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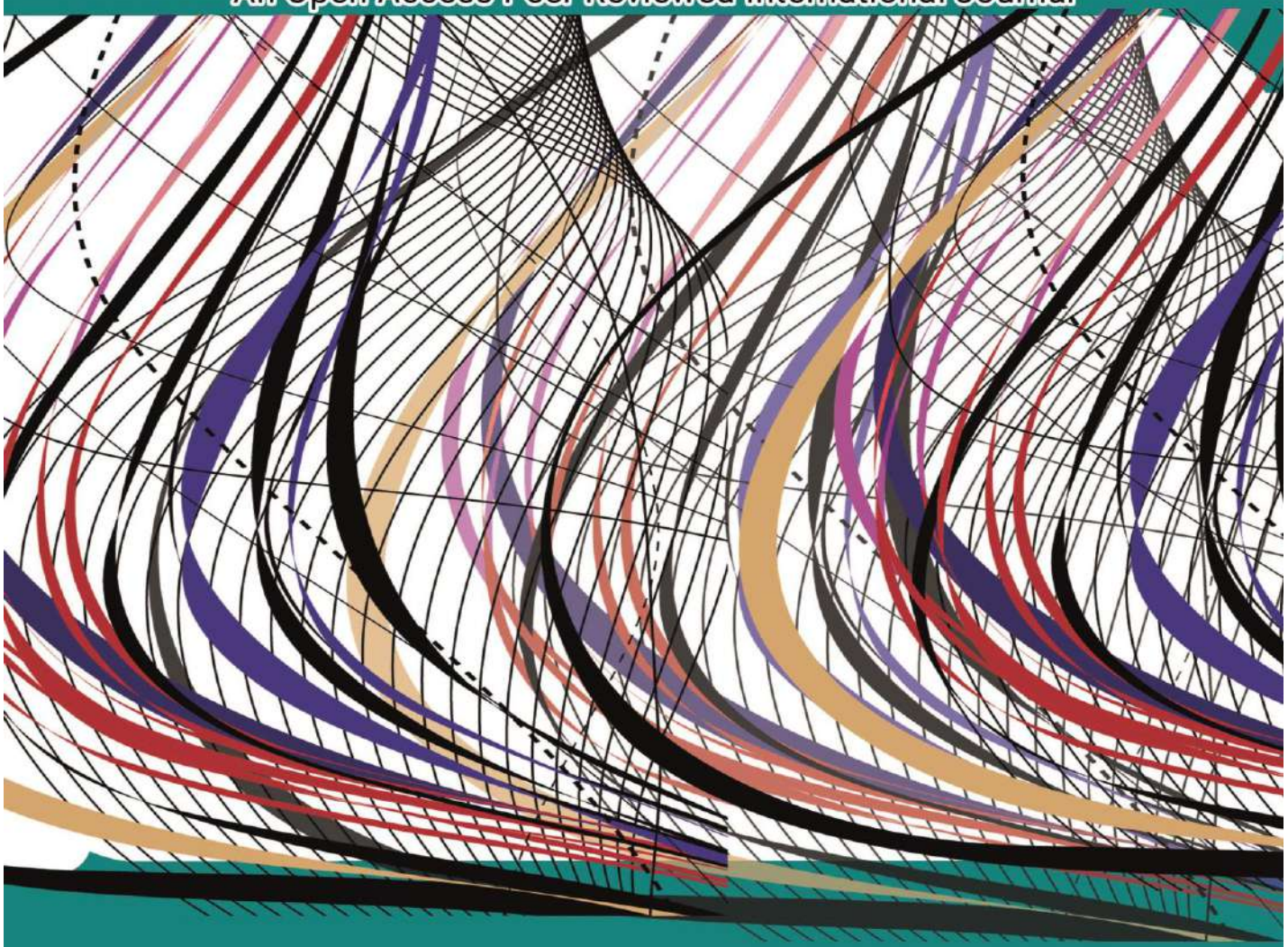

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FOREWORD

I am pleased to put into the hands of readers Volume-5; Issue-7: July, 2019 of **"International Journal of Advanced Engineering, Management and Science (IJAEMS) (ISSN: 2354-1311)" ,** an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers.

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Dinh Tran Ngoc Huy
Editor-in-Chief
Date: Aug, 2019

Editorial Board/ Reviewer Board

Vol-5, Issue-7, July, 2019

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Title with Article detail

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Battle of Sexes in the Workplace

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Abstract— *This study was undertaken to present the functions of gender for promotion and describe the forms of gender discrimination in the workplace.*

The researchers present knowledge about the Gender discrimination in the workplace and the study is deemed significant for it benefit the following sectors and groups of person;

This study is therefore useful socially, economically and academically. Socially it enables employees to co-exist peacefully without discriminating against others due to their ethnic background, gender or race.

The researchers used descriptive method, method of research which is a fact-finding study with adequate and accurate interpretation of data. It describes with emphasis what actually exist such as the current condition of the phenomenon.

The respondents of the study were the employees and employers of selected business establishments in Cabanatuan city.

First, the researchers presented the profile of the respondents as to age; sex; highest educational attainment; length of service and period of promotion granted .Next is the functions of sex in promotion and the forms of discrimination in the workplace.

For the summary of findings and conclusions*, majority of the respondents are not new in their work, female dominated the study, respondents were promoted after their provisionary period. Female are more supportive and approachable while male are more cooperative in the study. The respondents are continue seeking knowledge to be promoted or to have a higher position. Respondents are not new in service or in their job. Respondents are promoted after their provisionary period. Male easy recognize the scenario and straight forward in decision making. Men prefer a hierarchical leadership structure because it allows for easier role clarity and delegation of authority. Employers and employees are both believe in the patriarchal leadership that male are superior but women communicate properly in the workplace because they are more perfectionist and meticulous .Male are direct to the point in controlling the organization ,they do not use any further words to give their thought unlike women. And it is not usual for male to have corrective actions in every undertakings. Women are more efficient and almost perfectionist in all actions to be done .Women are less competent than men and lacking in leadership potential, because of these perceptions, women encounter greater challenges to or skepticism of their ideas and abilities at work. Men and women are correctly predicting the differential experiences that they would encounter with professional advancement and are making sound decisions. It is also possible that women are overestimating the negative consequences associated with power, that men are underestimating them, or both.*

Keywords— *Gender Descrimination, workplace, planning.*

I. INTRODUCTION

Gender Discrimination is not an issue, which one can ignore or tolerate silently. People should realize that gender discrimination at workplace is a serious form of employment discrimination, which should not be discharged. Gender based discrimination is defined as undesirable action or differential treatment against a person that would not have occurred if the person had been of another sex. Gender Discrimination is considered as a serious form of injustice and it is illegal in certain circumstances in most of the countries around the world.

Women still face a gender bias – especially in the workforce. Despite the best efforts of companies to promote diversity and equality, women still dominate the lower paying administrative ranks while men continue to dominate at the executive level. This inequality is hurting corporate performance. Today's women want it all – like

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their male counterparts. And a few are succeeding – but only a few.

Conceptual Framework

Peterson and Thea (2006) describe that there are so many ways of the gender biasness and discrimination in organizations due to the unfair actions of the employer; discrimination in job compensation package, hiring discrimination, favoritism related to job promotion, and biasness in wage setting for different type of job work. Many analysts agree on this "hiring is most important; promotion is second; and wages are third."

Elisabeth K. Kelan (2009) claimed that gender-quake is disturbing gender terms and relations dramatically. It looks like that western well developed countries are well aware this issue but don"t like to address gender biasness and inequality among male and female employee.

Objectives

1.To present the profile of the respondents.

2.To describe the functions of sex in promotion in the workplace.

3. To identify the forms of Descrimination in the work place.

II. METHODOLOGY

In this study, the researchers used of the descriptive method of research. According to (Calderon, 2007) descriptive method of research is a fact-finding study with adequate and accurate interpretation of data. It describes with emphasis what actually exist such as the current condition of the phenomenon.

Descriptive research describe what is and is concerned with the condition or relationships that exist, practices that prevail, processes that are ongoing or trends that developing (Manuel and Mendel, 1990).

The researchers used the descriptive survey type of descriptive research, because the researcher intended to gather relatively limited data from a relatively large number of cases. Another reason is that a survey is useful in improving the value of fact and focusing attention on the most important things to be reported.

The Research Locale

The data gathering conducted in Cabanatuan City . The researchers chose the local base on their own interest and also the prevalence of issues that concerns the research paper.

Table 1

Classification of respondents

	N	n
Employers	9	8
Employees	91	67
Total	100	75

Table 1 shows the classification of respondents, it is clearly presented that the expected respondents for this study were 9 employers and 91 employees 100, however during the retrieval of the questionnaire checklist some of them were absent, thus, the total respondents are 75 based from the retrieved copies of questionnaire.

Sampling Design

The researchers employed purposive random sampling. Purposive Sampling technique means choosing the sample with an underlying purpose. The researchers may wish to make particular point and chose sample with their purpose in mind.

Data Gathering Technique

The researchers sought the assistance of respondents to come up with analysis interpretation and conclusions of the study entitled "Battle of Sexes in the Workplace: An Assessment "

The researchers administered questionnaires to the respondents employed in Cabanatuan City and as a result, it helps in bringing ideas on the subject studied.

Also, the researchers employed personal interviews and observation in some instances, such as when certain information seems not accurate.

Research Instrumentation

The research instrument used in data gathering is questionnaire checklist. It is the most appropriate tool in collecting data, all information the researchers want to know are already there and the respondents answered based on the options given.

The questionnaire checklist was modified from "Adhikari, S. (2014). Impact of Gender Discrimination at Workplace. "

Statistical Treatment of Data

The researcher used the following statistical tools.

Frequency Distribution

It is tabular arrangement of data by classes or categories together with their corresponding class frequencies. Class frequency refers to the number of the observations belonging to a class interval, or the number of the items within the categories a class interval is a grouping

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or category defined by a lower limit band upper limit (Tan, 2006).

P% = F/N X 1OO

Summary of findings

The researchers used Descriptive method ,because it describe what is and is concerned with the condition or relationships that exist, practices that prevail, processes that are ongoing or trends that developing. The respondents were the employers and employees of the selected business establishment in Cabanatuan City.

Profile of the Respondents

Age majority of the respondents belong to 31-35 years old with 30 or 40%,followed by 15 or 20.00% belong to 26-30 years old ,there are 14 or 18.67% belong to 36040 years old,10 or 13.33% belong to 20-25 years old, while the least number of respondents belong to 41 years old and above with 6 or 8.00%.

Sex, in majority of the respondents are female with 47 or 62.67% and 28 or 37.33% male.

Highest educational attainment majority of them earned Bachelor's degree with 29 or 38.67% ,followed by 21 or 28.00% earned MA units,while 18 or 24.00% of them finished MA and only 7 or 9.33% has Ph.D. units.

Length of service majority of them with 29 or 38.67% belong to 8 to 10 years and above, followed by 17 or 22.67% belong to 3-5 years, while 10 or 13.33% belong to 1-3 years in service ,9 or 12.00% belong to 5 to 8 years.

Period of Promotion Granted majority of them with 39 or 52.00% belong to 3 years followed by 15 or 20.00%, 10 or 13.33% belong to five years and the least period of promotion with 7 or 9.33% belong to 8 years.

Function of sex for promotion

Planning the perception of employers it has a total weighted mean of 4.06 and verbal interpretation of Agree, the highest mean from the statement according to the perception of employers is the statement number 3 "1. Male are good in visualization and formation of proposed activities" followed by "Male are future-oriented" with a mean of 3.87 and verbal interpretation of Agree,and statement number 2" Male are good programmers" with a mean of 3.80. It implies that male easy recognize the scenario and straight forward in decision making while in the perception of the employees, it has a total weighted mean of 4.30 and verbal interpretation of agree, from the table of employees the statement with the highest mean is the statement number 2 "Male are good programmers" with a mean of 4.54 and verbal interpretation of Strongly agree,followed by statement number 1 "1.

Organizing perception of the employers has a total weighted mean of 3.76 and verbal interpretation of Agree, from the table of employers statement number 3 "Male are well delegated their employers /employees to the assign task" got the highest mean 3.90 and verbal interpretation of agree,followed by statement number 1 "Male are more systematic in handling employees" with a mean of 3.70 then statement number 2 "Male are good in establishing relationship with their employers/employees" has a mean of 3.67 and verbal interpretation of Agree.

Leading from the employers perception has a total weighted mean of 3.82 and verbal interpretation of agree, from the employers' table,statement number 2 "Male are best in motivating and inspiring their employees" got the highest mean of 3.90,followed by statement number 1" Male possess good leadership skills" with a mean of 3.87 and statement number 3" Male communicate effectively" with a mean of 3.70 and all are verbally interpreted Agree.

Controlling, it has total weighted mean in the employers' perception is 3.56 and verbal interpretation of Agree ,among the statement , statement number 2 "Male are good instructors" got the highest mean and statement 3" Male are very effective in taking corrective actions in every undertaking" got the lowest mean.

Forms of Discrimination in the workplace from the perception of employers has a total weighted mean of 2.88 and verbal interpretation of Undecided, and the highest weighted mean is the statement number 2 "Gender Entry Gap: Discrimination is there at the time of recruitment on the basis of gender. Males are given preference over female for higher or top level position in the organization" with a mean of 4.02 and verbal interpretation of agree and the lowest is the statement number 4" Sexual Harassment: Demand is made of sexual activities and favors in tern of giving promotion or employment" with a mean of 1.86 and verbal interpretation of disagree..

III. CONCLUSIONS

Based from the summary of findings the following conclusions were drawn;

1. Female are more supportive and approachable while male are more cooperative in the study.
2. The respondents are continue seeking knowledge to be promoted or to have a higher position.
3. Respondents are not new in service or in their job.

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4. Respondents are promoted after their provisionary period.
5. Male easy recognize the scenario and straight forward in decision making.
6. Men prefer a hierarchical leadership structure because it allows for easier role clarity and delegation of authority.
7. Employers and employees are both believe in the patriarchal leadership that male are superior but women communicate properly in the workplace because they are more perfectionist and meticulous .
8. Male are direct to the point in controlling the organization ,they do not use any further words to give their thought unlike women. And it is not usual for male to have corrective actions in every undertakings . Women are more efficient and almost perfectionist in all actions to be done .
9. Women are less competent than men and lacking in leadership potential, because of these perceptions, women encounter greater challenges to or skepticism of their ideas and abilities at work.
10. Men and women are correctly predicting the differential experiences that they would encounter with professional advancement and are making sound decisions. It is also possible that women are overestimating the negative consequences associated with power, that men are underestimating them, or both.

