

Market analysis of soil laboratory services in Davao Region, Philippines

**A study on the characteristics of soil laboratories in Davao Region, Philippines
and the perception of banana and rice farmers in the region on soil analysis
services**

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A research project submitted to
Van Hall Larenstein University of Applied Sciences
In partial fulfilment of the requirements for the
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Abbreviations

ARMM	Autonomous Region in Muslim Mindanao
DA	Department of Agriculture
FE	Far East
FSIA	Fresh Studio Innovations Asia
HPO	High Performing Organization
ISRIC	International Soil Reference and Information Centre
ISO	International Organization for Standardization
ME	Middle East
MMT	million metric tons
NEH	Nader and Ebrahim s/o Hassan Philippines
NGO	Non-government organization
NPK	Nitrogen, Phosphorus, Potassium
PEST	Political, Economic, Social, Technological
R&D	Research and development
SPSS	Statistical Package for the Social Sciences
UIC	University of Immaculate Conception

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Above all, to my Father for the gift of wisdom, strength and humility.

Dedication

To Benjamin who has been a constant source of inspiration...

Abstract

The purpose of this study is to prepare the entry of NEH Phils. to the soil lab market by providing a market research on the present situation of soil labs in Davao region. The study aims to help NEH Phils. in deciding to start a new lab or not.

This study was achieved through performing an empirical study comprised of 10 case study respondents and 30 survey respondents where opinions and views of soil laboratories and its customers from the banana and rice sectors were gathered. The tools used to analyse the qualitative data of the study included Porters' Five Forces Models, SWOT and 3Ps marketing mix where the product, price and promotion were looked into. In addition, quantitative data were processed using Statistical Package for the Social Sciences (SPSS) program.

Key findings of the study indicate that price, soil lab reputation and customer relations are significant factors to attract customers. However, between the two sectors studied, rice farmers are weak customers of a soil laboratory as they considered the service less important as they gave more priority to other farm cost like labour, pest control and fertilizers. Banana farmers can be potential good customers but an efficient marketing strategy focusing on price, service delivery and customer service should be designed to strongly persuade these farmers in availing the service regularly and keep their loyalty.

Lastly, this study created a scenario how soil lab behaves in the industry of agriculture in the Davao Region and how farmer customers perceived their services. Based on the findings, there is a possibility for NEH Phils. to start a new lab but not in the near future. There is potential for success but certain conditions like price, service delivery, customer relations, and perception of other farmers from other sectors have to be looked further into to ensure good investment returns. It is recommended that a follow up study should be conducted to determine the views and opinions of other farmers especially from other sectors to obtain a better overview on the success potential of a new soil laboratory planned to be built by NEH Phils.

Keywords: *market analysis, soil analysis, rice sector, banana sector, Davao Region*

1. Introduction

This chapter introduces this research by presenting the background of the study, statement of the problem and the problem owner, the research objectives, research questions and significance of the study. Also, a section is introduced to show the scope and limitations of the study. Terms are also defined as there are a number of topics discussed in this research. Lastly, the chapter ends up with an overview of the thesis outline.

1.1. Background of study

Being called the 'nation's fruit basket', the greater Davao region on the island of Mindanao consisting of three provinces namely, Davao del Norte, Davao del Sur and Davao Oriental in Philippines is economically dominated by agriculture which employs more than 40% of the country's population (Bureau of Agricultural Statistics, 2012). The sector consists of a mix of large corporations, small and medium sized producers and farmer cooperatives which serve the domestic as well as the export market with their produce. Among the top commodity products of the region are banana, meat, coconut and rice (Figure 1).

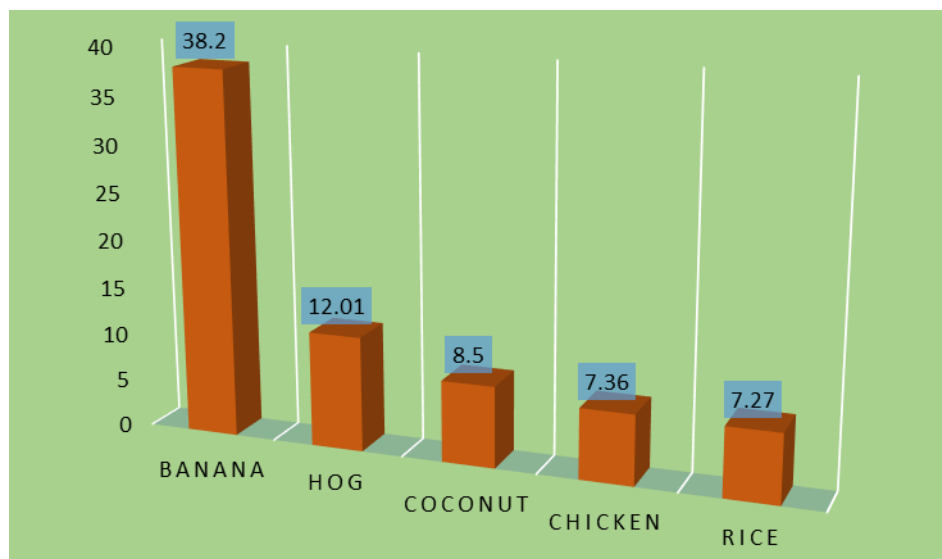


Figure 1. Percentage shares to total agricultural regional output of the top agricultural commodities in Davao Region in 2011 (BAS, 2011)

In 2011, Davao region represented by Davao del Norte and Davao City (Davao del Sur) shown in Figure 2 topped among the regions in the Philippines with the highest volumes of Cavendish bananas produced for export. Due to strict quality standards for this product in the global market, this crop is cultivated with intensive use of fertilizers and pesticides (BAS, 2012).

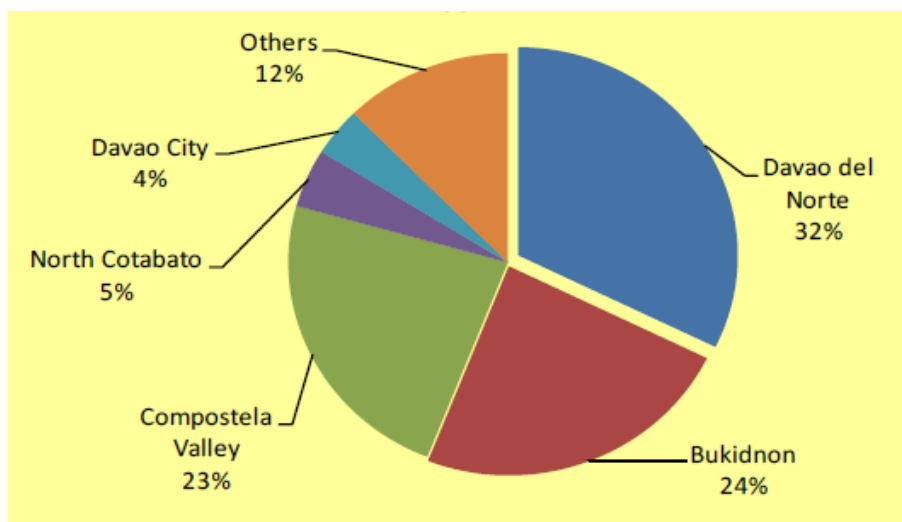


Figure 2. Major producers of Cavendish bananas in the Philippines (Bureau of Agricultural Statistics, 2012)

In 2009, the Philippines ranked as the world's second biggest producer of bananas with nine percent of global output, after India with 27 percent. It was also the world's third largest exporter in 2008. It accounted for a little over 10 percent of global exports, behind Ecuador's 29 percent and Costa Rica's 11 percent as cited by Macabasco in 2011. The total area devoted to Cavendish banana plantation in the Philippines is 30,000 hectares, mostly concentrated in Davao Region. The industry employs 40,000 workers directly and benefits 160,000 Filipinos indirectly. Among the issues concerning the sector is declining soil fertility due to intensive use of production inputs in soil, pest and diseases and postharvest quality (DAFFA, 2002).

Apart from banana, grain processing is another major industry of the region brought about by large industries of the rice and corn from Davao del Sur (Davao Guide and Reference, 2013). Rice remains the agricultural commodity with foremost political and economic significance in the Philippines. As a major staple food, rice accounts for 35 percent of average calorie intake of the population and as much as 60-65 percent of the households in the lowest income quartile (David and Balisacan, 1995). Rice unlike banana is cultivated by small scale farmers usually owning one to ten hectares of rice paddies. Farmers group themselves and usually form cooperatives to reduce costs on warehousing, purchase of machineries and transportation.

