KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

REPORT ON THE MAJOR PROBLEM FACING RESIDENTS OF ADENTA

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ACKNOWLEDGEMENT

First of all I would like to express my profound gratitude to the almighty God for His protection, guidance and favor. I would also like to express my heartfelt gratitude to some individuals who have really being of help to me, and supported me with my report.

To my parents, Mr. and Mrs. Attu for their financial support and directions, Mr. Emmanuel Nkegbe Head of animal health and food safety division (CSIR/Animal Research institute) for his assistance and Mr. Desmond Laweh Nartey, my special advisor and counselor.

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1.0 INTRODUCTION

1.1 Background of course

CENG 291 is a course in the college of engineering, which was introduced two (2) years ago by the provost of college Prof. S.I.K. Ampadu. The course consist of presentations, fieldwork and project work during the long vacation after the first year second semester, and a detailed report of findings from the project.

It seeks to abide in students an appreciation of the fact that engineering is all about problem solving, irrespective of one's chosen field of engineering. It introduces students to the economic, social and technical context within which engineers work.

1.2 Course Objectives

This course aims at inculcating in students an appreciation of the fact that engineering is basically about problem solving.

It offers students the opportunity to know more about their chosen field of study and their employment prospects.

Students are also exposed to the various challenges, which confront our Ghanaian society and come up with alternative solutions to address these problems. It also keeps the students busy during their long vacation study, thereby making good use of their time. It enhances their ability to critically analyze some engineering problems they might encounter as engineers.

1.3 Abstract

The report consists of a challenge confronting residents of Adenta-Frafraha, after an interview conducted with some of the residents and a questionnaire filled by these residents.

It also consists of a map of the community that was retrieved from Google Earth with the help of the Internet. An in depth analysis of the problem and how my field of engineering will help address this problem. It contains some images that helped me in course of my research.

2.0 METHODOLOGY

2.1 Problem Identification

Based on interactions with food vendors, residents and people who grow crops in my community, they lamented about how housefly has invaded the community and the negative impact in their lives. A questionnaire was later prepared and distributed to some residents in other to help analyze the problem. As a resident of the community, my personal experience with houseflies especially during mango season confirmed their enigma.

2.2 How map was prepared

'Google earth' was downloaded and the layout of the community was retrieved and also got the map of the area. Google earth is an application that helps people view satellite imagery, maps and terrain.

2.3 How data was collected

The questionnaires provided were collected and worked on. Upon interactions with the residents some vital information needed was retrieved.

With the help of Google and ask.com more information needed for the research was also retrieved.

3.0 DISCUSSION OF RESULTS

3.1 Description of Adenta-Frafraha

Adenta-Frafraha is a suburb of Adenta located 2km from Adenta barrier on the Dodowa road. The Adenta district was created in 2008 by the then president Prof. John Agyekum Kuffour and was inaugurated on 29th February 2008. Its capital is Adenta East, and it is one of the ten districts in Greater Accra. It is represented in parliament Hon. Emmanuel Nii Ashie-Moore, and has a population of about three thousand inhabitants.

Adenta Frafraha is one of the communities in Adenta noted for growing of mangoes. Many houses grow mangoes for both household consumption and for sale. Since it is a developing community, most of the inhabitants are middle-income people. Fig.1 Map of Adenta-Frafraha

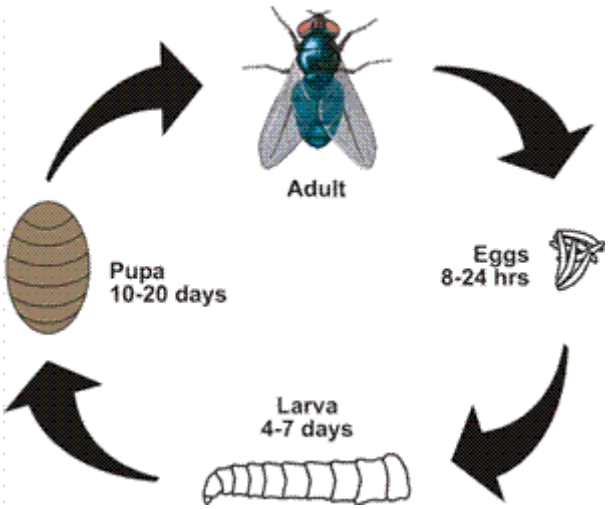
3.2 Nature and Characteristics of the Problem

Housefly management has been one of the major problems facing the people of Adenta Frafraha for years now. There are many houseflies in the area, which is really affecting the residents negatively. Chop bar operators, food joints and fruit sellers complain bitterly about this situation, saying they are losing a lot of customers because of houseflies that disturb them when they are eating. This increase in population of housefly could be due to poor drainage system in the community, bad refuse dump site, animal feces (dung) especially with livestock, improper disposal of pet's excrement, organic matter that are not properly discarded and compost heaps from gardens.