IV. RECOMMENDATION

Based from the summary of findings and conclusions, the following recommendations are offered;

1. Men should know how to deal with other people and not sorting the age ,civil status specially the sex of a person
2. Some of the respondents should continue their studies.
3. Respondents should aim for a higher position
4. Women should learn to stick in their decision.
5. Women should not be emotional in their workplace to avoid flat organizational structure .
6. Employers should pay attention to the capability of women to lead ,they should have gender sensitivity in their workplace.
7. Men should learn to accept mistakes in a nice way in order for them to learn from it.
8. Women should know how to address adversity in order to show their potential to lead.
9. Everyone should accept the fact that empowering women is one of the issues of globalization in the workplace for production, development and competence.

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BAJA -Chassis Fixture for Manufacturing

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Abstract— *In an All-Terrain Vehicle(ATV), chassis plays a very prominent role. Using a fixture will help us to build a chassis without any errors in manufacturing. The fixtures that I'm currently working on are 'Tare' designed for the flexible manufacturing of any structural members, like chassis or any two members. These fixtures are designed in such a way that the members are clamped together precisely and always stay in place relative to each other. In machining, fixtures will minimize work piece deformation which causes due to clamping and cutting forces essential to maintain the machining accuracy. The various methodology for clamping operation used in different application by various authors are reviewed in the paper. Fixture is required in various industries according to their application. This can be achieved by selecting the optimal location of fixture elements such as locators and clamps. The fixture set up for component is done manually. For that more cycle time required for loading and unloading of the material. So, there is need to develop system which can help in improving productivity and time. Fixtures reduce operation time, increases productivity and high quality of operation is possible.*

Keywords— ***Chassis Fixture, ATV, BAJA.***

I. INTRODUCTION

A fixture is a work-holding or support device used in the manufacturing industry. Fixtures are used to securely locate (position in a specific location or orientation) and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchangeability. Using a fixture, improves the economy of production by allowing smooth operation and quick transition from part to part, reducing the requirement for skilled labor by simplifying how work pieces are mounted, and increasing conformity across a production run.

Fig: 1 Fixture Components

A fixture's primary purpose is to create a secure mounting point for a work piece, allowing for support during operation and increased accuracy, precision, reliability, and interchangeability in the finished parts. It also serves to reduce working time by allowing quick set-up, and by smoothing the transition from part to part. It frequently reduces the complexity of a process, allowing for unskilled workers to perform it and effectively transferring the skill of the tool maker to the unskilled worker. Fixtures also allow for a higher degree of operator safety by reducing the concentration and effort required to hold a piece steady.

Economically speaking the most valuable function of a fixture is to reduce labor costs. Without a fixture, operating a machine or process may require two or more operators; using a fixture can eliminate one of the operators by securing the work piece.

II. FIXTURE COMPONENTS

A Fixture set contains of

S No	Description	Qty
1	Seamless Pipe	1
2	Square Blocks	2
3	Cylindrical Blocks	2
4	Locking Screws	2
5	Set Screws	8

As shown in Fig:1

2.1 Seamless pipe:

It is used for structural support in Fixture kit because it will take maximum amount of compressive loads when compare to seamed pipes. Variable Lengths of pipes are selected for suitable support. The seamless pipe is shown in Fig:2

S No	Description	Length	Qty
1	Ø22x2mm thick	2 m	2
2	Ø22x2mm thick	1 m	4
3	Ø22x2mm thick	0.5 m	4

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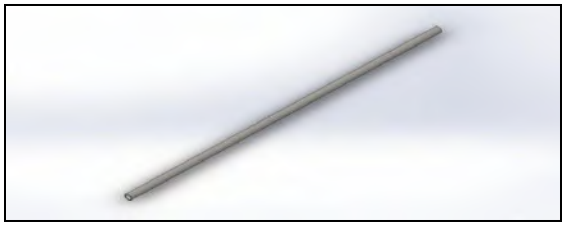

Fig: 2 Seamless pipe

2.2 Square block:

Cube of 50mm has been considered for holding the structural member of chassis by having a slot of width 30mm and height 20 will be made on the side face of cube as shown in Fig:-3.

Gripping surface has been made on the inner surface of cube by making rough machining.

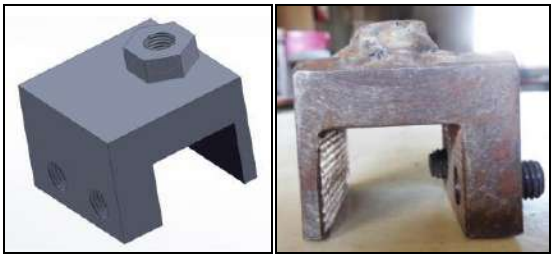

Fig: 3 Square block

Two Taped holes of M10 on the other side of the slot which will help to lock the fabricating members with the hexagonal set screws.

M10 nut is going to be weld on top of the block for locking the cylindrical block

2.3 Cylindrical Block:

Cylindrical block Ø40×ID 23×50 Length will be done by boring operation on a lathe machine which produces a rough surface and this will act as gripping surface between cylinder block and seamless pipe.

Cylindrical block has undergone milling operation to make two adjacent surfaces with 90 deg angle between them. Bottom surface of cylindrical block comes into contact with the cube top surface which helps to gain more stability and more friction due to increase in area of contact.

Flat side surface of the cylindrical block helps to increase weld bead contact area between cylindrical block and hexagonal bar having a 10mm through hole to lock the cylindrical block which is adapted from lathe square tool post.

Opposite side of the cylinder weld bead two M10 tapped holes are apart which will gives a locking mechanism between seamless pipe and cylindrical block with the help of hexagonal set screws. As shown in Fig:-4

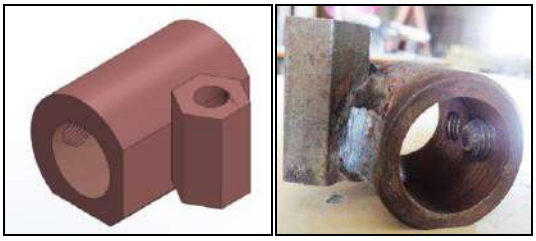

Fig: 4 Cylindrical Block

2.4 Locking Screws:

M10x60 Hexagonal Headed screws of Ø10×100 mm length rod is welded on top of hexagonal bolt head as shown in Fig:5 and it gives easy lock/unlock of the cylindrical block to cubical block without use of tools

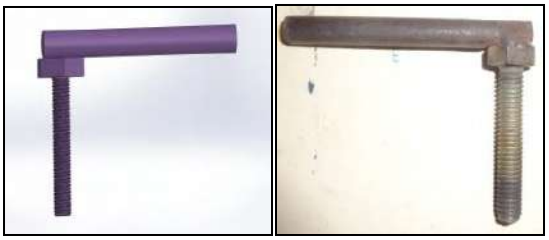

Fig: 5 Locking Screws

2.5 Set Screws:

M10x15mm and M10x10mm length set screws will help to lock the fabricating members in a slot of square block and also locks the cylindrical block on seam less pipe as shown in Fig:6

Set screws are selected for this function as they have a gripping surface on their bottom which will help to hold the pipe in a study position.

Fig: 6 Set Screws

III. CONSTRUCTION PROCEDURE

Assemble the cylindrical block and square block by the help of locking screw, then tight the set screws by placing it on the end of the seamless pipe. Now this semi-assembled parts (Fixture) is placed on the structural pipes for the further locking of the members. This is obtained by placing the structural member-1 in the given rectangular slot on the square block. So that we can lock the square block and structural member at desired position and tightened with the help of set screws. Now insert the semi- assembled fixture part by inserting through other end of the seamless pipe. Now position the structural

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member-2 as per design and follow the same locking procedure as structural member-1.

Now lock the both locking screws so that the positions and this assembly are shown on fig:7 the members will be secured and rigid this assembly is shown on fig:7.

Now weld the structural members and these fixtures helps to lock the positions of weld members and also helps to protect the members from thermal expansion or contraction by welding.

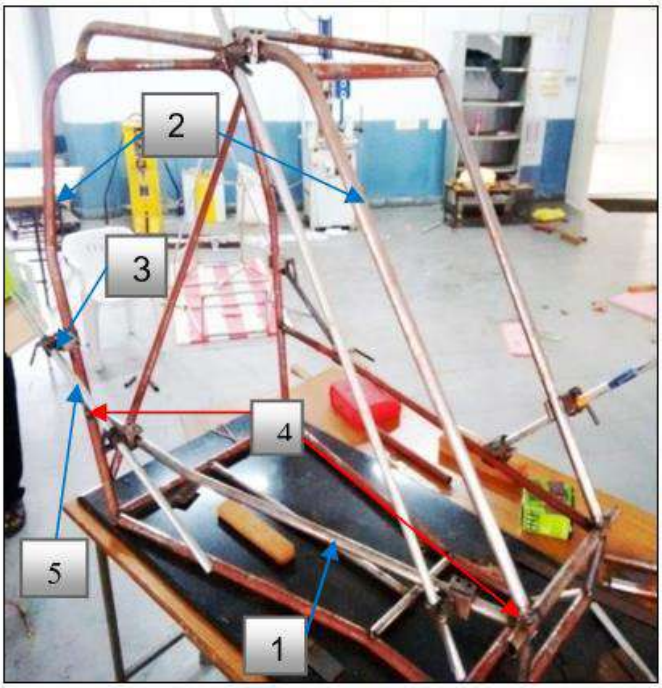

Fig: 7 BAJA chassis members are set for welding with the help of these fixtures

Figure:-7 Details.
1-Structural member:-1
2-Structural member:-2
3- Semi assembled part (fixture)
4- Joint to be weld.
5- Seamless pipe.

IV. RESULTS

Following are the results observed by using our customized fixture when compared with conventional fixture.

- 360 degrees lock
- Easy to access
- Light in weight
- User friendly
- Less cost

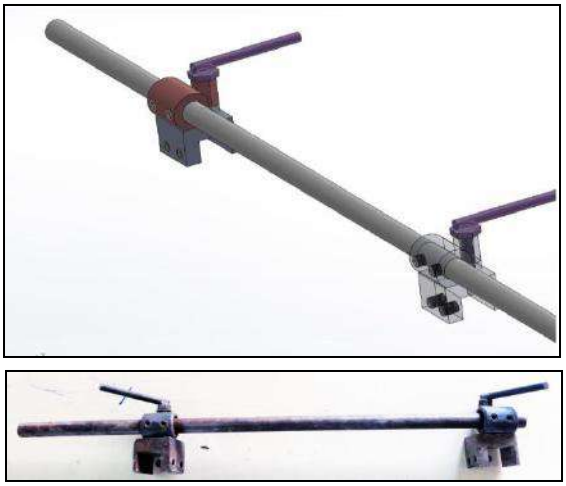

Fig: 8: Complete fixture set with assembly

V. CONCLUSION

By using these fixtures, it will provide very good precision and manufacturing easiness with improvement in welded structural member strength. It can be easily adaptable for any Structural engineering assembly which involves tubular frame.

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iMALERT – an Emergency Response Mobile ApplicationUsing Geo-Location for Palayan City Disaster Risk Reduction and Management Office

Oscar P.Oganiza, Maelyn P. Reselva, Jayson Paul V. Vicencio, Rolando C.Casim, Gener S. Subia

Abstract— *The researchers developed an Interactive Mobile Application for Less Emergency Response Time (iMALERT), a mobile application, aimed to aid in the emergency response activities of Palayan City Disaster Risk Reduction and Management Office (DRRMO) through real-time incident reporting. The mobile application is equipped with a web-based database server managed by the said office where the emergency incident reports are sent for assessment of the necessary and appropriate response activity. Using four of the five processes of Software Development Lifecycle, the researchers were able to conceptualize, design, develop and stabilize the features of the mobile application and database which were evaluated by expert and non-expert respondents as a reliable tool for emergency case reporting and response in terms of functionality, accuracy, service and usefulness and security and maintenance.*

Keywords— ***Disaster-risk reduction, emergency response, geo-location, mobile application, web-based database.***

I. INTRODUCTION

Emergencies are scenarios which need an immediate response because human lives and properties are at risk. The cause of these scenarios varies like disasters, road accidents, fires, and medical emergencies. Disasters alone are a major cause of emergency in the Philippines because the country is at high risk from cyclones, earthquakes, floods, landslides, tsunamis, volcanic eruptions, and wildfires and since 1990, more than 500 natural disaster events claimed about 70,000 Filipino lives and an estimated $23 billion in property damages [1].

According to INFORM, a global open-source risk assessment for humanitarian crises and disasters which rates key factors on a scale of 1 to 10 with ten being the highest, the Philippines has hazard exposure rate of 8.8 and ranks third on 191 assessed countries, meaning the country is at a high exposure to natural disasters. However, the coping capacity is rated as 4.3 and ranks 104th of the countries which signify the lack of response from the concerned agencies of the government [2]. Moreover, road accidents have been a global problem, and in the Philippines death tolls due to road crashes have been rising. According to the latest data available from the Philippine Statistics Authority, 10,012 people died from road accidents in 2015, which is one of the leading causes of deaths among 5 to 24 year-olds [3]. Meanwhile, fire tragedies, including building and house fires and wildfires also add to emergency concerns because of its unexpected nature.

In Palayan City, the Disaster Risk Reduction and Management Office (DRRMO) which was functional in 2017, have been mandated by its local government unit on the first-hand response on these emergencies in partnership with other local agencies such as the police, the fire bureau and the health office. In the past two years of operation, the office had been depending on their response activities from the citizens' reports through SMS and calls and response time is often delayed due to miscommunication and lack of incident details. Moreover, the office has difficulty in documenting and archiving reports which may be used for future references.

Response time is a vital element during these emergencies, so well-devised emergency plans should be made by the concerned agencies especially in the local government units because they are at the forefront of these scenarios, so the researchers had conducted a research which aims to aid in the emergency response of thePalayan CityDRRMO by building an interactive mobile application equipped with a database system that allows the people to be “human

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sensors" who report to the DRRMO any emergency cases needing immediate response.

Although, there are many existing mobile applications concerning emergency response as presented in different studies [4], the researchers had developed a localized integration of technology that will greatly help the response management team by taking advantage of smartphones' location sensing capability through Global Positioning System and a database system with QGIS platform, an open-source software for geographic information system [5] for further information on the location's topology (i.e. mountains, body of waters, low-leveled plains) in order for them to have a better assessment of the emergency case. With this system, the emergency response time will be optimized because time engaged will be reduced between the respondent and the office. Additionally, documenting and archiving of reports for future reference will be automatically available from the database.

With these scenarios, this study aimed to answer the following questions: how will the mobile application be developed through the following SDLC processes: inception, design, development, and stabilization? And how will the mobile application be evaluated in terms of functionality, accuracy, service and usefulness, and security and maintenance?

II. METHODOLOGY

This study utilized the developmental research design [6] using the four of the five SDLC model processes – Inception, Design, Development, and Stabilization in the development of iMALERT. The fifth process, which is the Deployment phase that involves the actual hand-off of the mobile application to the research locale and the concerned organization, was not included in this study.

Starting with inception or conceptualization, an idea is refined into a solid basis for an application. The design phase consists of defining the application's general layout, functions, and user interface. The actual building of the application happens in the development phase. System testing and bug fixes comprise the stabilization phase wherein, and a wider user audience is given a chance to use, evaluate and provide feedback on the application's functionality, accuracy, service and usefulness and security and maintenance [7].