Rice farming especially the lowland-irrigated rice in the Philippines also employ intensive fertilization to attain high yield. Although rice farmers generally recognize the importance of fertilizer for supplying crops with essential nutrients needed for sustaining high yield, they often neglect fertilizer application at the right time and in the right amount which is crucial in attaining high return on their investment (IRRI, 2010a). Inappropriate fertilizers are used in many areas because there is a lack of soil analysis, thus uneconomic applications of expensive and scarce fertilizer are used (Ceesay, 2004).

In agriculture, one of the major uses of soil analysis is the formulation of a fertilizer program for farmers to help in soil fertility management (Kinsey Agricultural Services, 2007). Soil fertility is of fundamental importance for enhancing productivity (Aune, n.d.). Yield and economic return can

be optimized when fertilizer rates accurately address the needs of a crop through a good soil analysis result (LMP, n.d). Concepcion and Batjes (1997) in their study concluded that knowing the soil status of the farms is instrumental in the decision-making of the farmers on what specific fertilizers are needed to be applied in the soil to attain high-yield.

However, traditional farmers in Davao region have limited resources and access to laboratory technology and extension advice. Farmers entirely depend on product suppliers with commercial interest (e.g. fertilizer or fungicide suppliers) and lack the capability of using the advice correctly. Larger farms and multinationals usually have access to technology through in-company R&D or outsource service, but most often do not share with other farmers. Oxfam in its study in 2013 stated that multinational companies have dominated the bigger agricultural sector in the region in terms of technology and development.

1.2. Statement of the problem

Bananas and rice are considered highly significant crops in the Philippines. However, in the banana sector particularly the Cavendish variety, only multinational companies (e.g. Dole, Del Monte, and Chiquita etc.) have the capacity to carry out technologies like soil analysis in their respective farms, leaving smallholder farmers to apply fertilizer and other production inputs often with invalid basis. In the rice sector, where corporations are non-existent, small scale farmers have limited capacity on the access of modern farming technologies to improve production.

Nader and Ebrahim s/o Hassan Phils. (NEH Phils) is a medium scale banana grower and exporter based in Davao City. Although its major operation is in the banana industry, the company has no in-house soil laboratory to cater its needs on soil analysis. This is the reason why its management is planning to build its own soil laboratory with an aim of catering internal in-house needs as well as commercialized service to compensate the huge investment. The company plans to provide service to small-medium enterprises operating in the agri-sector focusing in Region XI and neighbouring provinces and regions. However, one of the difficulties of NEH Phils. for this project is the perceived insufficiency of reliable information about the actual scenario of the soil laboratories in Davao Region and what are the views and opinions of customers on soil analysis service. Thus, this study is conducted to assist NEH to establish a baseline information especially in the market situation of soil laboratories in Davao region which will help the company in deciding to start or not a new lab in the future.

1.3. Problem owner

NEH Phils.

1.4. Research objective

The objective of the study is to prepare the entry of NEH to the soil lab market by providing a market research on the present soil lab sector in Davao region.

1.5. Research questions

To satisfy the research objectives, there are three main research questions in this study. They are the following:

Research question 1: How is the soil laboratory service sector organized in Davao Region?

Sub-questions

- 1.1. What are the different types of soil lab service present in the sector?
- 1.2. Who are the actors involved in the soil lab sector?
- 1.3. How do soil labs relate with other stakeholders in the sector?

Research question 2: What are the marketing strategies being employed by existing soil laboratories in Davao region?

Sub-questions

- 2.1. What are the different types of customers?
- 2.2. What are the prices and payment schemes offered to customers?
- 2.3. What type of service delivery do customers prefer according to the labs?

Research question 3: What influences the decision of farmers in Davao region to avail soil lab services?

Sub-questions

- 1.1. What makes customers avail service of a soil lab service?
- 1.2. What keeps customers satisfied with the service of a soil lab?

1.6. Significance of the study

This study is expected to elicit information on the characteristics of soil laboratories in Davao Region and determine the feasibility of a market entry based on the perception of farmers from the banana and rice sectors that are considered customers of soil laboratories. In addition, it also gives suggestions and strategies for NEH Phils. to further prepare its entry in the soil lab market in the future.

1.7. Timetable of study

This study was completed in 12-week period which ran from July to September 2013. Annex 1 presents the duration of each activity spent in the whole research process.

1.8. Scope and Limitations

As an exploratory study, this research does not aim to provide a statistically representative data or a comprehensive study on the experiences and economics of soil laboratories operating in Davao Region. This research however gives an overview, but nonetheless clear indications of the structure, target markets and pertinent issues confronting soil laboratories in the region at present and previous years. In addition, the study provides a relatively solid basis for a more thorough study of the operations of soil labs in the regions as well as recommending possible actions in aid of future entry of NEH in this type of business in the future.

1.9. Definition of terms

Consumers	they are the end user in the food chain. They could come either from a domestic market or foreign market.
Cooperatives	are groups of farmers usually coming from one sector or class formed to better facilitate and manage activities relating to business and economics. In Philippine setting, they are usually governed by laws. They are normally composed of small to medium scale growers, that come together to maximize their economic resources and also benefits. They produce and sell their products to institutional buyers which usually comes in formal seller-buyer agreements (Oxfam, 2013). They also engage in other small and medium-scale enterprises which sometimes selling a by-product of their main produce. Example are handicraft goods made from banana stumps, organic compost out of banana farm wastes which are sold and serve as additional source of income for the cooperative.
Institutional buyers	they are the big companies that have access to international markets (Rathke, 2008). In the banana sector, they are ones who buy bananas from growers or produce by themselves through rented lands from landowners and sell them to foreign markets. In Philippines, they are popularly represented by Dole, Del Monte, Sumifru and Chiquita-Unifrutti.
Market	is defined as a place where any type of trade takes place. Markets are dependent on two major participants – buyers and sellers. Buyers and sellers typically trade goods, services and/ or information (EconomyWatch, 2010).
Regions	administrative divisions that serve primarily to organize the provinces of the country for administrative convenience. Currently, the Republic of the Philippines is divided into 17 regions. Most government offices are established by region instead of individual provincial offices, usually (but not always) in the city designated as the regional centre (Jimdo, 2011).
Small to medium scale growers	they are farmers who cultivate their own farms but sell their produce to buyers. Growers are landowners who use their land for growing crops; they can own as small as 0.5 hectare of land or as big as 100 hectares of land (FAO, n.d). The size of the farm also determines the number of workers they employ to carry out the daily or weekly operations in the farm.
Stakeholders	are individuals, groups or organizations that have direct or indirect involvement with an operation (or chain) and the outcomes of activities. They can have influence of the operation by either giving resources (time, money, assets) or they can benefit from the results (WHF, 2013). In the various chains in the agri-sector, usually the major stakeholders are the

input suppliers, farmers, traders or wholesalers, retailers, consumers and the support service providers like government agencies, non-government organizations, etc.

Wet market is a term used to describe the market setup in the Philippines where fresh fruits, vegetables and other food commodities are sold in public market stalls and usually in lower price than those which are sold in the supermarket.

1.10. Overview of chapters

The first chapter is the introduction where justification of the chosen research topic and the research objectives are presented. Thereafter, the main questions of the research and sub-questions are outlined. Chapter 2 is the review of literature where the results of a literature study conducted to lay a sound basis for this study are discussed. Moreover, the approach taken is summarized thereafter in Chapter 3 where it deals with the methodology. Here, the way in which data was collected and analyzed to answer the research questions is presented. Chapters 4, 5 and 6 deal with the results of the case study and survey are presented and where answers to the research questions are elaborated comprehensively. Chapter 7 presents the interpretation based on empirical data that were gathered. The final chapter, Chapter 8 shows the conclusion of the research questions and presents the recommendations for the feasibility of soil laboratory in Davao Region in the future as planned to be built by NEH Phils. The organization of the chapters is shown in Figure 3.