Houseflies are such a common insect that belongs to the Kingdom: Animalia, Phylum: Arthropoda, Class: Insecta, Order: Diptera, Family: Muscidae, Genus: Musca, Species: Domestica. They are gray in colour, approximately 6mm (1/4 inch) long, with four dark longitudinal stripes on top of the thorax, or middle body region. The mouthparts of the housefly are adapted for sponging up liquids. It is important to understand the life cycle of the housefly (Musca domestica) in order to help reduce the population and also prevent disease transmission.

An adult female fly lays up to 120 eggs at a time, and does so up to 5 times in life. It prefers laying eggs on organic material such as garbage and manure. The eggs hatch within hours and the larvae (maggots) emerge. The maggots then burrow into the organic material, provided that it is not too wet. It can take maggots anywhere from 3 days to several weeks to develop. Eventually it migrates to a suitable location where it forms into a pupa, which has a surrounding capsule. This capsule allows it to transform from a maggot into an adult fly, which takes between 2 to 10 days. The adult fly emerges and after a few days it is able to reproduce.

Fig.2 Life cycle of a Housefly:



Houseflies mainly spread infectious diseases. These are diseases caused by viruses, bacteria, protozoa and even nematodes (worms like the roundworm or threadworm). There are over 100 pathogens (disease-causing organisms) that are associated with houseflies. Unlike other insects, such as mosquitoes or ticks, these pathogens do not specifically require an insect vector. The housefly plays no specific role in the life cycle of these pathogens. The fly is simply a carrier in some instances. Some of the diseases spread by houseflies include:

- Anthrax
- Cholera
- Conjunctivitis (epidemic)
- Diptheria (cutaneous)
- Dysentery
- Food poisoning/gastroenteritis
- Leprosy
- Poliomyelitis
- Trachoma
- Tuberculosis
- Typhoid fever
- Yaws

As a result, many of these diseases have been reported in hospitals in and around Adenta over the years, especially Cholera.

3.3 Chemical Engineering and its different Branches.

Chemical engineering is a branch of engineering that applies the natural (or experimental) sciences (e.g. chemistry and physics) and life sciences (e.g. biology, microbiology and biochemistry) together with mathematics and economics to produce, transform, transport, and properly use chemicals, materials and energy. It essentially deals with the engineering of chemicals, energy and the processes that create and/or convert them. Modern chemical engineers are concerned with processes that convert raw materials or (cheap) chemicals into more useful or valuable forms. They are also concerned with pioneering valuable materials and related techniques that are often essential to related fields such as nanotechnology fuel cells and bioengineering. These applications include:

•Develop economic ways of using materials and energy

•Chemical engineers use chemistry and engineering to turn raw materials into usable products, such as medicine, petrochemicals and plastics on a large-scale, industrial setting.

• They are also involved in waste management and research. Both applied and research facets could make

•A chemical engineer may be involved in industry or university research where they are tasked in designing and performing experiments to create new and better ways of production, controlling pollution, conserving resources and making these processes safer.

•They may also be involved in industry and constructing plants as a project engineer. Thus using optimum methods of production to minimize cost and increase profitability.

3.4 How Problem may be addressed

There are many ways to reduce the population of houseflies in our community. The first step in housefly control is IDENTIFICATION; it is easy to confuse houseflies with several other fly species including cluster flies. The different types of flies may look similar, but they require different control methods.

It is very important to identify the places where the flies have been depositing their eggs. It may be something simple like an uncovered trash can or a bowl of pet food on the patio. However the housefly-breeding site could be something that is not obvious. The breeding site could be cleaned up or removed; if the breeding site is not removed the flies will continue to be a problem. Some other prevention methods are stated below;

- Provision of better drainage system
- Keeping a good refuse dump site
- Proper management of animal feces
- Good compost heap technology
- Proper disposal of organic waste

From the data collected, many residents indicated that they do not separate organic waste from inorganic waste. Many others complained that if they separate organic waste from the inorganic ones they it will attract more flies and will be unwholesome to handle. Some also dump the organic waste they make in any available place, because they do not want to keep flies in their homes.