Inception

The researchers conducted a visit on the Palayan City DRRMO to assess its present-day emergency response capabilities. This information will be needed in conceptualizing the essential functionalities of the mobile application. As assessed, the current incident reporting of emergency cases is done through phone calls and text messaging, which often causes miscommunication on incident details thus, resulting in the delay of response. Additionally, the office has no evident archive of past emergency incidents which could be used for statistical analysis of the community's capacity to handle emergencies.

Based on the data gathered, the researchers came up with the following mobile application functionalities:

1. An image/video capture capability for real-time visualization of the emergency incident.
2. Location tagging enhanced with QGIS for an accurate incident location and geographic information.
3. Web-connected database for incident report management and archiving.

Design

By knowing the essential functions of the mobile application, designing iMALERT follows the conceptual framework, as shown in Figure 1. The mobile application will require the user to create an account to access its functions. Once signed-in, the user will then have the capability to report an emergency incident by just simply initializing the phone's camera and capturing the scene. Once an image/video is available, the location is automatically tagged through the Global Positioning System (GPS), and the user could add necessary information before sending the report to the web database. On the server web site, once the report has been received, the embed location will be plotted on a QGIS platform map and then stored in the database. The stored incident reports could be easily available by accessing the database if the Palayan City DRRMO wants to review and analyzeits past emergency responses.

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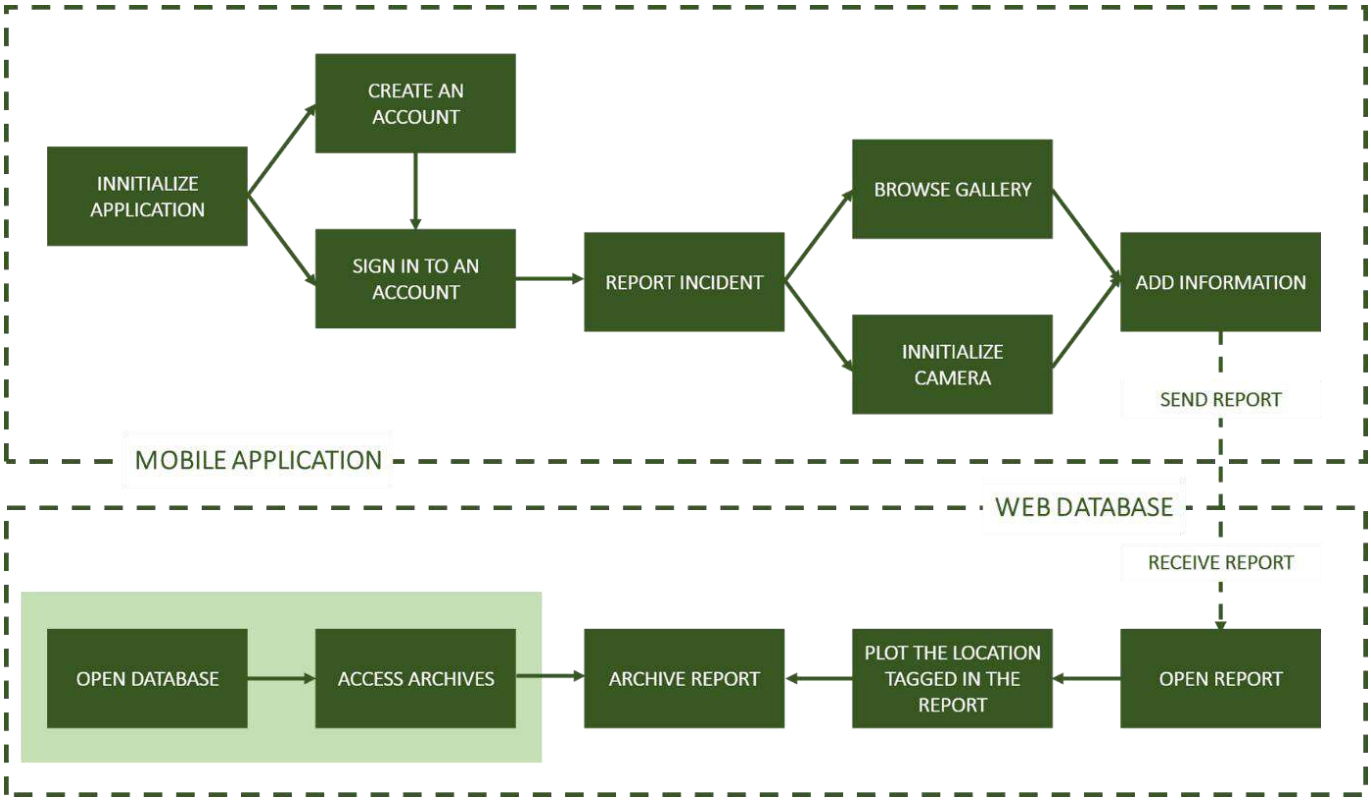

Fig.1: Conceptual Framework of the Functionalities and Features of the Mobile Application and the Web Database

The mobile application's interface is simple and user-friendly for everybody's ease of use. The Home screen (Figure 2) is composed of text fields asking for the user's e-mail address, and preferred password as well as an option to Register or Sign In. Clicking the Register button will switch to the Profile screen (Figure 3) which is composed of text fields asking for the user's information such as contact number and his/her first and last name. If the user has already an account, clicking the Sign In button will log into his/her account. The mobile application will then direct the user to the Camera window (Figure 4) wherein the user can take photo/video of an emergency scenario. This screen has a Camera button for capturing the incident, a Profile icon that allows to access, edit and add information on the user's account information, a Report icon that will display the chronological lists of reports that have been arranged and created with complete date and time, location and its status as pending, dispatched or completed (Figure 5), and lastly a Next button that will direct to the Report Incident screen (Figure 6). In this screen, the user can now classify the type of emergency happened and add any necessary information on the incident and pressing another Next button will show a dialog box confirming the submission of the report.

Meanwhile, the web-based server (Figure 7) is composed of a QGIS platform map wherein received reports will pop-up in the form of a notification pinned on the tagged location of the report. Upon clicking this notification pin, complete details of the incident will be displayed on the right side of the screen.

Fig.2: Home Screen

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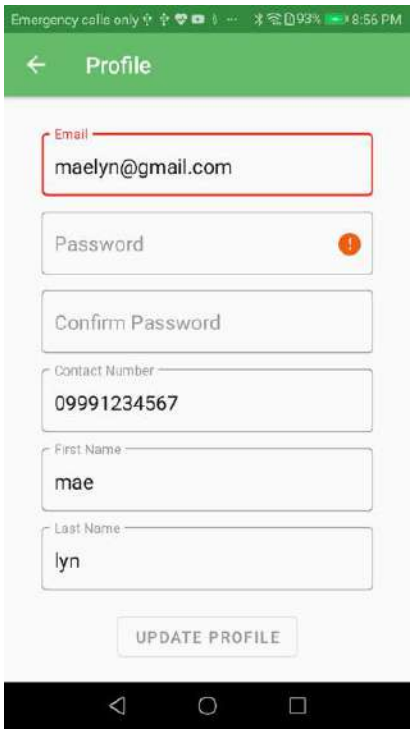

Fig.3: Profile Screen

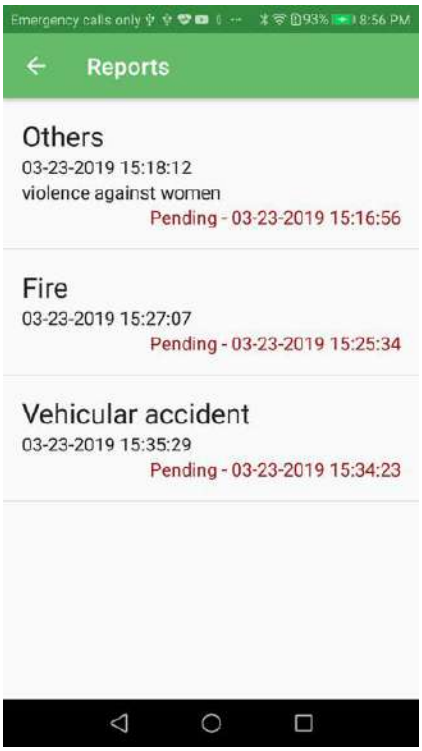

Fig.5: Report Screen

Fig.4: Camera Window

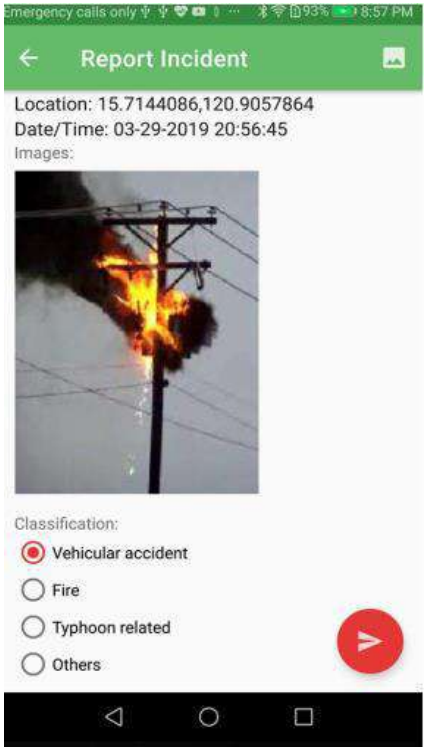

Fig.6: Report Incident Screen

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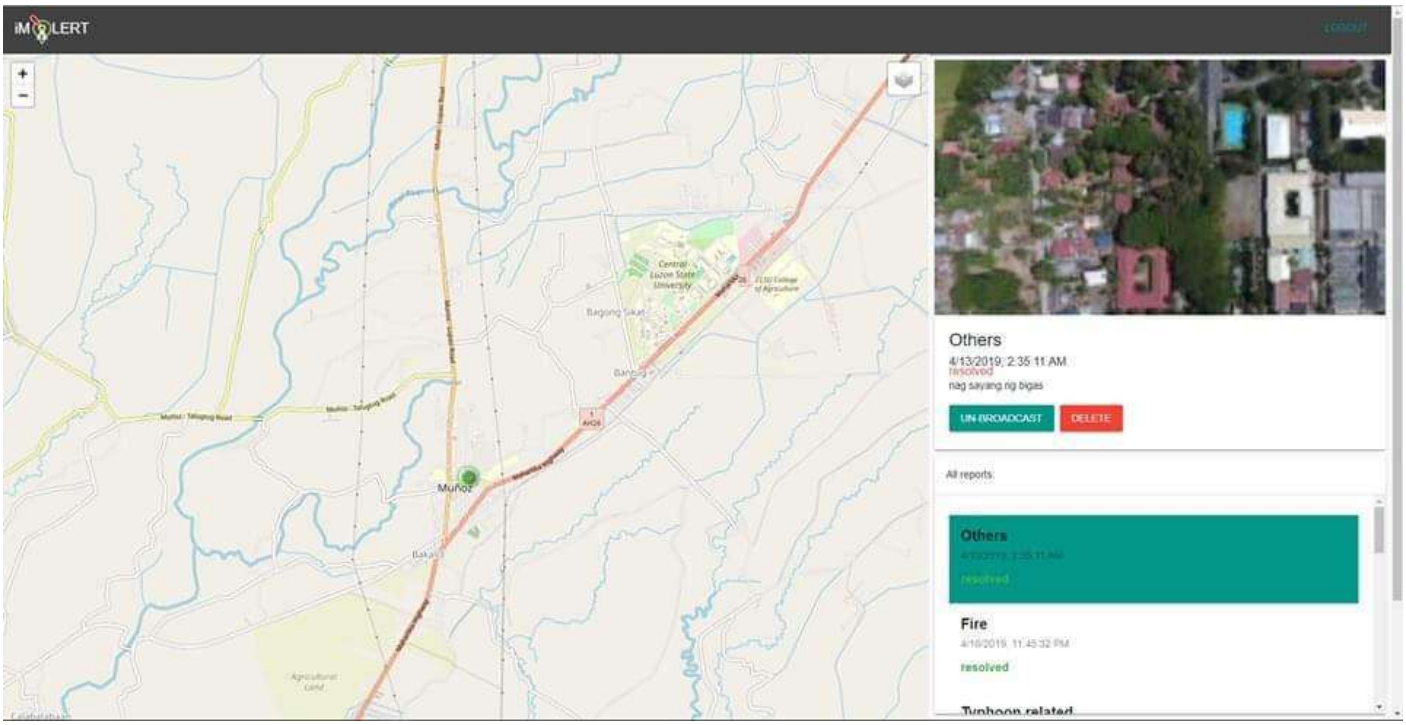

Fig.7: The Website Database with QGIS Map

Development

The mobile application's user interface and the script was developed through Node.js, an open source platform for scalable applications which was often equipped with web servers. Additionally, the database system was constructed using MongoDB, a member of the NoSQ database family, which stores structured data making integration of information with applications easier and faster [8].

Stabilization

To assess the mobile application's capability on emergency incident reporting, questionnaires were handed to 20 experts who were engineers, information technologists, and Palayan City DRRMO officers and 100 non-experts who were residents of Palayan City. The questionnaire was composed of questions thatevaluated the mobile application in terms of its functionality, accuracy, service and usefulness and security and maintenance in a four-rating Likert scale. The responses were tabulated and computed using the weighted mean and were interpreted using the scale shown in Table 1.

Rating Scale	Verbal Description	Interpretation
3.25 – 4.00	Strongly Agree	The application is very functional/accurate/useful/secure.
2.50 – 3.24	Agree	The application is functional/accurate/useful/secure.
1.75 – 2.49	Disagree	The application is not functional/accurate/useful/secure.
1.00 – 1.74	Strongly Disagree	The application is not very functional/accurate/useful/secure.

III. RESULTS AND DISCUSSION

Development of iMALERT

The researchers had developed the mobile application iMALERT, which was conceptualized and tailor-made for the emergency response services of Palayan City DRRMO. By using the SDLC model, the researchers were able to incorporate the mobile application's features, which were based on the needed functionalities of an effective emergency incident reporting and response.

The mobile application was beneficial not only to the Palayan City DRRMO but also to the whole community. The mobile application's interactivity was like a huge network of emergency sensors deployed all over Palayan City because the citizens itself will be the one reporting any emergency scenario. Meanwhile, the online database which receives and stores incident reports was managed by the Palayan City DRRMO. With the information sent from the mobile applications, they can easily assess what type of emergency response is best suitable for a certain case. Additionally, response activities were easier because of the

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real-time location and geographical information as shown in the web site's map in QGIS platform and whenever the office wants a statistical analysis of the emergency incidents for a certain period, incident reports are readily available and retrievable in the database in a structured tabular format.

Assessment of the Mobile Application

As shown in Table 2, which assesses the mobile application's functionality, the respondents agreed that the mobile application is very easy to use (WM=3.94), and it can be noted that the weighted mean of all the items on the list is beyond the 3.8 mark which means that the respondents strongly agree on the functionalities of the mobile application.