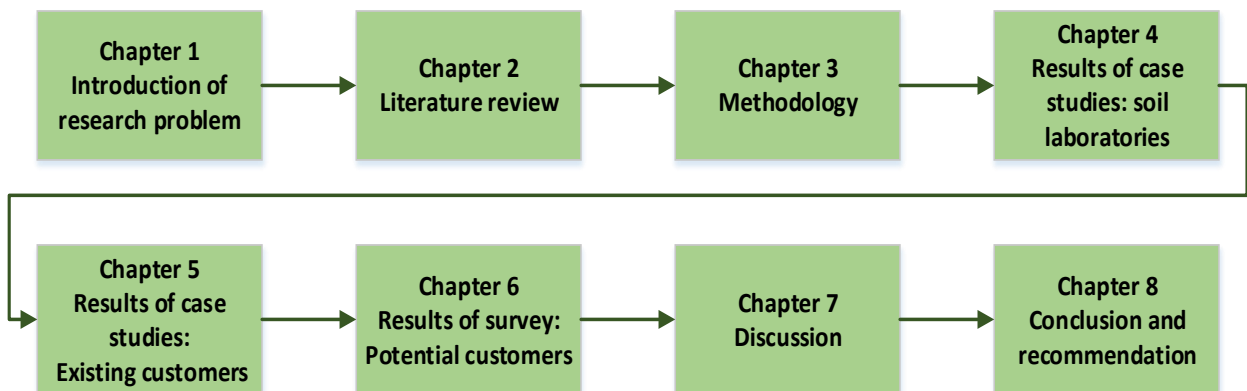


Figure 3. Thesis outline (Bumaya, 2013)

2. Literature review

This second chapter seeks to lay a foundation for the current research. Davao Region as study area is introduced through details of its economic condition. The two sectors of concern- banana and rice are presented separately in sections where descriptions are laid out to give a clear scenario of the current system of the two sectors discussed in this research. Further, the concepts of soil analysis and market analysis are presented to give a better understanding of the major areas of concern of this study. Lastly, a profile of the problem owner –NEH Phils. is given to have a short glimpse of what the company is all about.

2.1. Davao Region

Davao Region or Southern Mindanao, designated as Region XI, is one of the regions of the Philippines located on the south-eastern portion of Mindanao; the second largest among the three major island groups in the country (Figure 4). Davao Region is composed of four provinces, namely: Compostela Valley, Davao del Norte, Davao Oriental, and Davao del Sur. The region encloses the Davao Gulf and its regional centre is Davao City. The region has a generally a uniform distribution of rainfall throughout the year and lies outside the typhoon belt. Aside from its forestland and fertile fields, the region is famous for its rich mineral resources. Reserves of gold, copper, manganese and nickel are found in this part of the country (CountryStat Philippines, 2013).



Figure 4. The Philippine map, Golf Living Philippines (2006)

Agriculture is the main economic activity in the region and banana is the primary agricultural product produced in many banana plantations. In 2007, Davao Region produced a total of 3.1 metric tons - the highest among the seventeen regions in the country. Other farm products include rice, corn, coconut, pineapple, sugarcane, and durian. The region is also a well-known centre of the cut flower industry especially in orchid growing. Fishing and raising of poultry, hog, and cattle are some alternative sources of income (National Nutrition Council, 2006).

2.2. The rice sector in the Philippines

Rice is a staple food among the Filipinos, the reason why rice production is important to the food supply in the country and economy. 'Palay' or rice production (Figure 5) in the Philippines has tripled from 5.32 million tons in 1970 to a peak of 16.82 million tons in 2008. According to World Rice Statistics by the International Rice Research Institute (IRRI) in 2008, the Philippines is the largest importer of rice in the world, importing around 1.8 million tons of rice. Despite being criticized as a poor rice producer because of its status as the world's biggest rice importer, the Philippines has actually done remarkably well in raising its rice yields from 1.16 tons per hectare in 1960 (according to the United Nations Food and Agriculture Organization) to 3.59 tons per hectare in 2009 based on Republic of the Philippine Department of Agriculture's data.



Figure 5. Rice farmers in the Philippines, Philippine News (2010)

In 2007, average rice yields topped 3.8 tons per hectare and in 2008 there were 3.77 tons per hectare. Yet, rice yields in the Philippines are higher than those in Thailand, the world's biggest exporter of rice, where yields over the last few years have been around 3 tons per hectare (IRRI, 2010b).

However in 2009, Philippine rice yields were actually lower than the previous two years due to the damage done by the tropical storms "Ondoy" and "Pepeng." Two strong typhoons caused another decline in palay production in 2010 to 15.77 million metric tons (MMT). In 2011, production

rose to 16.68 MMT, a remarkable improvement over 2010 but still below the 2008 production level (PhilRice, 2013).

Paddy rice production in 2012 increased to 18.03 million tons, up about 8.1% from around 16.68 million tons produced in the previous year. Bureau of Agricultural Statistics (BAS) said that rice acreage increased by around 3.4% to 4.69 million hectares, and yields increased by about 4.5% to 3.84 tons per hectare last year (Figure 6). BAS in 2013 added that the increase was due to sustained usage of hybrid and certified seeds, sufficient supply of irrigation water and rainfall, adequate fertilizer application and lesser weather disturbances.

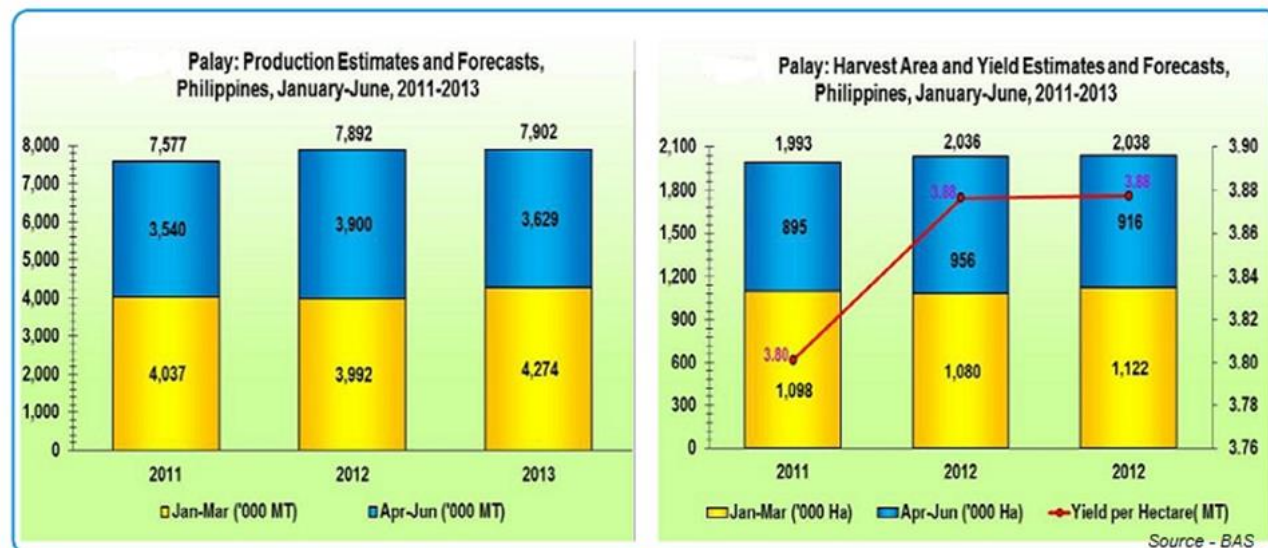


Figure 6. Rice or 'palay' production forecast in Philippines, BAS (2013)

The population of the Philippines is increasing at an average rate of 2.3 per cent per annum and is projected to increase by another 32 million over the next 25 years. Given this projected increase in population and considering the increasing per capita incomes and the still positive income elasticity of demand, the demand for rice may increase by another 40 per cent by 2030 (Casiwan, et al., 2003). But the Philippines is not doing well in increasing rice production lately. Among the reasons are decline in public sector investment for the expansion and maintenance of irrigation infrastructure and full adoption of modern technologies.

Yield improvement can come in either of two ways as pointed out by Pate and Tan-Cruz in 2007, this includes: a) shifting the yield frontier, i.e., breeding varieties that have significantly higher yield potential than the current varieties, and b) developing and promoting yield-enhancing technologies such as the use of high quality seeds and efficient fertilizers. This raises the aggregate questions of how technically efficient is the rice production in the Philippines and how much production improvement can be made through increased technical efficiency such as proper fertilizer application, use of high-yielding varieties and improved farm machineries and equipment to name a few.