Therefore the provision of **proper organic waste dumpsite** is the best way to reduce the population of housefly in my community. This organic waste site will have a unit that will produce housefly larvae for poultry feed, and will hereby serve as a source of employment to sum residents.

ORGANIC WASTE DUMP SITE

Organic wastes are biodegradable waste produced from plants and animals. They include animal manure, crop residue; uneaten food generated from restaurants, chop bars and home, food processing waste and expired food products. Organic waste is usually broken down by other organisms and may also be referred to as wet waste. Most of the time, it is made up of vegetable and fruit debris, bones, and human waste that quickly disintegrate. In effort to keep the environment clean and safe from flies, organic waste dumpsite needs to be provided and properly managed. Here are some typical organic waste categories that can be found inside and outside your home.

- Kitchen debris: Items that are considered to be organic waste from the realm of the kitchen include egg shells, vegetable and fruit peels like orange rind, apple skins, tomatoes and cucumber skins. Anything that you might use to make a salad would qualify as green waste or organic waste.
- Cooked foods: cooked leftovers and meals that will eventually shrivel up and recede into the earth. This category includes cold cut, browned meat, and bones.
- Excrement: Manure sewage and even waste from animal slaughter are all forms of biodegradable waste materials.

At the organic waste dumpsite, a production unit will be constructed to make use of the organic waste that the residents produce. As a chemical engineering, it is my responsibility to apply knowledge from my field of engineering to solve societal problem.

Out of these organic waste that are evaded by houseflies in the community, the production of housefly larvae (maggots) for poultry feed can be established to reduce the ambient population of housefly. Imagine there are 1000 female flies in the community, and I manage to convince 400 of them that the dumpsite are the best place imaginable to lay their eggs. They do so (rather than laying them elsewhere). But not a single fly larva gets to pupate and hatch, then we have just reduced the local fly hatch by 40 percent.

Housefly larvae (maggot) processing technology

Production of housefly eggs: Fly eggs for the process is produced by keeping houseflies under controlled conditions (temperature, light, humidity and feed quality) in an insectarium or cage. Adult female flies lay 500-600 eggs under natural conditions and more than 2000 eggs under controlled ones. Maggots feed for 4-5 days and then migrate to pupate in a dry place. The adult fly feeds mainly on decaying organic matter. Flies are first kept in cages with a small opening at the top to allow entry of the flies, at temperatures of 25 – 30 degrees Celsius. They are feed with milk powder. The flies lay their eggs on fermented chicken manure. The fly eggs are collected daily and are transported to the maggot preparation site. Many of the cages will be produced at the site in order to attract the flies in the area.

Production of maggot: At this place, the decaying organic waste is kept moist in a cemented pit (bay) of about 40 inches deep, with one end sloping upwards to the top. The fly eggs are added on top of the organic waste and within 24 hours the eggs hatch and become larvae. Just before the larvae pupate, the organic waste and the larvae are separated. Fly larvae normally migrate out of their substrate (organic waste) through any available way to pupate.

Fig.3 Picture of how the escaping larvae will be collected in the pit.

The sloping edge will allow the matured larvae to easily climb up as a means of escaping and fall in a small pit created just at end of the slope. The larvae will be collected on a daily basis to prevent them from maturing into a pupa. However, some of the larvae will stay in the substrate, therefore with the purpose to kill remaining larvae, it is necessary to heat threat or to pellet the organic waste before adding another any more eggs. This can be done on a daily basis jus after harvesting the larvae.

Production of poultry feed with maggot: The collected larvae are washed, killed in tepid or hot water and then dried and milled. They can either be dried in an oven or in the sun. Sun drying may in some cases result in less protein and more lipids than oven drying. This can then be sold out as poultry feed to farmers who rear chicks. Another alternative is to mix the larvae produced with sawdust and leave it for about a day. Then sieve the sawdust out and dry the larvae under sun. The larvae are then added to the feed to enrich its feed.

Housefly maggots are a source of protein and lipids, and the protein and fat content are high and extremely variable. Feeding trials in Serbia has proved that larvae meal can replace fishmeal in diets for broilers. Flocks that fed with larvae had a better meat quality than the flocks that were fed with fishmeal. It also reduces the competition with humans for fish as a meal for consumption.