On Table 3, the accuracy of information being sent and received from the mobile application to the web database is very accurate, as seen in the over-all weighted mean (WM=3.49). Although, the item about the syncing of data from the mobile application with the database has the lowest weighted mean of all the items (WM=3.33) it is still within the very accurate range.

Moreover, the mobile application's service and usefulness were presented in Table 4. The respondents strongly agree that the mobile application is very useful, and it is indeed essential in the emergency response activities of Palayan City (WM=3.91 and WM=3.93). Also, the respondents thought that emergency response time and management were reduced (WM=3.88 and WM=3.79). Lastly, Table 5 shows the security of information – user's data on the mobile application and archived incident reports on the database. The respondents believed that their personal information is very secured (WM=3.63). The item on the ease of maintenance of the database got the lowest weighted mean of all the items from the table, but it still on the favorable range (WM=3.17).

Table 2. The functionality of iMALERT Mobile Application

Functionality	**Weighted Mean**	**Interpretation**
1. Is the mobile application easy to use?	3.94	Very Useful
2. Is the mobile application not confusing to use?	3.92	Very Useful
3. Can the mobile application capture images?	3.86	Very Useful
4. Can the mobile application send reports to the server?	3.83	Very Useful
5. Can the mobile application access location/GPS of the smart phone?	3.90	Very Useful
6. Can the webpage receive incident reports from mobile application users?	3.91	Very Useful
7. Can the webpage provide real-time incident reports?	3.87	Very Useful
8. Can the webpage provide a database for storing the reports?	3.84	Very Useful
9. Can the webpage help assess the needs of the incidents being reported?	3.88	Very Useful
Functionality Weighted Mean	**3.88**	**Very Useful**

Table 3. Accuracy of iMALERT Mobile Application

Accuracy	**Weighted Mean**	**Interpretation**
1. Can the mobile application secure, accurate time and location information?	3.38	Very Accurate
2. Can the mobile application display information accurately?	3.58	Very Accurate
3. Can the mobile application sync information with the server?	3.33	Very Accurate
4. Can the webpage provide accurate incident reports?	3.67	Very Accurate
Accuracy Weighted Mean	**3.49**	**Very Accurate**

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Table 4. Service and Usefulness of iMALERT Mobile Application

Service and Usefulness	Weighted Mean	Interpretation
1. Is mobile application useful?	3.91	Very Useful
2. Is the mobile application necessary for Palayan City?	3.93	Very Useful
3. Can the mobile application/webpage reduce emergency response time?	3.88	Very Useful
4. Can the mobile application/webpage help incident response management?	3.79	Very Useful
Service and Usefulness Weighted Mean	**3.88**	**Very Useful**

Table 5. Security and Maintenance of iMALERT Mobile Application

Security and Maintenance	Weighted Mean	Interpretation
1. Is the mobile application/server capable of securing information?	3.46	Very Secure
2. Is the mobile application/server easy to maintain?	3.17	Secure
3. Is the database secured?	3.34	Very Secure
4. Are the user profile information secured?	3.63	Very Secure
Security and Maintenance Weighted Mean	**3.40**	**Very Secure**

IV. CONCLUSIONS AND RECOMMENDATIONS

iMALERT is an innovative way of integrating technology into the current emergency response process. With this application, emergency incident reporting was made as soon as it happened to inform the concerned agency with the real-time and accurate incident information thus, the response was quicker and effective preventing the scenario to worsen or to claim casualties. The evaluation of iMALERT mobile application has an over-all total weighted mean of 3.66 which means the respondents strongly agree that the application and database have the necessary functionalities of an effective emergency response system; the application and database have a high level of accuracy when it comes to data included in the emergency incident report; the application and database are very easy to use and can be beneficial to the Palayan City community; and the application and database have high security on sensitive user account data and archived incident reports.

Based on the conclusions, the researchers recommend this mobile application to be introduced not only to the citizens of Palayan City but also to all other communities because an effective emergency response means properties and lives are saved.Since this mobile application is made on a scalable platform, it is open for future innovations and improvements particularly integration to the upcoming 5G network technology for a more efficient and more interactive emergency incident reporting and response.

Further, it is recommended that Electronics and Computer engineers and Information Technology experts to venture on studies that are related to this study and continue to investigate and evaluate the technique [9] introduced by the researchers for further improvement of the system.

Lastly, since this study investigated only [10] the respondents in Palayan City, its findings do not translate to the entirety of all the people in the province of Nueva Ecija. Thus, the researchers suggest that additional studies involving more respondents and more areas should be done to further strengthen the result of this research.

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Awareness on Road Signs and Markings of Drivers and Passengers along Maharlika Highway in Nueva Ecija

John Mar M. Castillo, Sarah Mae B. Macabangon, Ricardo Gary B. Garcia III, Jonathan O. Felipe, Michael John M.Villar

Abstract*— *Road signs and markings are an integral part of the transportation systems which are logically designed and employed to provide essential road information for commuters' safety and protection. The study is an evaluation of drivers and passengers' awareness regarding road signs and markings along Maharlika Highway in the Province of Nueva Ecija particularly between the cities of San Jose and Cabanatuan. While drivers understanding and perception of road signs and markings were very substantial in the study, the perceptions of common passengers wereadded, because they are generally the victims of road accidents. A total of 100 drivers and passengers from the locality were surveyed based on a 4-point Likert scale ranging from strongly disagree (1) to strongly agree (4). The findings showed thatdrivers were aware and knowledgeable about road signs and markings but did not strictly abide by it. Passengers, on the other hand, were not very much aware of road safety features like road signs and markings and relied heavily on the capability of drivers since they believe that drivers were following rules and regulations onroad signs and markings.

Keywords*— *Awareness, Road signs, Road marking and Road Safety.

I. INTRODUCTION

Road accidents can be attributed to several reasons such as distracted driving, over speeding, drunk driving, reckless driving, poor road conditions, driving un-roadworthy vehicles and other contributing factors that often result in the injury or death of people involved. Data from the World Health Organization (WHO) reveals that there were 1.25 million road traffic deaths globally in 2013, with millions more sustaining serious injuries and living with long-term adverse health consequences [1]. In the Philippines, WHO published in 2017 that road traffic accidents death reached 10,767 or 1.74% of total deaths [2].Deliberating on the circumstances that lead to road accidents, it can be summed up that there are three major factors that must be considered: the driving environment (infrastructures), the vehicle (roadworthiness), and the driver (behavior) [3]. This study focused on the driving environment, particularly on the awareness of road signs and markings and its significance to drivers, as well as passengers or commuters.

Road signs are those that are usually erected at the sides of the road that provide direction, warning and other significant information to lead drivers and commuters safely toward their destination. Likewise, road or pavement markings are safety features or control measures that are usually painted in luminescent color on the surface of the roads to guide vehicles, commuters and pedestrians. Road signs and markings play a vital role in driver's proficiency, especially during night time. Drivers are always dependent on road signs and markings for safe driving. The American Association of State Highway and Transportation Officials (AASHTO) reports that every 21 minutes, a highway death occurs as a result of a lane departure, that is over 25,000 fatalities per year or almost 60 percent of the nation's highway

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fatalities [4]. A study on the performance of road signs and markings [5] explains that because of important information provided to road users through road signs and markings, there is a need for appropriate signs and markings planning, designing and implementation programs such as regular maintenance and replacements of traffic signs and markings.

The Land Transportation Office (LTO) is the lead agency that is mandated to issue a driver's license to qualified drivers. A driver's license isn't granted lightly to anyone without passing a set of tests and examinations to ensure that individuals will uphold road safety and follow traffic rules [6]. Part of the examination to get a driver's license is the applicant's knowledge of traffic rules, particularly on road signs and markings. In India [7], a similar study was conducted regarding awareness of road rules and road signs among drivers and it was concluded that better training of drivers and testing techniques for issuing license would reduce the number of accidents in Delhi.

There are also studies conducted to evaluate the benefits of pavement road markings and how it affects their driving capabilities. One of these studies is conducted by Tsyganov on rural two-lane highways where edge line markings were added [8]. The highways had lane widths of 9, 10, and 11 feet. The activity is to test the driver work load before and after the edge lines were installed. The researchers also monitored the heart rate of the drivers for the workload. The researchers found out that the installation of edge lines on the highways decreased workload during night time for both free driving conditions (were no oncoming vehicles) and meetings with oncoming traffic. During daylight, similar effects were observed as well, but at the same time, some drivers experienced emotional tension that may be caused by higher speed.

Similar studies about the importance of road signs and markings and its contributory effect to road mishaps were conducted in the past. These studies, however, focused mainly on the drivers understanding and perception of road signs and markings. The perception of common passengers about the driving environment wasadded in the study because they are generally the victims of road accidents and that their knowledge in road signs and markings may have an influence on the driver's behavior. This is one of the knowledge gaps that this research study would like to fill in. Moreover, with all these past studies and reports linking the influence of road markings in drivers' capabilities, this study looked at the influence of road signs and markings in the overall safety of the commuters.

II. METHODOLOGY

The study was conducted in the province of Nueva Ecija particularly along the main thoroughfare (Maharlika Highway locally known as DaangMaharlika) connecting San Jose City and Cabanatuan City that spans about 50 kilometers. The Pan-Philippine Highway, also known as the Maharlika ("Nobility/freeman") Highway is a 3,517 km (2,185 mi) network of roads, bridges, and ferry services that connect the islands of Luzon, Samar, Leyte, and Mindanao in the Philippines, serving as the country's principal transport backbone [9].

The data were collected with the use of two approaches. One is the use of questionnaires and the other one is through direct observation. The main advantage of using questionnaires is that a large number of people can be reached easily and economically and it provides quantifiable answers for a research topic that are relatively easy to analyze [10].Questionnaires were distributed to drivers of public transport who often pass though the said highway. Buses from the Baliwag Bus Company are the usualbuses that plySan Jose City and Cabanatuan City. There are also Jeepneys/ XLTs that transport passengers every day from San Jose City up to Cabanatuan City and vice versa. Tricycles, on the other hand, are the most common public transport in both cities within the city limits.

The researchers were able to observe and record various road signs and markings while driving along Maharlika Highway from San Jose City to Cabanatuan City and back. It was done in both

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directions and was done in the morning and the evening. The existence of road signs and markings, as well as deficiencies, were recorded. Dilapidated or obscured roads signs and markings were also observed and noted.

Researchers also observedand took note of peculiar behaviors of buses, jeepneys/XLTs and tricycles while plying the said thoroughfare bearing in mind the influence of road signs and markings in their journey. Unlike other methods like an interview, questionnaire, etc., where the researcher has to depend on the information provided by the respondents, direct observation method can directly check the accuracy from the observed and the data collected through observation is more reliable [11].

A total of 100 questionnaires were given to public drivers and passengers selected purposively based on the following criteria [12]: they normally travel the route from San Jose City to Cabanatuan City or vice versa andbus and jeepney drivers as well as their customary passengerswho have routine experiences and mastery of the route. Questions werecentered on the understanding and awareness of drivers and passengers on the road signs and markings and its usefulness, particularly on its safety features.Survey questionnaires were designed conformably to the four-point Likert scale format (1-strongly disagree, 2-disagree, 3-agree, 4-strongly agree) where the respondents checked the numbers corresponding to their perceptions. The researchers analyzed the given data using frequency count, percentage, mean, and weighted wean.

III. RESULT AND DISCUSSION

1. Profile of Respondents

The data in Table 1showed that all of the respondent drivers are males accounting to 50 or 100% of the sample population (N=50). This is very logical since drivers of public transport are a male-dominated job. Meanwhile, data also showed that 25 or50% of the respondent drivers are driving buses while another 25 or 50% are jeepney or XLT drivers. The average years of driving experience is 15 years, while the average monthly income is 20,500 pesos.

Table.1: Demographic Profile of Respondent Drivers

Type of Vehicle	N	Gender Male/Female	Average Age	Average Years of Driving Experience	Average Monthly Income (Php)
Bus Drivers	25	25/0	45	18	24,000
Jeepney/XLT Drivers	25	25/0	41	12	17,000
Overall	50	50/0	43	15	20,500

The data in Table 2, on the other hand, indicated that majority of the respondent passengers are male with a ratio of 27:23 to that of female comprising 100% of the sample population (N=50).

Table.2: Demographic Profile of Respondent Passengers

Type of Vehicle Usually Ridden	N	Gender Male/Female	Average Age
Passengers	50	27/23	32

2. Level of awareness of Drivers and Passengers

The summary of responses of respondent drivers and passengers on the questionnaires administered to them by the researchers about their level of awareness regarding road signs and markings were shown below:

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Question D1: *May maaayos at kumpletongmga road signs at markings sa Daang Maharlika (The road signs and markings in Maharlika Highway are well and complete)*. An overall weighted mean of 2.76 or Agree was obtained.

Question D2: Ang mga drayber ay nauunawaan ang mga kahulugan ng mga palatandaan at marka ng daan *road signs & markings (The drivers understand the meanings of road signs and markings)*.An overall weighted mean of 2.60 or Agree was obtained.

Question D3: *Ang Mga drivers ng pampublikong transportasyon ay mahigpit na sumusunod sa mga road signs & markings (The drivers strictly follow the road signs and markings)*.An overall weighted mean of 2.44 or Disagree was obtained.

Question D4: *Ang Mga Ordinaryong Pasahero ay may sapat nakaalamanpatungkolsamga road signs & markings (The passengers are well versed about the road signs and markings)*.An overall weighted mean of 1.98 or Disagree was obtained.

Question D5: *Bukodsamga drivers, kailangan din magingedukadoangmgaordinaryongpasaherosamga road signs &markings parasa mas ligtas at maayosnapaglalakbay (Aside from the drivers, the passengers needed to be educated in the road signs and markings for safety travel)*.An overall weighted mean of 3.10 or Agree was obtained.

Question D6: *Angmga drivers ay mag-aalinlangannalumabagsabatastrapiko o samgaisinasaadnababalangmga road signs & markings kung may kaalamanangmgapasaherosanasabingpaksa (The drivers will be afraid to violate the rules if the passengers are knowledgeable about the rules about road signs and markings)*.An overall weighted mean of 2.70 or Agree was obtained.

Question D7: *Nakakatulong Sa Mas ligtas na paglalakbay ang mga road signs & markings (Road signs and markings are beneficial for safety travel)*. An overall weighted mean of 3.62 or Strongly Agree was obtained.

Question D8: *Angmga road signs & markings aynakakapagbigayngmaagangbabalalalonasamgalugarnam adalasangsakuna (Road signs and markings are very helpful to drivers to prevent accidents)*.An overall weighted mean of 3.50 or Strongly Agree was obtained.

Question D9: *Sagabi at madilim, nakakatulongsamaayosnapaglalakbaylalonasapag-aninagngkalsadaangmga road signs & markings (Road signs and markings are very beneficial to drivers to travel safely even at night)*.An overall weighted mean of 3.62 or Strongly Agree was obtained.