2.3. The banana sector in the Philippines

Banana is the leading fruit grown in the Philippines and a consistent top dollar earner. Cavendish, the export variety is grown in plantation scale in Mindanao (Figure 7). The Philippines ranks no.5 among the major producing countries in the world and ranks no.2 in exporting countries in 2004. Region XI (Davao) contributed about 41% of the Philippine production, followed by Region XII (11.2%), Region X (10.1%), ARMM (6.8%), Region XIII (3.6%) and Region IX (3.2%) (BAS, 2010).



Figure 7. Banana production in Davao Region, Philippines (Bumaya, 2011)

The popular varieties grown in the country include Cavendish, saba/cardava, lacatan, latundan, bungulan and señorita. 'Saba' is processed into banana chips, which is also an export product. It is likewise made into banana cue and 'turon' (banana fritter), which are popular snacks in the country. It can also be made into 'maruya' (fried banana with flour breading), 'nilupak' (mashed), or boiled. In some parts of the country, 'saba' is eaten as staple in place of rice. Meanwhile, the other varieties are mainly table varieties.

Banana production is undertaken mainly in Mindanao. For Cavendish, production is concentrated particularly in the regions of Davao and Northern Mindanao, with nearly 90 percent of total output. Among the regions in Mindanao, Region XI or Davao Region has the highest production from 2006 to 2010 according to BAS in 2011 (Figure 8). For Saba, a native variety, production is widespread not only in Mindanao but also in the Visayas, with the former accounting for over 40 percent of output and the latter for about 15 percent. For Lacatan, some 80 percent of production also comes from Mindanao (Macabasco, 2011).

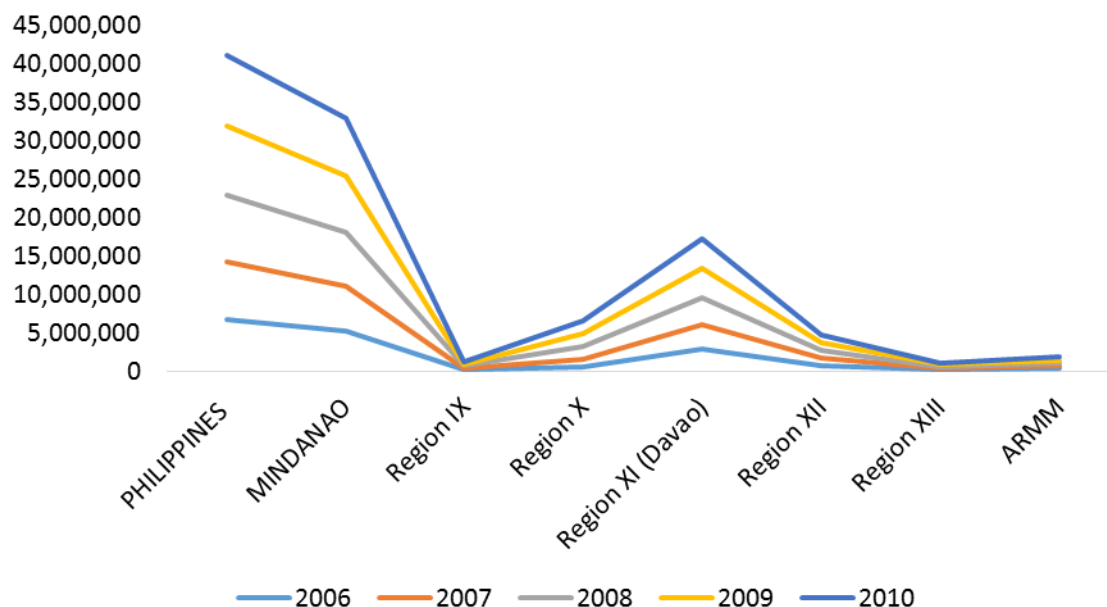


Figure 8. Volume of banana production in metric tons from regions in Mindanao from 2006 to 2010 (BAS, 2011)

The country's volume of banana production is increasing at an average annual growth rate of 7.58%. In Mindanao, average annual growth rate in volume of production is 8.98%. Highest growth in the island was registered in Region X with 26.62% while Region XIII posted a negative growth (BAS, 2011). Among the leading banana multinational companies operating in Davao Region are Dole-Stanfilco, Del Monte, Chiquita-Unifrutti, Sumifru and NEH Phils. The Cavendish variety are exported to various countries in the Far East (Japan, China, Korea), Middle East (Iran, Bahrain, Kuwait, Egypt), USA and Europe.

Additionally, BAS in 2011 cited that the highest volume of production was registered in Region XI (Davao Region) in 2010 alone while Region XIII contributed the least (Figure 9). In terms of variety, Cavendish variety occupied 74.82% of the country's banana production area.

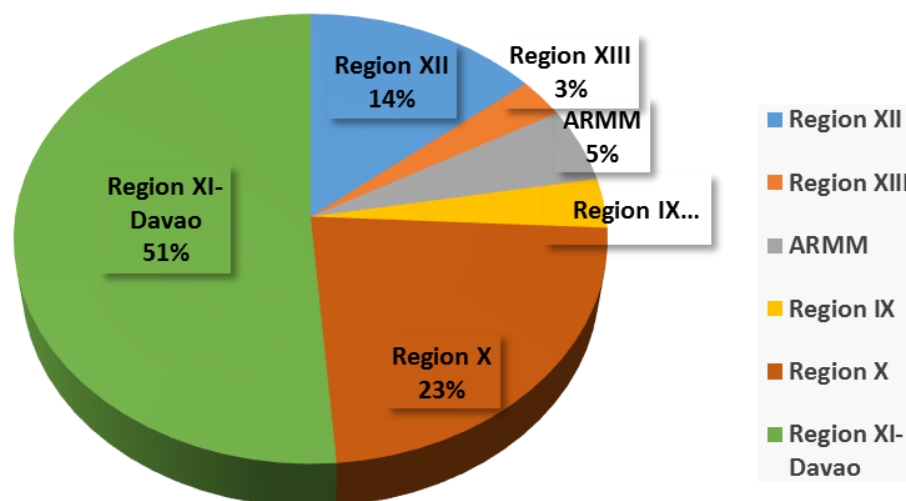


Figure 9. Distribution of banana volume of production in Mindanao in 2010 (BAS, 2011)

Key challenges besetting the industry include increasing the productivity, addressing intensifying competition in the world market, managing diseases such as Sigatoka, further improving production and processing efficiencies, and pursuing product innovations. The industry also has to develop adaptation measures for climate change (Macabaso, 2011).

In banana production, obtaining soil samples during site preparation is given importance to get the soil pH and nutrients right so the plants get a good start (Newley et.al, 2008).

2.4. Soil analysis

Soil testing or soil analysis plays an important role in crop production and nutrient management. On farms that use commercial fertilizer as the main nutrient source, it is the best way to plan for profitable fertilizer applications. Knowing how much nutrient is present in the soil to start with is critical. Only then can a nutrient management plan be developed to properly manage both the nutrients that have been generated on-farm and any nutrients that are being imported to the property as bio-solids or commercial fertilizer (Murphy, 2002).

Soil testing is a three-step process: the collection of a representative sample from each field or section (Figure 10), proper analysis of that sample to determine the levels of available nutrients, and use of the results to determine optimum fertilizer rates. Reid in 2006 suggested that keeping records is an integral part of the soil-testing process; they will help determine if soil test levels are increasing, decreasing or being maintained over time.



Figure 10. Collection of soil sample from a banana field (left) and physical examination of soil (right) (Bumaya, 2012)

Hanks in 2013 cited that the conventional uses of soil analysis are the following:

- Increasing knowledge of what nutrients are specifically available in the soil
- Reducing environmental impacts due to soil amendments
- Increasing efficiency of resource inputs such as fertilizers and water
- Prediction of nutritional values needed for crop production

In determining the status of the soil for example nutrient availability; these are the parameters being analysed to form a basis to determine fertilizer needs—macronutrients (nitrogen,

phosphorus, potassium), micronutrients (zinc, boron, calcium, magnesium, manganese, sodium), available moisture, soil pH, texture, organic matter.