4.0CONCLUSION AND RECOMMENDATION

4.1 Key findings from study

- Poor management of organic waste is the major cause of housefly outbreak in my area.
- Production of poultry feed from housefly larvae is a controversial method of making use of organic waste.
- There are over 100 pathogens (disease – causing organisms) that are associated with houseflies.
- A single female fly can lay up to 120 eggs at a time, and does so up to 5 times in life, hereby many houseflies can be produced in our community if waste is not properly managed.

4.2 Follow up to solve problem.

The general public should be educated about how dangerous houseflies can be, and advised to desist from practices that make the environment dirty and unsafe to live, hereby providing breeding grounds for mosquitoes.

Waste management agencies such as Zoomlion can help by providing litterbins to residents, in other to collect and separate organic waste they produce from inorganic waste.

5.0APPENDICES.

Fig.5 A fly cage

6.0 REFERENCE

- **Description of Adenta** (2015) – googlesearch.com
- **Diseases caused by housefly** - Retrieved from Healthhype.com/Site map
- **Classification of housefly** (2015) – Ask.com encyclopedia
- **Life cycle of housefly** - healthhype.com (2015)
- **Map of Adenta-Frafraha** – Google Earth (2015)
- **Breeding of flies** – Harvey and Ellen Ussery, 2005
- **Housefly control** – Retrieved from Orkin.com
- **Production of housefly eggs** – Niels Fin Johansen, Danish Agricultural Advisory service, National Centre, Poultry
- **Production of poultry feed with maggot** - Jørgen Hinge, Danish Agricultural Advisory Service, National Centre, Buildings and Machinery
- **Images of Bay and fly cage** – Council for Scientific and Industrial Research/Animal Research Institute (CSIR/ARI) 2015.
- **Organic waste** – Retrieved from doityourself.com (2015)

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FIRST YEAR ENGINEERING STUDENT'S PROJECT

1. How long have you been living in Adenta Frafraha?

a. About a month now ☐ b. About a year now ☐ c. More than a year ☐ d. Since I was born ☐

2. How old are you?? a. Less than 18 ☐ b. Above 18 ☐

3. Have you ever fallen ill of any of these diseases? Please tick

Anthrax ☐ Typhoid Fever ☐ Cholera ☐ Food poisoning ☐ Dysentery ☐

4. How often have you been sick with these diseases?

a. Once ☐ b. Never ☐ c. Very often ☐ d. Once in a while ☐

5. Do you have a refuse dump site/incinerator in your house? Yes ☐ No ☐

6. How often do you empty it?

a. Daily ☐ b. Weekly ☐ c. Monthly ☐ d. Once in a while ☐

7. Do you separate organic waste (e.g. kitchen residue) from inorganic waste (e.g. paper, rubber)

Yes ☐ No ☐

8. Do you have gutter in your area? Yes ☐ No ☐

9. Where do you dispose off your organic waste?? (e.g. kitchen residue) .....

10. How often do you clean your gutters?

a. Once ☐ b. Never ☐ c. Very often ☐ d. Once in a while ☐

11. Where do you dispose rotten fruits and vegetables?? ……..

12. Do cows or sheep graze in your area? Yes ☐ No ☐

13. Do you have a place of convenience in your house? Yes ☐ No ☐

14. Are you comfortable with the standard of sanitation in your area? Yes ☐ No ☐

15. Do you get disturbed by housefly in your house? Yes ☐ No ☐

16. Do you have a garden in your house with compost? Yes ☐ No ☐

17. Do you have a dog in your house? Yes ☐ No ☐

18. How often do you clean its cage? a. Daily ☐ b. Weekly ☐ c. Once in a while ☐

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TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION

The bearer of this note is a first year engineering student of the College of Engineering conducting a project in a course titled "Engineering in Society".

The overall aim of the course is to inculcate in students an appreciation of the fact that the purpose of engineering is to solve societal problems. This course is aimed at encouraging students early in their programmes of study to draw a link between their chosen field of engineering and the application of this field to the issues that confront the day to day lives of people.

We should therefore be most grateful if you could facilitate his data collection and provide any other assistance that he may need.

Counting on your usual cooperation in such matters.

Yours sincerely,

ING. PROF. S.I.K. AMPADU, *FGHIE*
Provost, CoE