Question D10: *Naniniwalaakonaangisasamgadahilanngmgaaksidentesa Daang Maharlika ay bunsodnghindipagsunodsamgaroad signs & markings (The violations of the drivers regarding road signs and markings are the reasons why there are accidents in Maharlika Highway)*. An overall weighted mean of 3.38 or Strongly Agree was obtained.

3. Direct Observation

The researchers observed while travelling Maharlika Highway from Cabanatuan City to San Jose City that some portion of the road were missing road markings which is an important part of road that identify appropriate lane while driving. Also some of the road signs were hidden by tree branches.The reflectors of the signage were not visible and some were destroyed. Some of the additional observation of the researchers, were most of the drivers were not mindful of the use of the overtaking lane and non-overtaking lane.

IV. CONCLUSIONS AND RECOMMENDATIONS

In view of the above findings, the following conclusions are drawn:

1. Drivers were aware and knowledgeable about road signs and markings along Maharlika Highway as well as the safety features that it provides. On the contrary however, drivers thought that rules and regulations regarding road signs and markings were not strictly followed;
2. Passengers on the other hand were not very much aware of road safety features like road signs and markings. Theyrely much on the capability of drivers since they think that drivers strictly followed rules and regulations regarding road signs and markings;
3. Drivers perceived that passengers were not mindful of road signs and markings as well as the safety and protection that it provides. The drivers and passengers agree in unison that passengers' knowledge on road signs and markings will induce driversto drive properly and strictly follow regulations knowing that

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their passengers were knowledgeable about road safety;

4. Drivers and passengers also believe that most of the accidents along Maharlika Highway were caused by non-adherence to road signs and markings; and

5. Road signs and markings along Maharlika Highway particularly between San Jose City and Cabanatuan City were incomplete and needs constant maintenance.

Based on the above findings and observations, it is recommended that lead government agencies like Department of Transportation (DOT), Department of Public Works and Highways (DPWH), Department of Education (DepEd) and other concerned government units conduct information campaign regarding road signs and markings targeting not only drivers but passengers as well to be able to make accurate decisions given available information [13] to have safer roads and minimize road accidents. The DepEd can also include in its curriculum or program of instruction a sort of road safety education so that students at their early age can be informed about road signs and markings, thus institutionalizing the learning about the said subject.

Likewise, it is also recommended by the researchers to study and explore the performance [14] in drivingof drivers and have a thorough inspection of theircapabilities to understand road signs and markings for safety travel along Maharlika Highway.

Additionally, a thorough inspection of road signs and markings alongMaharlika Highway particularly between the cities of San Jose and Cabanatuan be conducted. It is also a must for the national agency like Department of Public Works and Highways (DPWH) to monitor and maintain areas along Maharlika Highwayon maintenance and improvement of road markings and signages that shielded by tree branches. Also the Land Transportation Office (LTO) being the one responsible on releasing every driver's license must be strict enough on educating every driver on the significance of road markings/signages on their everyday driving.

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Prevalence of Electricity Power theft in Nueva Ecija II Electric Cooperative, inc. (NEECO-II)-Area 2

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Abstract— *This research focused on the prevalence of electricity power theft in areas covered by NEECO II-Area 2. The data from the Special Energy Recovery Group (Apprehension Group) revealed that there were 386 apprehended electric pilferers from 2014-2016 and that the towns of Sta. Rosa and San Leonardo recorded the highest number of consumers and also have the highest number of electric pilferers as compared to other towns covered by NEECO II – Area 2.*

Among all the types of electric theft, the jumper is the most prevalent in areas covered by NEECO II – Area 2 from 2014-2016. Based on data available, the towns of Sta. Rosa registered the highest number of electric power theft by means of jumper (91) and illegal connection (30), followed by the town of Gen. Tinio (42), San Leon ardo (32), Peñaranda (32), Bongabon (23), Gen. Natividad (16) and the rest of the towns are minimal in number. By comparing the total number of electric power theft regardless of its type, the year 2014 registered the highest number of violators (173) and significantly decrease in the year 2015 and 2016 (119 and 95, respectively) and up to August 2017 (39).

Based on the computation from the Special Energy Recovery Group (Apprehension Group) and that of the Finance Department, the total non-technical losses occurred from 2014-2016 was 6.50 % and it is equivalent to P81,464,791.83 or on the average P2,292,910.88 per month. Losses can be even higher because the actual non-technical losses cannot be easily detected, meaning the apprehended party might consume higher than the average consumption because as being said, it is electric theft.

Keywords— electricity, direct hooking, non-technical loss, consumers, losses.

I. INTRODUCTION

In many countries, including the Philippines, electric system loss is common and comprise of three components: the administrative loss, the technical loss, and the non-technical loss. The latter constitute the electricity theft, which includes jumper/illegal connection (direct hooking), meter tampering (injecting foreign element into the electric meter and physical obstruction).

Electricity theft is the use of electrical power without the knowledge of the supplier with total or partial used by passing a metering system or such as interfere this system in the way to adulterate its measurements. The electricity theft by a consumer essentially bears some risk of being detected and be fined. It is a criminal practice and is punishable by law.

The financial losses are critical to many electric power organizations [1]. Electricity theft in effect deteriorates the financial condition of the electric utility provider, curtails new investments for capacity development that eventually leads to electricity shortage. But, the financial loss is high due to a large amount of electricity distributed [1]. Huge losses adversely affect the utilities' profitability and consequently, the quality of service it provides to its consumers. The losses include technical, non-technical and that mainly constitutes electricity pilferage and theft. The financial loss due to electricity theft accounts for a considerable and valuable amount, which can result in debt and hurts future investment for capacity additions. Such losses can be used for other operation by the electric utility provider. An effort is needed to prevent electricity theft by restricting dishonesty among utility employees and consumers.

Electricity theft is an economic issue for the electricity company due to the unbilled revenue of consumers who

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commit such action. In a regulated scenario, the company needs to fit within the laws of a regulatory agency and the loss of revenue is a problem that can compromise the compliance with regulatory targets and business efficiency [2].

Moreover, with the number of cases of energy theft on the increase, isn't just a matter of monetary theft, but can have detrimental consequences for the building's occupants, increasing the risk of electrical fire, gas leaks and explosions [3].

In the Philippines, although there is a law about the pilferage of electricity and theft of electric power transmission lines/materials(R.A.7832)[4], the prevalence of pilferage is very evident in most of the towns and municipalities.

That is why this study was conducted. The researchers who are engineers want to investigate the prevailing concerns of electricity theft in the Nueva Ecija II Electric Cooperative, Inc. – Area 2 (NEECO II – Area 2) located at Nueva Ecija, Philippines. It isan electric power provider of 10 municipalities and one chartered city. It covers the towns of Sta. Rosa, San Leonardo, Peñaranda, Gen. Tinio, Bongabon, Rizal, Llanera, Gen. Natividad, Laur, Gabaldon and the City of Palayan. NEECO II-Area 2 coverage area is composed of ten (10) municipalities and one (1) chartered city and is divided into three (3) Zones. Zone I is composed of the municipalities of Sta. Rosa, San Leonardo, Gen. Tinio, and Penaranda. Zone II is composed of the City of Palayan and towns of Bongabon, Laur and Gabaldon while Zone III is composed of the municipalities of Rizal, Llanera and Gen. M. Natividad. It is under the supervision of National Electrification Administration (NEA) and has currently 105,785 consumers and was established during the early '90sunder the name of National Electrification Management Team(NMT) and in November 2004changes its name to NEECO II-Area 2 [5].This research focused on three-year (2014-2016) electric theft in NEECO II-Area 2. It described the prevalence and types of electricity theft among the different towns covered by NECCO II- Area 2 as well as recommendations to avoid electric theft within the service areas.

II. METHODOLOGY

For practical and valid reasons, the researchers used the mixed approach to research combining in one study two research strategies, namely: a survey (quantitative) and process documentation (descriptive). According to [6], the purpose of survey research is to "generalize from a sample to a population so that inferences can be made about some characteristic, attitude or behavior of this population." In addition to the survey, the researchers used process documentation (PD). According to Korten (2008), as cited by [7],"PD is a collection of available data on a project to provide learning and to check objectives, to set working methods, to develop a monitoring system and human resource development planning."

The researchers used records available in the Customer Services Department, Technical Services Department, Finance Services Department, Special Energy Recovery Group (Apprehension Group) in data collection for the quantitative aspect of the study.

The respondents who were interviewed were chosen purposively based on the following criteria [8]: they were technical manager who manages the day to day operation of the cooperative regarding technical matters; finance division chief who was tasked to oversee the financial matters of the cooperative; the chief of consumer services division who in-charge with customer-related concerns; and the head of Special Energy Recovery Group and its personnel who were tasked to look into the violations committed by the offenders.

To determine the total number of electric consumers in every town covered by NEECO II- Area 2, the list was taken from the Consumer Services Department of NEECO II – Area 2 in San Leonardo, Nueva Ecija. For the socio-demographic profile of electric pilferers (question 2) the researcher used frequency count and percentages.

III. RESULTS AND DISCUSSION

Based on the records available from the Customer Services Division, there are105,785 consumers as of August 2017 from the ten towns and one city covered by NEECO II – Area 2.

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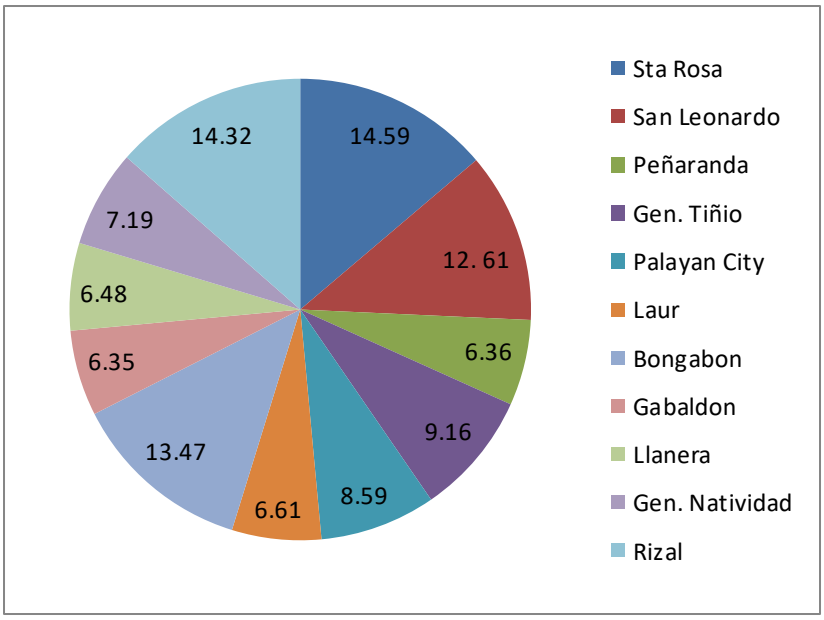

Fig.1: Total number of NEECO II – Area 2 consumers as of August 2017

Based on the data presented above, the towns of Sta. Rosa and Rizal comprise the largest number of consumers (14,594 and 14,325, respectively), followed by Bongabon (13,476), San Leonardo (12,615), Gen. Tiñio (9,166), Palayan City (8,597), Gen. Natividad (7,191), Laur (6,616), Llanera (6,481) Gabaldon (6,359), and Peñaranda (6,366).

Table.1: Total Number of Consumers of NEECO II- Area 2 from 2014-2016

Year	2014	2015	2016
Electric Consumers	95,471	99,023	102,937

Based on the data above, the total number of consumers' difference in 2015 against that of 2014 is 3,552 and 3,914 in 2016 against that of 2015. As shown in Table 2, data from the Special Energy Recovery Group (Apprehension Group) revealed that there were 386 apprehended electric pilferers from 2014-2016 and are as follows:

Table.2: Total Number of Apprehended Electric Pilferers

NEECO II Area 2 Coverage Area	**Year**			**Apprehended**
	2014	**2015**	**2016**	
Sta. Rosa	74	38	20	132
San Leonardo	23	25	36	84
Gen. Tinio	19	12	12	43
Peñaranda	18	21	3	42
Bongabon	11	9	12	32
Gen. Natividad	11	5	0	16
Palayan City	4	2	9	15
Rizal	6	2	2	10
Laur	3	1	1	5
Gabaldon	3	2	0	5
Gen. Llanera	1	1	0	2
Total				**386**

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The towns of Sta. Rosa and San Leonardo recorded the highest number of consumers but also registered the highest number of electric pilferers (132 and 84, respectively) as compared to other towns covered by NEECO II – Area 2. It is being followed by the towns ofGen. Tinio (43), Peñaranda (42), Bongabon (32), Gen. Natividad (16), Palayan City (15), Rizal (10), Laur (5) Gabaldon (5), and Gen. Llanera (2). The towns which are located on the southern part of Nueva Ecija (Sta. Rosa, San Leonardo, Gen. Tinio, and Peñaranda) recorded the most number of electric pilferers while the eastern towns and city of Nueva Ecija (Bongabon, Gen. Natividad, Palayan City, Rizal, Laur, Gabaldon, and Gen. Llanera) recorded the least number of electric pilferers.

Table.3: Different types of electric thefts in areas covered by NEECO II- Area 2 from 2014-2016 as compared up to August of 2017.

NEECO II Area 2 Coverage Area	Types of Electric Pilferage Violations	Year				
		2014	2015	2016	SubTotal	2017
Sta. Rosa	Jumper/illegal connection (direct hooking)	68	33	18	119	8
	Suspended neutral	5	3	3	11	0
	Tampered meter	0	2	0	2	1
	Illegal grounding	1	0	0	1	0
San Leonardo	Jumper/illegal connection (direct hooking)	19	15	15	49	6
	Suspended neutral	3	3	2	8	0
	Tampered meter	0	7	19	26	0
	Illegal grounding	1	0	0	1	0
Gen. Tinio	Jumper/illegal connection (direct hooking)	18	12	12	42	0
	Suspended neutral	1	0	0	1	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Peñaranda	Jumper/illegal connection (direct hooking)	16	19	3	38	2
	Suspended neutral	2	2	0	4	0
	Tampered meter	0	0	0	0	1
	Illegal grounding	0	0	0	0	0
Bongabon	Jumper/illegal connection (direct hooking)	11	9	3	23	20
	Suspended neutral	0	0	1	1	0
	Tampered meter	0	0	8	8	0
	Illegal grounding	0	0	0	0	0
Gen. Natividad	Jumper/illegal connection (direct hooking)	11	5	0	16	0
	Suspended neutral	0	0	0	0	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0

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Palayan City	Jumper/illegal connection (direct hooking)	3	2	8	13	1
	Suspended neutral	1	0	1	2	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Rizal	Jumper/illegal connection (direct hooking)	6	2	2	10	0
	Suspended neutral	0	0	0	0	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Laur	Jumper/illegal connection (direct hooking)	3	1	0	4	0
	Suspended neutral	0	0	0	0	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Gabaldon	Jumper/illegal connection (direct hooking)	3	2	0	5	0
	Suspended neutral	0	0	0	0	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Gen. Llanera	Jumper/illegal connection (direct hooking)	1	1	0	2	0
	Suspended neutral	0	0	0	0	0
	Tampered meter	0	0	0	0	0
	Illegal grounding	0	0	0	0	0
Total		**173**	**118**	**95**	**386**	**39**

Among all the types of electric theft, jumper/illegal connection (direct hooking) is the most prevalent in areas covered by NEECO II – Area 2 from 2014-2016. Based on data available, the towns of Sta. Rosa registered the highest number of electric power theft by means of jumper or direct hooking (119)followed by the town of San Leonardo(49), Gen. Tinio (42), Peñaranda (38), Bongabon (23), Gen. Natividad (16) and the rest of the towns are minimal in number.