After the soil is analysed, fertility recommendations are made based on amounts of actual nutrients in the soil, not on the amount of any particular fertilizer or mixture. For example, if 100 lb (45 kg) of N were recommended, that amount could be supplied by approximately 300 lb (136 kg) of ammonium nitrate (33%N), 220 lb (100 kg) of urea (45%N), or 120 lb (54 kg) of anhydrous ammonia (82%N). Likewise, a recommendation of 60 lb (27 kg) of P₂O₅ per acre (0.4 ha) could be added as 133 lb (60 kg) of 45% triple superphosphate (Baker, 2002).

2.5. Market analysis

Before managers can begin to formulate marketing strategies for their businesses, a strong understanding of the internal and external marketing environments in which they are operating is usually undertaken. The aim of companies why they are conducting market analysis is to acquire a bigger market share.

Market analysis contributes to all the steps in a business from the initial determination of customer needs to final delivery of a product or service. It can be divided into the following general functions: market research, market strategy development, the identification of specific markets to serve, and use of market analysis in decision making. It is a study designed to define a company's markets, forecast their directions, and decide how to expand the company's share and exploit any new trends (EPA, 2012).

Moreover, market analysis includes market size, growth rate, profitability, cost structure, distribution channels, trends and key success factors. Market analysis may take two distinct forms. It is a method used by investors to look at the market and try to determine whether it is going up or down, in order to make investment decisions. The term can also be used for a field used by marketers to analyse the target market of their clients and determine the best courses of action to take to improve sales and profitability (McGuigan, 2013).

From a marketer's perspective, a marketing analysis involves looking at every angle of a market to determine policies that will help a company capture more of a market share and make the share it already controls more profitable. An analysis of customer desire and satisfaction is a large part of marketing. The goal of market share analysis is not to determine whether a customer would purchase a product, but rather to examine customer loyalty levels, brand perception, and the overall competitive edge, and to come up with a strategy to draw market share away from competitors and increase one's own share (Berry, 2005).

There are several tools used in analyzing a market, among which are SWOT (strength, weaknesses, threats, and weaknesses) and Porter's Five Forces Model. SWOT is used to analyze the internal environment of a business while Porter's Five Forces Model is often used for industry analysis. In this study, both concepts were used to help NEH Phils. in deciding whether to start a new lab or not.

2.6. The concept of Porter's Five Forces Model

The Porter's Five Forces Model identifies and analyzes 5 competitive forces that shape every industry, and helps determine an industry's weaknesses and strengths (Investopedia, 2013). The model according to Chapman (2013) provides suggested points under each main heading, by which one can develop a broad and sophisticated analysis of competitive position, that can be used when creating strategy, plans, or making investment decisions about a business or organization. The interaction of the crucial competitive forces affecting a business is shown in Figure 11.



Figure 11. Porter's five forces model

The model helps to show the competitive intensity of a business including the attractiveness and unattractiveness of a market. The forces from the microenvironment are considered close to the company affecting its capacity to gain profit.

2.7. Background of NEH Phils. as a company

Nader & Ebrahim S/O Hassan (NEH) Philippines, Incorporated, represented by its holding company, NEH International, one of the major importers and exporters of fresh fruits and vegetables in the Gulf and Middle East was formed 2001 with a goal of having a Philippine-based company that can provide fresh Cavendish bananas to cater the increasing demand of the global markets.

The company started its business by buying from individual farmers and cooperatives, until in 2010 it has decided to produce its own banana due to shortage in volume and inconsistent quality from outsourced bananas from contracted growers. NEH together with its research arm, Fresh Studio Innovations Asia (FSIA) is geared to develop value-added strategies in the business, to understand changing consumer trends, and to address needs from seed to shelf. These strategies include providing technical assistance to its partner banana growers and monitors their operations

to ensure consistent quality products. The company organized technical teams who work closely with the growers to ensure continuous improvement with the quality of the bananas.



Figure 12. Marketing flyer of NEH showing its flagship brand Dana (FreshPlaza, 2009)

Currently, the company is actively operating in Davao del Norte, Davao del Sur and neighbouring provinces of Region XI. The flagship brand, Dana (Figure 12) is known in the Far East and Middle East countries where the products are exported. The company also pioneered the first FairTrade bananas from Asia. NEH Philippines' head office is located at Ladislawa Building, Ladislawa Village, Buhangin, Davao City, while its operations facility is located at Sto. Tomas, Davao del Norte (Suela, 2013).

3. Methodology

This chapter provides details about how the methods were used in this research. Research design, data collection, research site and data analysis are presented to give more insight on how answers are provided to answer the research questions as outlined.

3.1. Research design

The research used a qualitative and quantitative approach which were based on empirical data, literature and relevant documents. The collection of data was conducted on the basis of triangulation through desk research, case study, interview and survey. Data were obtained and analysed following the research framework in Figure 13.

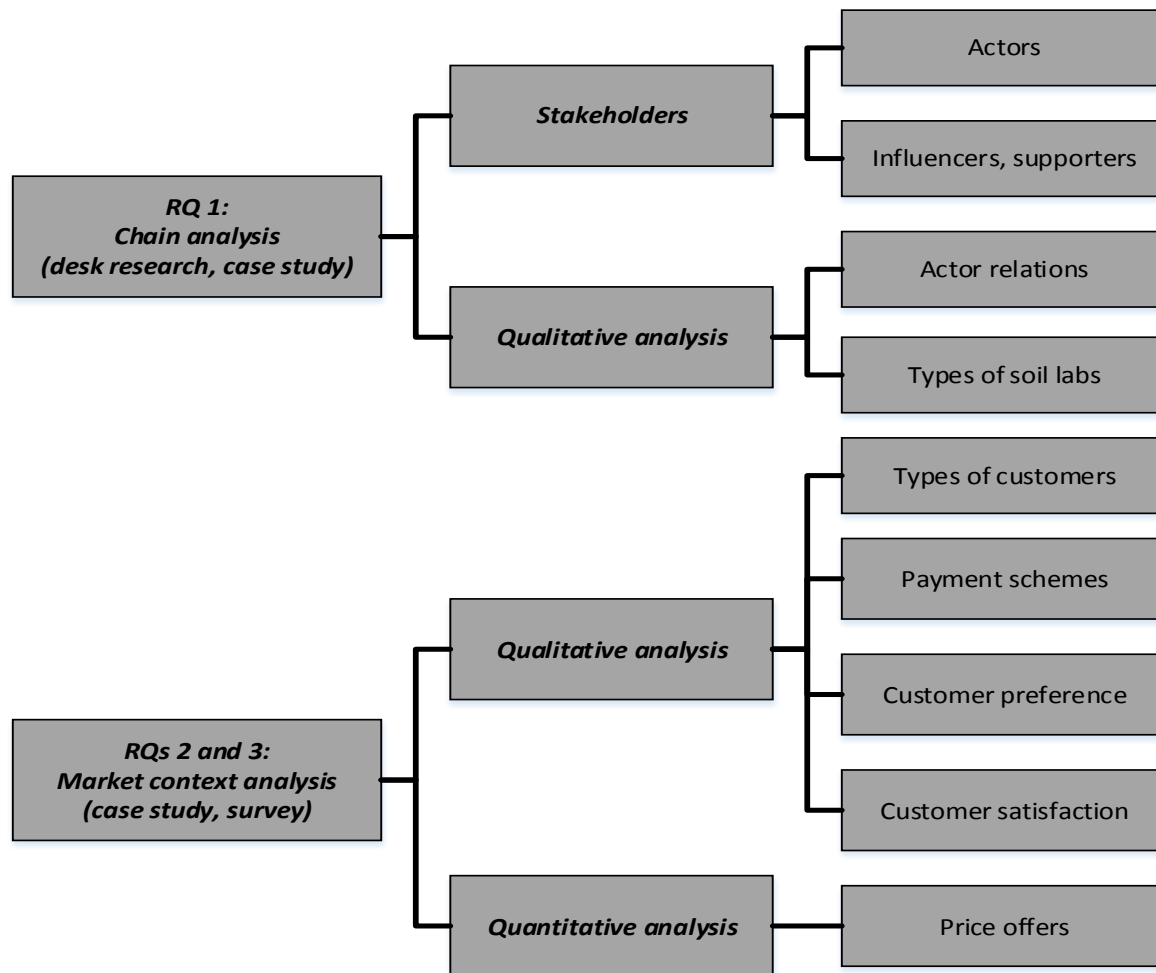


Figure 13. Research framework of the study

3.2. Desk research

The search for secondary sources was carried out to refine the objectives and provide inputs for the next stages of the study. Specifically, the desk research gathered information about soil laboratories services in Davao region. This data gave useful indication as to the status of soil labs

in the marketplace. The desk research explored materials such as books, brochures and websites and established the following:

- What is a soil laboratory?
- What are the existing soil laboratories in Davao region?
- What are the services provided by soil laboratories?
- What are the benefits given by soil laboratories to customers?

