the land again for growing crops. Then the amount of crop production is less than the cost. When farmers use pesticides on their land, no one takes any precaution. When they spray pesticides on the land, these drugs are released into the air. As a result, the air becomes polluted. Air is an important element of the environment.

This air enters the human body through the respiratory tract when a person receives it as oxygen.

Then people have different problems Such as: stomach infection, respiratory problem, fever, kidney, seizer and many more. No gloves, max when farmers spray the land and no one uses their own caution. The problems that farmers have those are Irritation in skin and eyes, headache and blurred vision, dry throat and many other problems. The problems are increasing day by day. They are responsible for the increase in problems. Because they do not take any action to protect their own health. Which is why these problems. They are responsible for the problems themselves. There are many problems when fertilizing the land. The biggest problem is in the hands. If they use a hand glow while spraying, it will not happen again. Moreover, as a result of excessive use of fertilizers and pesticides, the fertility of the land is being lost day by day. Excessive use of fertilizers and pesticides is increasing their economic costs. As a result, they are suffering economically. We can find out these problems by talking to them during the survey. The pesticides and fertilizers used in the soil keep them active in the soil for a long time. It takes a long time for the quality of these pesticides to deteriorate. Moreover, when it rains, the pesticides and fertilizers are mixed with the rain water. Then the rain water enters the pond around the agricultural land. Pesticides and fertilizers used in agricultural lands are mixed with rain water. This loses its balance when rainwater mixed with these pesticides and fertilizers enters the pond. This increases the pH value of the pond water. Increasing EC (electrical conductivity) TDS (total dissolved solids), hardness and total harness increase the combined amount. Water is one of the important components. Fertilizers and pesticides are made with many harmful chemicals. The water in the pond is getting polluted when harmful elements enter the pond due to rain water. The main reason behind the contamination of the water of these ponds is all these pesticides and fertilizers used in the land. As a result of the contamination of the pond water, the elements mixed in the water are being contaminated. These elements are closely related to each other. Due to these reasons the amount of acid in the water increases a lot. If the amount of acid in the water increases, it is very harmful for the water. These people living in the vicinity of agricultural land use the water of these ponds

for their daily needs for example, for washing dishes, for bathing and for washing clothes. They use water in these ponds for bathing cattle.

The main reason for using water from these polluted ponds is that there are no tube wells in the village houses. One or two tube wells can be seen in a few houses. The water from these tubes is used for cooking and food. The rest of the work they do in the water of the polluted pond. Talking to them, it is known that using the water of these polluted ponds causes them various problems such as: dermatitis, allergies, diarrhea, skin disease and many more. They use this water even though they know that they have these problems as a result of using contaminated water. Because there is no tube well in these families. Due to the lack of tube wells, they use the water of these ponds for necessary purposes. Again there are many who use it even after staying. Many tubes do not have water during the dry season. At that time the villagers used the water of these polluted ponds more for daily necessities. Pesticides and fertilizers entering the pond due to rain water increase the contamination of each element of the water. PH, TDS, acidity, total hardness and hardness. These elements have a certain value. If these elements exceed their certain standards then those elements become contaminated. Water is contaminated because the ingredients are contaminated. As a result, the number of germs in the water increases day by day. Pesticides and fertilizers enter the pond regularly due to rain water.

As the amount of acid increases, so does the amount of other ingredients. Acids are many harmful chemical elements. And the villagers use this water for their daily necessities. This results in many health problems. I can learn more by talking to the villagers. The small children of the village bathe in the water of the pond for a long time. As a result, children get different types of skin diseases. Learn more young children often accidentally drink water from the pond. Resulting in diarrhea. For many children this problem goes to a much worse stage. Moreover, when they wear the clothes washed in the water of the pond, their body becomes allergic. Bathing in the pond water increases their inflammation. At one stage inflammation causes wounds. Moreover, there is a lot of damage to the animals and fish living in the pond and dies. Moreover, wounds are caused on the fish. This problem spread to all the fish in the pond at one time. Moreover, different types of insects live in the pond water. Insects are slowly becoming extinct. This is having a devastating effect on biodiversity and ecosystems. And all these are important

elements of the environment. If these elements of the environment lose their balance in this way day by day then the environment will be damaged. The place where I did this is a very rural area. The problems are happening most in rural areas. By doing the survey I can know the problems.

CHAPTER 5: RECOMMENDATIONS AND CONCLUSION

In this final chapter of the study, I tried to assemble all study points from the literature review, data collection, data analysis, result, and discussions. Here, we also tried to justify the objectives of the study. Recommendations are also given for the researchers in order to better understanding of the future study.

5.1. Recommendations

a. Study limitations

- Most of the farmers were uneducated to which their survey questions had to be explained in Bengali. So at this time you have to work patiently.
- There may be various problems while collecting water so be careful about this work.
- Need to know the exact pattern of water collection.

b. Study outcomes or understandings

- Bangladesh is a major agricultural country. More than 70% population depends on agricultural land dedicated to growing crops. For that, the government should have to think about that.
- The problem can be reduced if the government fixes the amount of fertilizers and pesticides used in the crops. As a result, both health and environment can be protected.
- Due to these reasons, as the water is getting polluted, the animals and plants living in the water are dying and becoming extinct. As a result of the villagers using this contaminated water, their health risks are increasing. As a result, environmental disasters are coming down.

c. Future study

- Farmers need to understand that the use of excess fertilizers and pesticides is detrimental to the environment and their own health.

- When farmers use pesticides and fertilizers on the land, they will use gloves, safety mask to protect themselves. They need to be made aware that not using them is harmful to their health.
- They need to be warned that water from ponds near agricultural land cannot be used. All the villagers have to be aware and work together.
- The problem can only be solved if farmers reduce the use of harmful chemical pesticides and fertilizers and increase the use of organic fertilizers.
- When farmers spray pesticides on crops, they spray it as if it were in the not mixing with air. This will maintain the balance of the environment.

5.2. Conclusion

Most of the people in rural areas are farmers. Their livelihood depends on agricultural work. This agriculture has kept them live. They take various steps to increase crop production. They use a variety of harmful pesticides and fertilizers on the land to increase crop production. The harmful pesticides and fertilizer they use to increase crop yields mix with the soil and destroy soil fertility. As a result, the quality of the soil is lost. Moreover, these harmful fertilizers and pesticides remain active in the soil for many months. As a result, when it rains, these pesticides and fertilizers are mixed with rain water and enter the pond. As a result, the water of the pond is polluted. With this all the components of water are contaminated. Then the plants and animals living in the polluted water are harmed. Moreover, there are various health problems of the user villagers. The damage to all elements of the environment including water, plants, animals and people is increasing day by day. We all need to work together to solve this problem, but the environment can protect everyone, including people. The first thing to be aware of is the farmers. Villagers who use water in these ponds for daily necessities should refrain from using water in these ponds. One has to be aware of oneself and explain these harmful things to others so that they are alert. Only awareness can save a country, society and nation Because Bangladesh is dependent on agriculture. 70 per cent of the people depend on agriculture for their livelihood.

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