By comparing the total number of electric power theft regardless of its type, the year 2014 registered the highest number of violators (173) and significantly decrease in the year 2015 and 2016 (118 and 95, respectively) and up to August 2017 (39).

Table.4: Percentage of Non-Technical Losses from 20014-2016

Year	% Non-Technical Loss from 2015-2016	
2014	2.1	6.50%
2015	2.4	
2016	2.0	

Based on the computation from the Special Energy Recovery Group (Apprehension Group) and that of the Finance Department, the total non-technical losses occurred from 2014-2016 was 6.50 % and it is equivalent to P81,464,791.83 or on the average P2,292,910.88 per month. Losses can be even higher because the actual non-technical

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losses cannot be easily detected, meaning the apprehended party might consume higher than the average consumption because as being said, it is electric theft.

Table.5: Comparison of Revenue, Expenses and Income of NEECO II- Area 2 from 2014-2016

	2014	2015	2016
Sales	1,202,456,000.00	1,386,144,989.00	1,147,286,805.00
Expenses	1,189,223,159.00	1,385,963,610.00	1,128,566,580.00
Income	13,232,841.00	181,379.00	18,720,225.00

Considering the number of consumers from 2014-2016, there was a significant increase in the sales of the utility by electric power provider. However, as compared to the income of 2015 it is significantly lower because Nueva Ecija was struck by typhoon Lando sometime in October 2015. Majority of the sales were allotted for the rehabilitation of lines in areas covered by NEECO II-Area 2. If the damaged power lines are not rehabilitated on time, the service and supply of electricity among consumers will not be made possible. Thus, it will result in more financial losses on the part of the company. As compared to the three years operation, the year 2016 earned the highest income because it is attributed to the increase in several consumers and a significant decrease in the number of electric power theft incidence as shown in Tables 1 and 3, respectively.

If electric power theft continues, losses amounting to millions of pesos, it can be said that primarily, the quality of operational efficiency among its consumers by the utility provider is being compromised. Also, administrative efficiency, human resources development (trainings/skills acquisition), operation and maintenance as well as rehabilitation of power lines, etc.,are at stake.

If the non-technical may persist, the consumers, as provided by RA 7832 (Sec.12), and under its implementing rules and regulations (IRR), allow private distribution utilities and rural cooperatives to retrieve their electricity costs as part of their system loss. In short, the honest consumers will be the one to shoulder the actual system losses being committed by apprehended electric pilferers. Though electricity theft can be minimized by upgrading the facilities of the utility distributor, the consumers will be the one to shoulder a high rate of electric charges (billing).

IV. CONCLUSIONS AND RECOMMENDATIONS

The towns of Sta. Rosa and Rizal comprise the largest number of consumers followed by Bongabon, San Leonardo, Gen. Tiñio, Palayan City, Gen. Natividad, Laur, Llanera, Gabaldon, and Peñaranda. The data from the Special Energy Recovery Group (Apprehension Group) revealed that there were 386 apprehended electric pilferers from 2014-2016 and that the towns of Sta. Rosa and San Leonardo recorded the highest number of consumers but also registered the highest number of electric pilferers as compared to other towns covered by NEECO II – Area 2.Among all the types of electric theft, the jumper is the most prevalent in areas covered by NEECO II – Area 2 from 2014-2016. Based on data available, the towns of Sta. Rosa registered the highest number of electric power theft by means of jumper (91) and illegal connection (30), followed by the town of Gen. Tinio (42), San Leonardo (32), Peñaranda (32), Bongabon (23), Gen. Natividad (16) and the rest of the towns are minimal in number. By comparing the total number of electric power theft regardless of its type, the year 2014 registered the highest number of violators (173) and significantly decrease in the year 2015 and 2016 (119 and 95, respectively) and up to August 2017 (39).

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Due to the high prevalence of electric theft in the town of Sta. Rosa and San Leonardo, the following are being recommended: installeither smart meter or pre-paid meter in barangays where there is a high registry of apprehended electric pilferers. This can be done on a staggered basis and should be included in the rehabilitation program of NEECO II. Strict implementation of R.A. 7832 should be imposed. Likewise, it is also recommended by the researchers to study, compare and explore the performances [9] of

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different NEECO Areas regarding their programs in stopping electricity theft from being able to make accurate decisions given available information [10] to have a much more effective plan in preventing electricity pilferage in Nueva Ecija.

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Acquired Knowledge, Skills and Abilities of Graduates of Business Administration of Graduate Education of Neust

Delilah Pangilinan, Arriane Garcia Juan, Marilou Pascual, Mercedes Santos, Richard Simangan

Abstract*— *This study was done to find out the current employment status of graduates after acquiring Masteral and Doctorate in Nueva Ecija University of Science and Technology for A.Y. 2013-2019. It also described the school- and work-related factors which might affect their employability after getting the degree from NEUST. It also assessed the extent by which work knowledge, skills and abilities thru education have bearing with their current work. Findings showed that the majority of graduates were employed and got promoted. They studied the course primarily for professional advancement, as an institutional requirement and gain management skills. Entrepreneurial and problem-solving skills were the foremost competencies acquired from school. They also found very important the teacher communication skills, professionalism and mastery of the subject to be very relevant too in their education.

***Keywords*— knowledge; skills; abilities; Graduate Education.**

I. INTRODUCTION

A tracer study is a research that involves tracing the alumni of an institution to find the alumni's current situation, and how the knowledge they attained helped them in their daily lives and the skills enhanced from the education they were given [1].In addressing the emerging and complex nature and challenges of the 21st century, higher education stands out as one of the major keys to cope with reforms. Through its essential functions of instruction, research, extension and production, higher education makes-up a vital and strategic part in development [2]. Tracer study can also be used in evaluating the results of their education because it reviews the transition between the educational and the professional world, how high a position in the work place they can attain the worth of the condition of educational institution of their career [1].Recognizing the reality in today's academic world, the role of higher education institutions can not only be limited to impart knowledge, but also to contribute to maintain a competitive economy and most important of all, to secure the dream of graduates to get jobs and become socially recognized and successful in their respective field of endeavors. On the other hand, one of the major factors for underemployment and the difficulty in finding jobs is the inability of graduates to meet the necessary skills and competencies required by the industry [3]. Master of business administration (MBA), a masteral degree in business administration can be achieved at a university or college that provides theoretical and practical training to help graduates attain a wider understanding in the functions of general business management. The MBA degree has different focuses such as accounting, finance, or marketing. While the Doctorate in philosophy (Ph.D.) in business addresses substantial accounting issues with theories and methods. In this study, the respondents are the graduates of Nueva Ecija University of Science and Technology A.Y. 2013-2019. The goal of the Master of Business Administration (MBA) program is to add value to the graduates andprovides them with certain competencies to make them better managers and leaders [4].It has assisted participants in developing basic management and administration skills [5]. This is seen in increased managerial skills, self-confidence and several aspects of career development [6].

II. OBJECTIVE OF THE STUDY

This tracer study aimed to trace the graduates of MBA and Ph.D. in Business Administration programs from Nueva Ecija University of Science and Technology Graduate School on 2013-2019. The objective of this study aimed to describe the profile and current employment of MBA and

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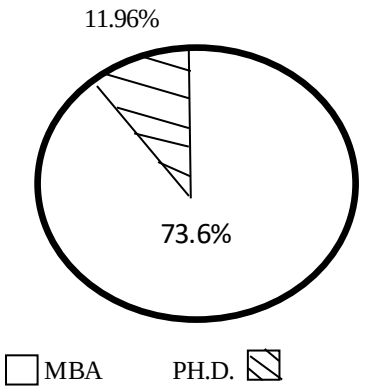
Ph.D. graduates. Determined the school-related factors that affect the graduate's employability and promotion [3].

III. RESEARCH METHODOLOGY

Research Method. Descriptive research design was used to trace the graduate's employability and employment status, and the impact of acquired knowledge, skills and abilities of the respondents who were chosen purposively based on the following criteria [7]:They have finished their Master of Administration and Doctor of Philosophy in Nueva Ecija University of Science and Technology Graduate School during 2013-2019.Out of the total 125 graduates, 92 or 73.6% were surveyed. They are broken down as follows: The figure 1 shows that 92 of respondents were equivalent to 100%, MBA graduates got a total number of 81 or 88.04% and Ph. D. respondents consist of 11 or 11.96% were able to finish the course.

Figure 1. Distribution of Educational Attainment of Respondents, 2013-2019



Instrument. The main instrument used in the study was a questionnaire with an unstructured interview, the educational background, employment history, and the checklist as follows; reasons why the respondents decided to study at NEUST, competencies and skills attained from school to job placement of the respondents.

Procedure. Names of the graduates from 2013-2019 were obtained from the office of registrar of Nueva Ecija University of Science and Technology. The said questionnaire was personally distributed by the researchers to the respondents.

Data Analysis. The collected data were categorized, tabulated and coded for analysis. The following statistical tools were employed using frequency and percentage.

IV. FINDINGS

The data gathered from the respondents about the research objectives are as followed.

Table 1. Status of employment

Response	Frequency *f*	Percentage (%)
Employed	83	90
Self-employed	9	10
TOTAL	92	100%

The table shows the frequency distribution of the respondents that 90% were employed, while the other 10% were engaged in another line of business. It shows that the majority of them were employed in the past.

Table 2. Frequency Distribution of the Respondents According to their Occupational Classification

Occupational Classification	f	%
Entrepreneur	9	9.78
Private Agency	21	22.83
Government Agency	62	67.39
Total	92	100

The table 2 shows that the frequency distribution of the Respondents according to their occupational classification. Out of 92 respondents, 67.39% were in the government, while 22.83% were in the private agency and 9 or 9.78% were entrepreneurs.

Table 3. Past Employment History of the Respondents

Status	Present	
	f	%
Contractual	30	36.14
Permanent	53	63.86
Total	83	100

Table 3 shows that the contractual status decreased from previous to current employment, while those regularly employed retained the employed and at the same time promoted in work.

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Table 4. Distribution of the Respondents According to their Present Employment

Present status	f	%
Regular/Permanent	48	57.83
Contractual/Temporary	26	31.33
Self-employed	9	10.84
Total	83	100

More of the Respondents were in temporary status and the rest of them were either regular or permanent and there some who practiced their major in the field of business because of the experienced and more preferred.

Table 5. Distribution of the Respondents According to their income

Salary	f	%
P 10,000-below	2	2.41
P 10,001-above	72	87.80
Total	74	90.21

The bracket P10,001 - above salaries received by BSBA alumni could indicate that they are already in regular employment status. Only a few could be considered in managerial position above this scale. It could also signify competency (qualification) on the part of these graduates. Skills and experience play a vital role in one's promotion, according to respondents. According to Table 4, nine respondents are currently self-employed with no fixed income due to this, the nine respondents are not imputed in Table 5.

Table 6. Reasons Why Respondents Decided to Study at NEUST

Reasons	f	%
Professional Advancement	89	96.74
Institutional Requirement	71	77.17
Low / No Tuition Fees	64	69.57
Reputation of the School/ Training Institution	87	94.57
Referral by Co-Employees	31	33.7

Majority of the graduates' reasons were professional advancement, the reputation of the school/training institution, institutional requirement. It implies that graduates want to be more competitive in our society. Also, the graduates know that NEUST have good records and reputation in education and it trains the students to make accurate decisions given available information [8] which they can utilize in their workplace.

Table 7. Competencies/Skills Acquired from NEUST

Competencies/ Skills Acquired	f	%
Entrepreneurial skills	61	66.30
Conceptual skills	36	39.13
Managerial skills	73	79.35
Critical solving skills	78	84.79
Human relation skills	59	64.13
Information (technology) skills	48	52.17

The skills acquired in NEUST were found very useful. Skills include critical solving skills, managerial skills and entrepreneurial skills. The graduates became more creative and able to solve problems, formulate processes and understand the relationship between ideas, concepts, patterns, and symbols. Also, the graduates turned to be competitive, good managerial skills and can assume the risks in business aspects. These characteristics were very beneficial to the respondents since employers always like an employee that is skilled. Thus, this will help them to have a good and reliable source of income [9].

Table 8. School-related factors to the job placement

Relevance of school-related factors to job placement	Important		Very important	
	f	%	f	%
The teacher has good communication skills	14	15.22	78	84.79
The teacher has mastery of the subject	20	21.74	72	78.26
The teacher conducts himself/herself in a professional manner	6	6.52	86	93.48
Teacher relates subjects to the practical corporate situation	4	4.35	88	95.65

It is very interesting to note that on the relevance of school-related factors to job placement to be "very important" to the graduates focused on teachers; relates subjects to the practical corporate situation 95.65%, conducts himself/herself in a professional manner 93.48%, and teacher has a good communication skills 84.79%.

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V. CONCLUSION AND RECOMMENDATION

Majority of the respondents are gainfully employed.Their employment status improved from contractual to regular employment, coupled with work promotion.

Likewise, professional advancement, the reputation of the school/training institution and institutional requirements were the top reasons why they studied in NEUST.

Further, competencies/skills like critical solving skills, human relation skills and conceptual skills which they considered very useful.A school-related factor such as teacherrelates subjects to the practical corporate situation; teacher conducts himself in a professional manner and the teacher has a good communication skill, were considered very important by the respondents.

The finding shows the competitiveness of NEUST as an educational institution where faculty are qualified and competitive. The MBA-Ph.D. contributed much to the professional growth in the graduates' career. Nonetheless, a follow-up investigation to study and explore the performance [10] of the MBA and PH.D. graduates in their workplace was recommended by the researchers to further strengthen the findings of this research.