Results of case studies and surveys after analysis was supported with literature relevant to findings to validate the information gathered.

3.3. Qualitative research

Case study

Given the exploratory nature of the objectives of the study, a detailed qualitative information was provided through a case study. A focused research was explored to understand the marketing scenario of a soil laboratory in the region. Through open interviews (see Annex 2 for interview checklist), this stage was conducted based on two categories; A as the type of soil laboratory existing in Davao region and B as the type of farmer as an existing customer.

For A dealing with soil labs, the selection of one respondent under A1 was based on the lone presence of a government soil lab in Davao Region. Since there were ten private soil labs (see Table 2), two labs were selected to obtain a rational representation of the existing private laboratories. One was a non-affiliate to a banana company (e.g. Dole, Chiquita, Del Monte) but catered any type of customer like the government soil lab. The other respondent was an affiliate to a banana company which was Tristar Group of Companies. The profiles under this category are the following:

A	Type of soil laboratory	No. of respondents
1	Government soil laboratory	1
2	Private, commercial soil laboratory	2

And the issues probed under this category were the following:

- To whom do soil laboratories relate to?
- Who are the target customers?
- What type of customers frequently avail the service?
- What prices are charged?
- How are services delivered?
- What are the types of services offered?

For B dealing with farmers, there were six farmer interviewees for both B1 and B2. B1 was represented by the banana growers and B2 was represented by the rice farmers (see Annex 3 for interview checklist). The three labs chosen in Category A were spread equally to both B1 and B2 accordingly. For each soil lab, two customers were selected to compare the opinions obtained. Since there were more private labs than the government labs, more respondents were interviewed from the private lab sector.

The names of farmers who served as respondents came from random selection through 'draw lots' technique after obtaining a list of the existing customers from the soil labs (see Annex 4). All the farmers that were selected had a minimum farm size of two hectares. This requirement was based on a valid farm size for a soil analysis protocol according to Caion (2013).

The profiles under this category were the following:

B	Type of farmer	Customer of	No. of respondents
1	Cavendish banana grower	Government lab	2
		Private lab 1	2
		Private lab 2	2
2	Lowland, irrigated rice grower	Government lab	2
		Private lab 1	2
		Private lab 2	2

And the issues probed were the following:

- What is the customer's opinion of the services of a soil laboratory?
- What triggers them to avail the service?
- Why did they choose a specific lab?
- What keeps them satisfied of a service of lab?

However during the actual conduct of the case study to soil lab customers, there were no available respondents of Private lab 1 from the rice sector as there were no identified customers. Later in the results chapter, this portion was labelled 'not applicable'.

Lastly, the selection of these growers was based on the criteria that Cavendish banana, being the export variety is the heaviest user of fertilizer among the banana cultivars. In addition, among the rice production systems in the region, the lowland-irrigated rice is the most common and often has the highest fertilizer application. The names of the respondents in the case studies are shown in Annex 4.

3.4. Quantitative research

Customer survey

A customer study was carried out using a survey questionnaire (see Annex 5) to answer the third main research question. This stage aimed to quantify how many customers were likely to avail the service of a soil laboratory from the banana and rice sector. Based on their economic importance, banana and rice were chosen as they rely heavily on production inputs such as fertilizers and pesticides.

The list of banana growers in Sto.Tomas. Davao del Norte came from the database of Municipality of Sto.Tomas while the list of rice farmers was acquired from the Office of the Municipal Agriculturist in Hagonoy, Davao del Sur. From the lists, a random selection through 'draw lots' technique was done to determine the names of the farmers who became respondents of the survey. The farmers that were selected had not experienced availing soil lab services in the previous years so they were considered as potential customers. An estimated 600 banana farmers were existing in Sto.Tomas municipality and around 800 rice farmers were existing in Hagonoy. Fifteen respondents were chosen from the banana sector and another fifteen respondents from the rice sector, thus a total of thirty farmers interviewed all with a minimum farm size of two hectares.

The survey questionnaire probed the following issues:

- What kind of service are they likely to avail?
- What are their considerations when deciding to avail a service of a soil lab?
- How frequent are they likely to avail the service?
- What prices are they willing to pay for the different services?
- Would they be prepared to pay more for a service?

The language written in the questionnaires was English but was translated orally (by the researcher) to a local dialect when an interviewee had a difficulty in understanding the questions. An advance communication via email, call or text message was sent to the respondents to ensure their availability for an interview appointment. Some farmers considering the distance were interviewed over the telephone conversation was written verbatim on notebook.

3.5. Research site

The first phase of the study- the desk research was conducted in the university library of Wageningen UR in a span of one week. The second phase of the study covering four to five weeks was the case study and survey conducted in Davao del Norte and Davao del Sur. The decision prompting the selection of these locations was based on the fact that banana and rice plantations are more concentrated in the form of small-medium enterprise (SMEs) and cooperatives in these areas. In Davao del Norte, respondents came from town of Sto.Tomas where the highest number of banana farmers are located. Respondents for Davao del Sur area came from the town of Hagonoy where there are high number of rice farmers (see Figure 14).

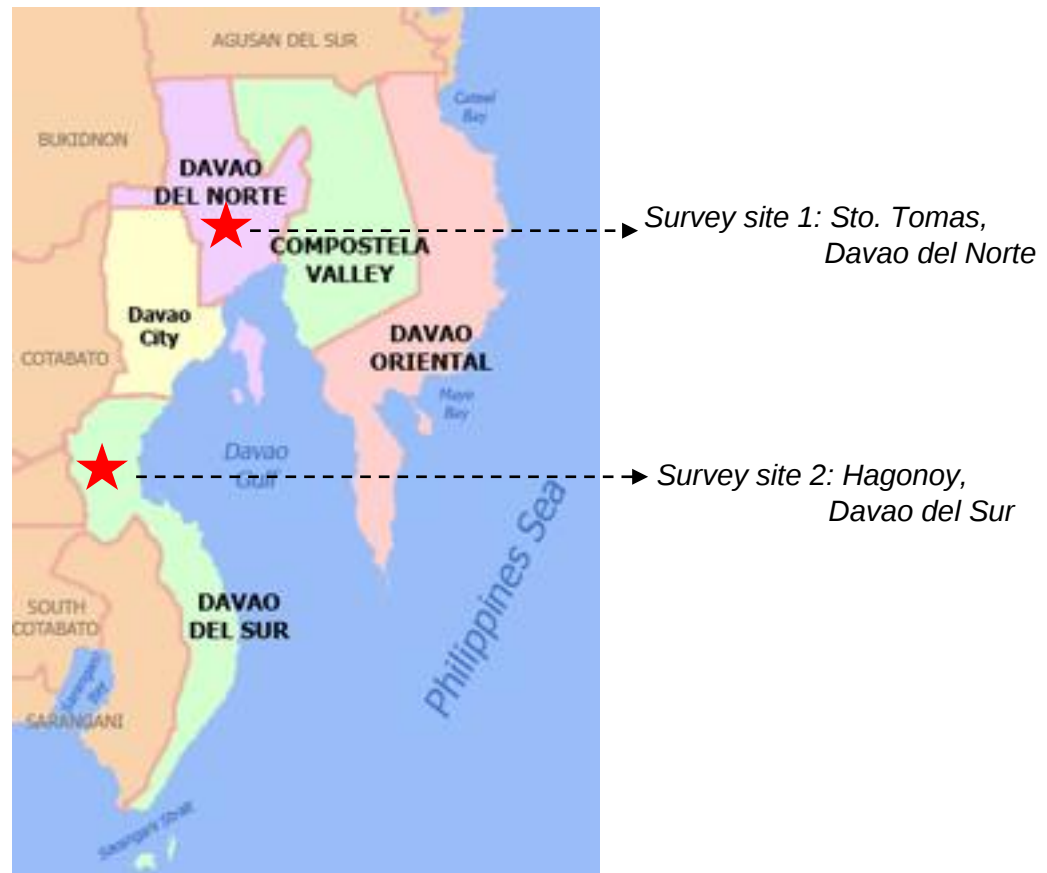


Figure 14. The survey sites in the region

A. Survey site 1: banana farms in Sto.Tomas, Davao del Norte

Davao del Norte is known to be the banana capital in the Philippines. Among its member municipalities and cities, Sto.Tomas has the highest numbers of banana farmers. Its favourable weather conditions, with rainfall evenly distributed around the year and a being typhoon-free

municipality, brought a number of multi-national corporations and cooperatives engaged in banana-based commercial production and successfully operate in the municipality. The production of high value crops is favourable all year round and becomes a profitable investment.