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Study of Radiation Interaction Mechanisms of Different Nuclear Detectors

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Abstract *— In this paper, an attempt has been made to describe the radiation interaction mechanisms of nuclear detectors. There are lots of radioactive detectors available in the field of radiation detection and measurements instruments/systems such as Geguier Muller (GM) Tube, Scintillation Counter, High Purity Germanium (HPGe) and so on. Each of these detectors have different and distinct radiation interaction mechanisms and detecting principle for processing each type of radiation measurement (qualititative and quantitative).The interaction mechanisms of these detectors are governed by generation of ions (positive and negative) in case of GM tube; the photo-electric effect, Compton scattering and pair production for Scintillation detector and HPGe along with diode principle. The special feature of this diode is a constant current generator depending on the energy of the photon deposition in the detector. The characteristics of these interaction mechanisms have been presented along with intensity of measurements, efficiency and detector resolution (FWHM).*

Keywords ***—Radiation Interactions, Radiation Measurements, Nuclear Detectors, Photo-electric Effect Compton Scattering and Pair Production.***

I. INTRODUCTION

Nuclear detectors are devices that convert the energy of a photon or incident particle into an electric pulse [1].These detectors fall into two categories: gross counters and energy sensitive. Gross counters count each event (gamma or neutron) emission the same regardless of energy. Energy sensitive detectors, used in radio-isotope identification devices (RIIDs), analyze a radioactive isotope's distinct gamma energy emissions and attempt to identify the source of the radiation [2]. Gamma rays and x-rays ionize the gas indirectly by interacting with the metal wall of the GM tube via the photoelectric effect, Compton scattering or pair production in such a way that an electron is "knocked" off the inner wall of the detector. The electric field created by the potential difference between the anode and cathode causes the negative member of each ion pair to move to the anode while the positively charged gas atom or molecule is drawn to the cathode. If the electric field in the chamber is of sufficient strength approximately 10^6 V/m these electrons gain enough kinetic energy to ionize the gas and create secondary ion pairs. The result is that each electron from a primary ion pair produces a cascade or avalanche of ion pairs [3]. When ionizing radiation enters a scintillator, it produces a fluorescent flash with short decay time. This is known as scintillation. In the case of gamma rays, this scintillation occurs as a result of excitations of bound electrons by means of free electrons in the scintillator. These free electrons are generated by following three mutual interactions photoelectric effect, Compton scattering or pair production. The probability of occurrence of such interactions depends on type of scintillator and the energy of the Gamma rays [4]. The purpose of an HPGe detector is to convert gamma rays into electrical impulses which can be used, with suitable signal processing, to determine their energy and intensity. All HPGe radiation detectors are either coaxial HPGe, well-type HPGe or broad energy HPGe (BEGe) just large, reverse-biased diodes. The germanium material can be either "n-type" or "p-type". The type depends on the concentration of donor or acceptor atoms in the crystal[5].

II. METHODOLOGY

2.1 Gamma Interaction Mechanism

Four major interaction mechanisms play an important role in the measurement of photons. These mechanisms are: photoelectric effect, coherent scattering, incoherent scattering and pair production. The photon energy of major interest for environmental spectrometry studies ranges between a few keV and 1500 keV. The term "low energy" will be used here for the energy range 1 to 100 keV, "medium energy" for energies between 100 and 600

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keV and "high energy" for energies between 600 and 1500 keV.

2.1.1: Photoelectric Effect

In the photoelectric effect, there is a collision between a photon and an atom resulting in the ejection of a bound electron. The photon disappears completely, i.e. all its energy, Ep, is transferred to the electron. The amount of energy, Ee, which is transferred to the electron can be calculated if the binding energy, Eb, of the ejected electron is known:

$$Ee = Ep - Eb \quad (1)$$

2.1.2: Coherent Scattering

In the coherent scattering process no energy is transferred to the atom. The electromagnetic field of the photon sets atomic electrons into vibration. The electrons then re-emit radiation of the same magnitude as the interacting photon and mainly in the forward direction. The cross-section for coherent scattering decreases rapidly with increasing photon energy. This process can be neglected for photon energies above 100 keV. The differential cross section per atom for this process as a function of scattering angle θ is written as follows:

$$\frac{\partial \sigma_{coh}}{\partial \theta} = \frac{Zr_0^2}{2}\left(1 + cos^2(\theta)\right)[F(x,Z)]^2 . 2\pi . \sin(\theta) \quad (2)$$

with the parameter x defined as:

$$x = \frac{\sin(\theta/2)}{\lambda} \quad (3)$$

Where r_0 is the classical electron radius, F(x, Z) is the atomic form factor and λ is the photon wavelength.

2.1.3: Incoherent or Compton scattering

In the incoherent or Compton scattering process, only a portion of the photon energy is transferred to an electron. The remaining energy appears as a secondary photon. The direction (scattering angle theta) and energy of the secondary photon, Ep', are related by the following equation:

$$E_p' = \frac{E_p}{1+\alpha(1-\cos(\theta))} \quad (4)$$

With α defined as

$$\alpha = \frac{E_p}{m_0 c^2} \quad (5)$$

Where m_0 is the rest mass for an electron and c the speed of light in vacuum.

2.1.4: Pair Production

The pair production mechanism only occurs for photon energies above 1022 keV. Here photons are converted to electron-positron pairs under the effect of the field of a nucleus. Since one electron and one positron are formed, the photons must have energies equivalent to at least two electronic masses (2 x 511 keV) and the excess photon energy is shared between the created electron and positron pair. The annihilation of the positrons produces two photons in opposite directions, each with 511 keV. The total cross-section for this process increases with energy above the threshold energy.

$$\sigma_{Total} = \sigma_{Photoelectric} + \sigma_{Pair\ Production} + \sigma_{Coherent\ Sc.} + \sigma_{Incoherent\ Sc.} \quad (6)$$

The total probability of interaction per unit path length for a photon is proportional to the sum of the total individual cross-sections [6].

2.2: Detector Bias Power Supply

Generally it is a high voltage power supply with enough current capacity to feed the detector without any loose in regulation. The ripple should be less than 100 mV. For stable operation of the detector in any measurement system, it needs bias voltages ranges from 400-1000V for GM Tube; 1000-3000V for Scintillation and 3000-5000V for HPGe.

2.3: Count Rate Consideration

Generally, a γ-radiation from a ^{60}Co source is specified to characterize the almost all types of detectors. A source with an activity of around 37000 Bq (1 μCi) could be used. The choice of detector in any count rate application depends not only on the systemelectronics but also on the count rates. The count rate can be classified as below:

- Low — Below 100 cps
- High — Above 75,000 cps input rate
- Very High — Above 100,000 cps [5]

The GM tube is suitable for the first count rate; scintillation for the second and HPGe for low to very high.

2.4: Detector Sensitivity & efficiency

2.4.1: Sensitivity

The sensitivity, S, to γ- radiation is defined as the ratio of the number of counts per second, N, obtained and the exposure rate, X .

$$S = \frac{N}{X} \quad (7)$$

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Generally, it is specified for a Cobalt-60 source produces an exposure rate *X* in R/hr. The sensitivity can vary widely, between 0.2 cps/mR/hr and 240 cps/mR/hr, depending on the detector model [1].

2.4.2: Quantum efficiency and Collection efficiency

The photomultiplier tube output current Ip of NaI (T1) Scintillator is given by

$$I_p = \frac{N \times \eta \times \alpha \times \mu \times e}{\tau_s} \quad (8)$$

Where

N = Amount of light flash per event produced from scintillator

η= Quantum efficiency of photocathode (assumed to be 25%)

α= Collection efficiency of photomultiplier tube (assumed to be 90%)

μ= Gain of photomultiplier tube

e= Electron charge

τs= Decay time of NaI (TI)

From Eq. 2.4.2 Quantum efficiency of photocathode and Collection efficiency of photomultiplier tube can be derived as follows[4]:

$$\eta = \frac{I_p \times \tau_s}{N \times \alpha \times \mu \times e} \quad (9)$$

and

$$\alpha = \frac{I_p \times \tau_s}{N \times \eta \times \mu \times e} \quad (10)$$

2.4.3:Absolute efficiency

The absolute detector efficiency at that energy is calculated by dividing the net count rate in the full-energy peak by the decay corrected gamma-ray-emission rate of the standard source. Efficiency curves were constructed from these full-energy-peak efficiencies.

$$\varepsilon_{abs} = \frac{\text{Total number of counts recorded under the photo peak}}{\text{Total number of photons emitted by the standard sources}}$$

$$\varepsilon_{abs} = \frac{\text{cps experimental}}{\text{cps theoritical}}$$

$$\varepsilon_{abs} = \frac{\left(\frac{C}{S}\right)_{std} - \left(\frac{C}{S}\right)_{sample} - \left(\frac{C}{S}\right)_{BG}}{\left(\frac{C}{S}\right)_{theo} \text{Exp}\left(-\ln(2).\frac{t}{t_{\frac{1}{2}}}\right)} \quad (11)$$

$\left(\frac{C}{S}\right)_{std}$ Count of soil sample with standard solution, $\left(\frac{C}{S}\right)_{sample}$ Count of soil sample without standard solution, $\left(\frac{C}{S}\right)_{BG}$ Count of background, $\left(\frac{C}{S}\right)_{theo}$, Counting of gamma ray of used standard solution, t is the time of decay, $t_{1/2}$ is half-life of the radionuclide [7].

2.5: Detector Resolution

2.5.1:Scintillation Counting

There are two measurement methods available in Scintillation Counting. One is spectrum method and the other is counting method. In the spectrum method, pulse height discrimination is important to determine photopeaks produced by various types of radiation. This is evaluated as Energy Resolution or Pulse Height Resolution(PHR).

The energy resolution is defined by the following equation as shown fig.1.It is generally expressed as a percentage.

$$R = \frac{\Delta P}{P} \quad (12)$$

R= Energy Resolution

P= Peak Value

ΔP= FWHM (Full Width at Half Maximum) [4].

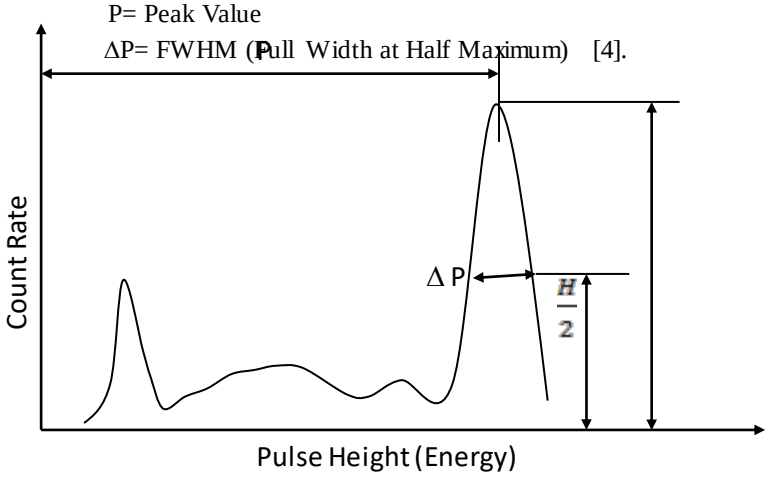

Fig.1: Definition of Energy Resolution.

2.5.2: High Purity Germanium (HPGe)

Energy resolution is the dominant characteristic of a germanium detector. Gamma-ray spectrometry using high purity germanium detector is enhanced by the excellent energy resolution which can help to separate and resolve various close energy gamma-ray peaks in a complex energy spectrum. The full width at half maximum of the full energy peak known as FWHM and sometimes referred as a measure of energy resolution. The units of FWHM are expressed in KeV for Ge detector and are defined at specific, characteristic full energy peaks associated with standard sources such as 662 KeV for a

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^{137}Cs source or 1332 KeV for a ^{60}Co source. The energy resolution of the germanium detector can affected by the number of electron-hole pairs created in the detector, incomplete charge collection and electronic noise contributions. The effect of these three factors depends on the properties of the detector and the gamma-ray energy [8].

2.6: Discussion

The radiation interaction mechanisms for Geguier Muller (GM) Tube, Scintillation Counter, High Purity Germanium (HPGe) detectors have been presented in this study. Although these three different nuclear detectors having different operating principles and specific applications but the four major interaction mechanisms viz. photoelectric effect, coherent scattering, incoherent scattering and pair production dominate the detection process.

And these interaction mechanisms have been described in sub-section 2.1.The detector bias power supply for these three detectors also vary chronologically from 400V to 5000V as shown in sub-section 2.2 .In case of count rate consideration for the same detectors, HPGe would be the superior with respect to two others. According to sub-section 2.3, this detector is suitable for both low to very high energy gamma rays, the GM Tube is at the bottom and scintillation counter stands in between position of them. Regarding performance evaluation, the GM tube belongs to sensitivity rather than efficiency

but the terminology 'efficiency' goes well with the rest of two detectors. Quantum efficiency of photocathode and Collection efficiency of photomultiplier tube are important for scintillation counter. The absolute detector efficiency of HPGe is important than intrinsic or relative efficiency.

III. CONCLUSION

An elaborate study of radiation interaction mechanisms of different nuclear detectors like GM tube, Scintillation counter and HPGe have been presented in this research. Moreover, range of detector bias voltages and count rate considerations from low to very high energy also have been presented sufficiently. Detector sensitivity and efficiency have been discussed as well. The study would be helpful hints for the design and detecting principle of nuclear detectors.

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Status of Agricultural Food Sector: Basis for A Proposed Continuity Plan

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Abstract— *This study described the status of agriculture in the province of Nueva Ecija. It determined the current situation of the farming business in Nueva Ecija in terms of agricultural land use, its statistical profile on agriculture, crops grown by cities and municipalities and the presence of support agencies in maintaining the continuous development of farming and other forms of agriculture therein.*

Based on its agriculture profile, land, mostly irrigated shares the biggest portion in terms of its usage for food production. Rice, corn, onion and tomatoes are the major crops being grown in cities and municipalities. Findings revealed that rice and corn share the biggest in domestic consumption.

For support agencies, bank and business agencies are found in support for farmers while the government mostly provides seminars. It was also revealed that other seeds for crops are introduced as a farmer's option and lesser in choosing for an investment in their income. As their contingency plan, farmers opt to sell and engage in driving rather than farming during lean months. Pest attacks constitute the main problem encountered by farmers, while seeding management is a priority.

The above findings point to certain sustainability that requires improvement and a continuity plan to match up with the continuous supply of goods from the farms to the demands of an increasing population for its consumption.

Keywords— ***Agriculture profile, continuity plan, farming business, production and consumption, sustainable agriculture, support agencies .***

I. INTRODUCTION

Sustainability is considered in the agricultural sector is a vital component in our country's economics and labor. Based on the statistical data provided by the Philippine Statistics Authority in 2018, "agriculture grew by 1.80 % in the fourth quarter of 2018. Crops, livestock, poultry and fisheries contributed to the higher production during the quarter. At current prices, the gross value of agricultural production amounted to PhP 521.2 billion, higher by 4.05 % than the previous year's level". From January to December 2018, agricultural production increased by 0.56 percent. Crops production slightly increased by 0.25 percent. It accounted for 50.40% of the total agricultural output"[1].

Studying agriculture sustainability is very important. "Sustainable agriculture frequently encompasses a wide range of production practices, including conventional and organic. A regionally integrated system of plant and animal production practices are designed to produce long-term results such as a .production of sufficient human food, feed, fiber, and fuel to meet the needs of a sharply rising population; b. protection of the environment and expansion of the natural resources supply; and c.sustainment of the economic viability of agriculture systems [2].