Among the large plantations found in the province are Del Monte, Dole, Sumifru, Del Monte, Chiquita-Unifrutti and Dizon Farms. The banana industry is a more established sector as most of these companies have ISO and GlobalGap certifications. Most of these institutional buyers have growership system of buying the bananas. In growership system, a group of small landowners agree to enter into a contract to sell a certain amount of bananas within a certain period of time. The bananas bought from the farms of the growers' collective under the growership system are processed in production plants.

B. Survey site 2: rice farms in Hagonoy, Davao del Sur

The province of Davao del Sur is considered one of the major rice-producing provinces of Region XI. It has been regarded as Mindanao's top rice-yielding province because of its municipality's (Hagonoy) high yield performance. The municipality of Hagonoy is basically an agricultural area with favourable soil and climate for agriculture. Its people depend on its agricultural products for food and livelihood. Major livelihoods include farming and fishing.

Both the province of Davao Del Sur and the municipality of Hagonoy are predominantly agricultural areas. Favoured with a mild tropical climate, relatively good soil and abundant water supply, they have an advantage for the cultivation of various crops, aquaculture, and fishery products. For many years now, they have produced a considerable surplus on major crops such as rice, corn, and bananas. According to Hondrade in 2007, Hagonoy's average rice yield of more than six tons per hectare has consistently been higher than the provincial average (average of all municipalities in Davao del Sur) of a little more than five tons per hectare, both of which are higher than the regional average (average of the 4 provinces of Region XI – Davao del Sur, Davao del Norte, Davao Oriental and Compostela Valley) of more than four tons per hectare.

3.6. Data analysis

The qualitative section of the research used specific tools for analysis. Research question 1 used chain mapping as a tool for analyzing the relationship between the stakeholders in the sector. Research question 2 was answered through the 3P's of marketing (product, price and promotion) which elaborated the marketing scenario in the perspective of the soil laboratory. Supplementary tools such as SWOT and Porter's Five Forces Models were also used to describe the market environment of the soil laboratories in the region of concern.

The quantitative section on the other hand, used computer tabulation via Statistical Package for Social Sciences (SPSS) program. Considering the sample size and information gathered, research question 3 used descriptive stats, ANOVA and Chi –square test as tools to analyze the data sets particularly those relating to prices.

4. Results of case study on soil laboratories

In this chapter, the results of the case study on the soil laboratories existing in the Davao Region are presented. The chapter attempts to illustrate the chain structure by showing chain maps, soil lab supporters and influencers, and the flow of product, money and information. The current situation being a service provider is also described in the perspective of the three soil labs studied to show their operational characteristics and draw comparison among the three labs.

4.1. The role of soil laboratories in the banana and rice sectors

Due to the presence of several agricultural companies in Davao region, a number of soil laboratories emerged in the past years to cater the needs of these organizations and assisting them in achieving their desired level of productivity through reliable and accurate fertilizer programs.

In Davao, the popular soil laboratories include the Regional Soils Laboratory under the control and management of Department of Agriculture, Davao Analytical Laboratory Inc. (Figure 15), University of the Immaculate Conception Science Resource Center, Davao Trade Exponents Inc. and Lapanday Foods Corporation. The last two labs are affiliated to two banana plantations based in the region – Tristar Group of Companies and Lapanday Agricultural and Development Corp. respectively.



Figure 15. Davao Analytical Lab. Inc.

The nature of soil labs in the region operates purely as support provider to farmers and agriculture-related industries (e.g. feedmills, fertilizer companies) by providing services on soil analysis, fertilizer analysis, feed and food analysis to name a few. The service portfolio of the ten soil labs present in the regions differs from each other depending on their technical capability based on available equipment and technology.

In the banana sector as shown in Figure 16, soil laboratories are considered as service providers for input suppliers, farmers and traders. Traders who were represented by institutional buyers like Dole, Del Monte, NEH Phils. ensure that farms where they acquire bananas for export have consistent high yields. Production targets are intensified through proper plant care which includes correct fertilization and pest and disease control. Input suppliers like fertilizer companies need the service of soil laboratories when they conduct product testing to determine effectiveness of their fertilizer products.

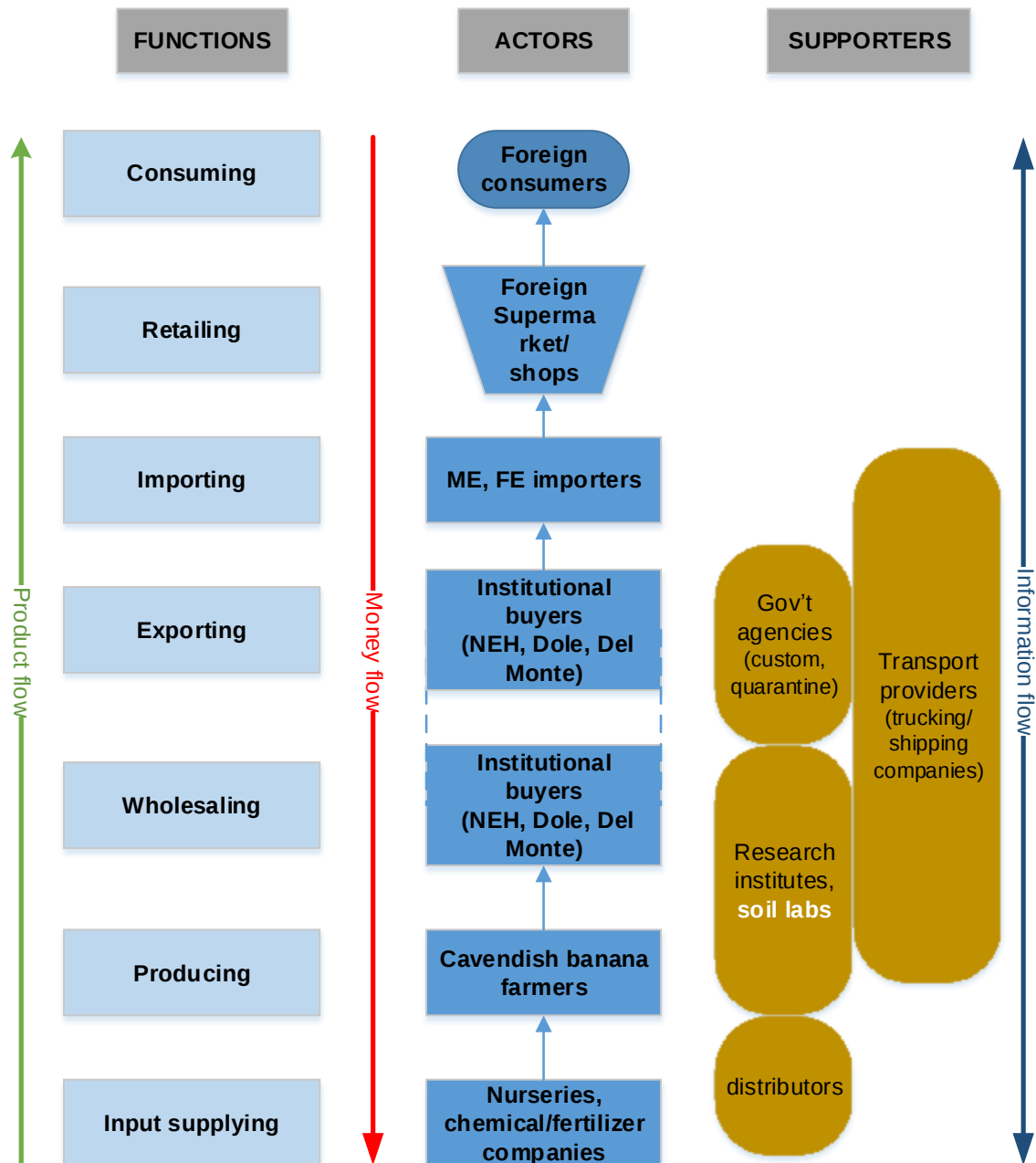


Figure 16. Chain map showing soil laboratories as a supporter in the banana sector in Davao Region

Same scenario goes with soil laboratories in the rice sector as shown in Figure 17. Soil laboratories play as service provider for the upstream actors in the chain. The only difference compared to the banana sector, soil analysis is not a common service availed by rice farmers. Due low production issues encountered by most rice farmers in the region, farmers often neglect the service and focus on other farm costs like pesticides and labour which they thought were more important.