In the Philippines, Nueva Ecija, which is one of the agricultural provinces in the country is considered as the "Rice Granary of the Philippines" because of its endless farms dedicated to producing rice. It also has lands that produce other crops such as onion, mango, calamansi, banana, garlic, and different types of vegetables [3]. This farming business in the province aims to alleviate the poverty of the farmers and their families.

However, poverty in the province is not reduced through farming business solely as several lands are instead being devoted to some other business purposes such in manufacturing and textile industries. In Cabanatuan, one of the big cities in Nueva Ecija, the rise of subdivisions and conversions of agricultural lands for residential purposes have created a rippling effect as to its impacts on food security and supply.

Hence, a major concern of the researchers focuses on other factors affecting agricultural stability in the province and its cities to be able to make accurate and better decisions

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[4] regarding the life and working conditions of the farmers.

By this context, this study has been conceived. This research aimed to describe the current situation of the agriculture or farming business in Nueva Ecija and identify the problems in the production and consumption of the crops that farmers produced as a basis for a proposed continuity plan that can harmonize with the continuous operation and development of sustainable agriculture in the province.

This study also considers how families in the Nueva Ecija heavily rely on their income from the crops they grow, reap and sell in the local markets. Such sustainability, although confronted with other problems, still requires protection, support and monitoring. The support for farmers for production of crops at these times and as was in the past are continuously faced by some various concerns and issues, especially so that supply of water during dry spell or El Niño phenomenon and the conversions of lands for residential purposes affect the areas for cultivation of crops and other means of agricultural production. Each of which requires support and monitoring. Studying and exploring [5] certain factors that affect the day to day agricultural activities must be done to reconcile with the most appropriate solutions which aimed to reduce the difficulties [6] of the farmers in their farming business. A continuity plan is important. Much more than this, it requires a prospective view of how farming business fares in the cities and the rest of the province and how farmers live with the income they gain from agricultural activities.

To have sustainable agriculture, farmers need to increase soil fertility and improve land productivity in sustainable ways. This may include the appropriate use of fertilizers, planting different types of crops each season, and using techniques to avoid unnecessary plowing.

II. METHODOLOGY

The research method used in the study is a descriptive design. According to [7] descriptive theory is a set of propositions that attempts to describe something. Additionally, according to [8], as cited by the authors in [9] and [10], descriptive research systematically describes a situation, problem, phenomenon, service or program, attitude toward an issue or simply, it provides information on a subject.

The researchers have selected staff of the Office of the Provincial Agriculturist. Ten (10) farmers were chosen as respondents for the validation of other information relevant to the objectives of this study. This is done to complement other information not indicated in the profile of the agriculturists and also to serve as other resources of information for proposing a continuity plan.

The major instruments used to gather information and data were the researchers-made interview, questionnaire and questionnaire checklists.

The data gathered were all tabulated and analyzed by the researchers and explained after every table. Frequency analysis and percentage analysis were used. The most common responses or the modal frequency expressed in percentage was used to describe the responses of farmers as respondents.

III. RESULTS AND DISCUSSION

1. Agricultural Profile

1.1 Agricultural Land Use

Table 1. Present Land Use in Nueva Ecija (Area and Percentage)

Land Use	Area (has)	Percentage (%)
Agricultural Areas	276,741.50	50.25%
Forest Land	123,412.50	22.41%
Grazing and Pastures	65,354	11.87%
Others (Institutions/open space)	50,410	9.15%
Residential and Commercial	30,514	5.54%
Freshwater swamps and fishpond area	4286	.78%
Total Land Area	**550,718**	**100.00%**

Table 1 shows the provinces' total land area is 550,718 hectares. The biggest portion or 50.25% are being utilized as agricultural land with an area of 276, 741.50 hectares, more or less. The remaining 49.75% or 273,976.50, more or less, are distributed to forest land, grazing and pasture, freshwater swamp and fishpond, residential, commercial and institutional land and open space/area.

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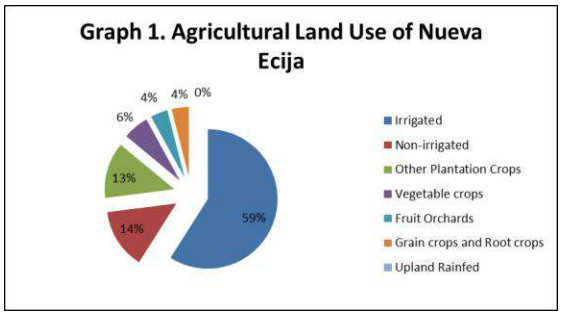
1.2 Agricultural Statistical Profile

Graph 1. Agricultural Land Use of Nueva Ecija
(Source: Provincial Agriculturist, 2018)



The graph shows that the total Agricultural land area of the province is 276,741.50 hectares. Paddy areas dominate the agricultural land use with a total irrigated land area of 162,311.55 and non-irrigated 37,622.90 hectares respectively. The remaining areas are devoted to vegetables (17,621 hectares), fruits orchard (11,000 hectares), other plantation crops (36,346 hectares), other grain crops and root crops (10,946 hectares). While the remaining, 894.05 are upland rainfed, wetland and unclassified areas [11].

1.3 Crops Grown by Cities and Municipalities

Its agricultural production covers an area of about 298,742 hectares of fertile lands that are nourished by the Great Pampanga Rivers and its many auxiliaries [12]. Most of the crops grown by city or municipalities are Palay (rice/cereal grain). Each and every city and municipalities are planting and producing palay. Other crops grown are Ampalaya (Bitter gourd), Talong (Eggplant), Kamatis (Tomato).

Table 2. Nueva Ecija Agriculture Profile
(Source: Philippine Statistics Authority, 2019)

AGRICULTURE	2017	2018
Top five agricultural crops		
Palay		
Area (harvested/hectares)	260,633	309,006
Production (metric tons)	1,435,624	1,664,736
Corn		
Area (harvested/hectares)	77.25	8,018.94
Production (metric tons)	498.78	49,090.84
Onion		
Area (planted/hectares)	11,003.6	9,206.08
Production (metric tons)	137,681	77,550
Garlic		
Area (planted/hectares)	58.89	274.106
Production (metric tons)	224.3	619.1437
Squash		
Area (planted/hectares)	1,272.01	1,021.06
Production (metric tons)	8,842.05	6,750.03

The table above shows the main agricultural products, majority of which are rice, onion, and squash. Aside from the top (5) crops grown in the province are amplaya (bitter gourd), talong (eggplant), and kamatis (tomato) [1].

Domestic Consumption

Rice and Corn

The provinces' annual per capita consumption of rice averaged 49.93 kilograms. By cities or municipalities, average yearly per capita consumption of rice ranged from 38.12 kilograms to 40.68 kilograms.

Corn consumption in the province was estimated at 0.26 kilogram per person a year. The biggest corn consumption was noted in Quezon at 0.46 kilograms.

By barangay classification, households residing in urban barangays had bigger per capita consumption of corn at 0.21 kilogram per year.

Vegetables, Legumes and Condiments

Across the province, the biggest yearly per capita consumption levels were noted in onion at 2.65 kilograms, eggplant at 2.32 kilograms, tomato at 1.24 kilograms, and ampalaya at 0.98 kilograms.

Fruits

The major fruits eaten in the region were banana at 4.04 kilograms and mango at 2.71 kilograms. Consumption of banana was 0.70 kilograms per person per year. The least consumed fruits were papaya at 0.43 kilograms and calamansi at 0.36 kilograms.

Table 3. Livestock Inventory
(Philippines Statistics Authority, 2019)

Top five livestock	2016	2017
Carabao	56,820	35,320
Cattle	30,666	30,323
Chicken	8,825,309	2,173,141
Duck	467,033	7,265
Goat	72,450	67,791

The table 3 shows the top 5 livestock inventory in Nueva Ecija. In 2016, the carabao has a total inventory of 56,820 and it decreased by 21,500 in 2017. In 2016, the cattle have

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a total inventory of 30,666 and it decreased by 343 in 2017. In 2016, the chicken has a total inventory of 8,825,309 and it decreased by 6,652,168 in 2017. In 2016, the duck has a total inventory of 467,033 and it decreased by 459,768 in 2017. In 2016, the goat has a total inventory of 72,450 and it decreased by 9,659 in 2017 [1].

In the urban barangays of Nueva Ecija, high consumption estimates were noted for pork at 16.46 kilograms and chicken meat at 15.64 kilograms. Per capita consumption of chicken egg across the province averaged 64 pieces per annum. Minimal consumption of duck egg was noted at an average of 2 pieces. Less than a liter of fresh/pasteurized milk was consumed per person annually.

1.4 Support Agencies in Maintaining the Continuous Development of Farming and Other Forms of Agriculture.

Table 4. Support Given by the Government

	No of Respondents	Percentage
Programs/Seminars	5	50%
Financial Program	1	10%
Agricultural Promotion	4	40%
TOTAL	10	100%

Table 4 shows that 50% of the respondents said that the government support the agricultural farming through programs/seminar while 1 respondent which was equivalent to 10% that government support through financial program and 40% of the respondents said that the government support through agricultural promotion.

Table 5. Agency that Gives Support to the Farmers

	No of Respondents	Percentage
Business Agency	4	40%
Commercial Agency	0	0
Bank Agency	6	60%
TOTAL	10	100%

Table 5 shows that 6 respondents which was equivalent to 60% said that bank agency gives support by the agency and 40% of the respondents said that business agency support by the agency. Business agency includes the provincial government through Rice Competitiveness Enhancement Fund (RCEF) while the Development Bank of the Philippines where the provincial capitol has standing credit line and support each provincial government's objective [13].

Other findings revealed that consumer support is lacking and somehow affects farming business, crop rotation is less practiced and use of organic fertilizer is gaining popularity through organic wastes or in combination of it with chemicals to maintain fertile farmlands. Use of pesticide is higher than the use of harvest bug as a method. Surveyed data also revealed that agricultural production is affected by a series of pest infestations, climate change causing livestock count to decrease, the economic trends on supply and demand, coupled with other factors such as temperature, altitude, rainfall, wind, soil type, market, capital and the availability of technology used in farming.

2. Problems in the production and consumption of agricultural crops.

Five villages in this northern Nueva Ecija municipality were placed under a state of calamity after armyworms, which were hatched by a certain kind of butterfly inside and quickly ate up the young leaves of onion, totally damaged nearly 450 hectares of crops [14].

The top five livestock production in 2018 decreased because of climate change. The price of the major commodity in Nueva Ecija is changing weekly. And it also depends on the production of agriculture foods, and the number one cause that affects the production is the weather condition like a typhoon. If there are typhoons the production is low and the price became high, according to the law of supply; if the price increases the supply also increases, and according to the law of demand; if the price decreases the demand increases.

Marketability of goods counts also as a factor. For any commercial farm to succeed there must be demand. If the demand for crop drops, then profits will fall. A more profitable one will then replace that crop. Lastly, capitalization and purchase of modern technology are also problems encountered by farmers.

3. Proposed Continuity Plan to harmonize with the continuous operation and development of sustainable agriculture in the province.

The researchers proposed continuity plans derived from the 72 ways to make Agriculture Sustainable by authors in [15]. The researchers gained some ideas and added other ways for the continuous operation and development of sustainable agriculture in the province of Nueva Ecija. The following can be adopted:

a. Conserve and create healthy soil

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b. Conserve water appropriately
c. Manage organic wastes and farm chemicals, so they don't pollute
d. Manage pest with minimal environmental impact
e. Select crops and animals adapted to the environment
f. Protect biodiversity (of domesticated animals, crops, native plants and aquatic life)
g. Conserve substitute resources
h. Increase profitability and reduce risk
i. Conduct seminars, trainings and workshops.

The researchers proposed a continuity plan to maintain sustainable agriculture by way of improving the production of crops and enhancing its variety adapted to climate change and its impacts. Irrigation should be continued and the government must do its fair share in financing the farmers and promoting local or domestic production. Since there has been a decrease on livestock production essential to the symbiotic relationship between the fertility of the soil and the so-called "beasts of burden" used in farmland cultivation, the government must also give its helping hand in propagating farm animals alongside with enriching the soil by organic manure. Also, the best quality of the goods in Nueva Ecija with the help of conserving and creating healthy oil, conserving water appropriately, managing organic wastes and farm chemicals, selecting crops and animals adapted to the environment, managing pest with minimal environmental impact, protecting biodiversity, conserving substitute resources, increasing profitability and reducing risk and also conducting seminars, trainings and workshops. To improve the sustainability of agriculture and the business in producing goods in Nueva Ecija such as crops, livestock, and rice. To support the farmers by providing agricultural equipment and motivating them by giving incentives.

IV. CONCLUSION

Agricultural land use: the total Agricultural land area of the province is 276, 741.50 hectares and it must be maintained to have continuous sustainable agriculture. The land is divided into Paddy areas irrigated land area and non-irrigated, vegetable land area, fruits orchard, plantation crops land area, grain crops and root crops land area, upland rainfed, wetland and unclassified areas.

Crops Grown by City or Municipalities: most of the crops grown by city or municipalities are Palay (Rice/cereal grain). Every city and municipalities are planting and producing palay. Other crops grown are Ampalaya (Bitter gourd), Talong (Eggplant), Kamatis (Tomato), which are the primary ingredients of Pinakbet.

Agriculture Statistical Profile: the primary agricultural product in the province is rice, which is practically grown in all towns. The municipality of Guimba accounts for the biggest share of production area for rice and consequently, has the most number of farmers engaged in rice farming. It is followed by the cities of San Jose, Cabanatuan, Munoz, and the municipality of Talavera in that order.

Problems identified in the consumption of the agriculture foods and products that we produced: the consumption of agriculture foods depends on the price, needs and wants of the consumers. The price of the major commodity in Nueva Ecija is changing weekly. And it also depends on the production of agriculture foods, and the number one cause that affects the production is the weather condition like a typhoon.

The proposed continuity plans for the continuous operation and development of sustainable agriculture as regards in maintaining and enhancing of having a sustainable agriculture food industry in Nueva Ecija.

V. RECOMMENDATIONS

1. A similar study be conducted so a more accurate picture of the agriculture food sustainability can be used as a reference for having a sustainable agriculture
2. For the concerned government agencies to create incentives for the farmers to adopt best management practices at farm level (environmentally friendly); these would include the use of animal waste (manure storage and management), diversions, grazing land protection. Also, to promote access to good quality food and facilitate training on sustainable feeding practices for livestock.
3. For the concerned government regulatory agency to continue developing and implementing policies and tools to facilitate farmers' access to markets to help improve their livelihoods. Also, continue giving effective information and education program for farmers on local environmental problems and agricultural operations.
4. For the farmers to consider all the environmental, economic and sociological factors that impact the sustainability of their farms.
5. For the consumers to be aware and get information for the prices of the agriculture foods and products they are

buying. And buy only what they need and do not waste agriculture foods.

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