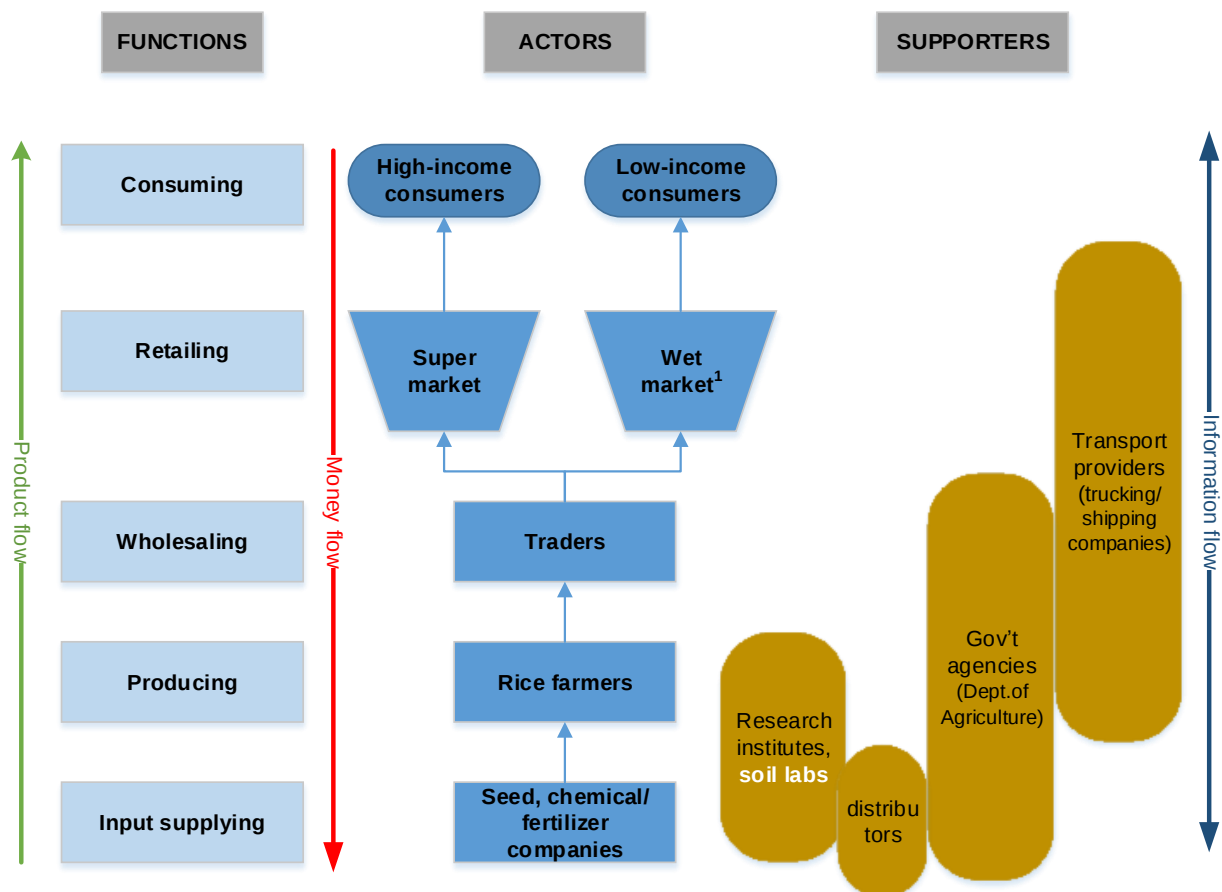


Figure 17. Chain map of the rice sector in the region

However, ‘zooming-in’ closely to the operational nature of soil laboratories, they are also actors in a so-called mini-chain in the agriculture industry (see Figure 18). Their input supplies which are basically test chemicals, reagents, equipment are provided by the manufacturers of these products while the customers are the farmers, cooperatives, agri-companies and universities who need the analysis results in various purposes such as fertilizer recommendation, experiments and researches. The support providers are the distributors and importers who are companies or individuals who bring the input supplies to the soil laboratories.

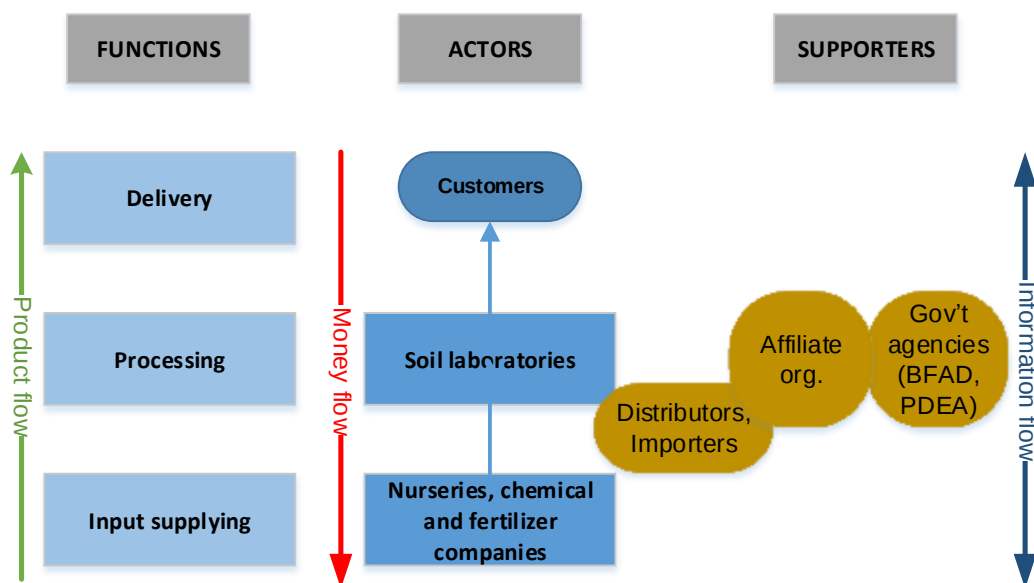


Figure 18. The mini-chain of a soil laboratory

4.2. Soil laboratory supporters and influencers

A number of individuals and organization play a specific role in supporting or influencing the soil laboratories in Davao Region and they are the following:

- a. Manufacturers are individuals or companies that manufactures chemicals, reagents, laboratory equipment needed by soil labs to operate. Examples of companies producing chemical and solid chemicals include Damilab, Chemline, Belman while Perkin Elmer, Merck and Schimadzu are companies manufacturing various laboratory equipment and instruments like test tubes, petri plates, spectroscopy, spectrometers, detectors among others.
- b. Importers are individuals or companies who bring the product of export origin in bulk to the local area. Example, most of the materials and equipment used by soil labs in the region are imported from USA, Japan and Europe.
- c. Distributors are individuals or companies who acts as an agent who supplies goods to labs and other businesses that sell services to customers. Molave Trading is one example of a company distributing chemicals or equipment to laboratories.

- d. Mother company or head office is a company or office which is usually the owner and has the major control and management of subsidiary company or office. Support of the mother company or head office may come in financial or management decisions. Examples are Davao Trade Exponents Inc. being a subsidiary company of Tristar Group of Companies and Regional Soils Laboratory under the control of its head office, the Department of Agriculture Region XI.
- e. Bureau of Food and Drug (BFAD) is a government agency in the Philippines that regulates and ensures the safety, efficacy, purity and quality of processed foods, drugs, diagnostic reagents, medical devices, cosmetics and household hazardous for the protection of public health. Soil labs purchase only chemicals approved by the agency.
- c. Philippine Drug Enforcement Agency (PDEA) is the lead anti-drugs law enforcement agency in the Philippines, responsible for preventing, investigating and combating any dangerous drugs, controlled precursors and essential chemicals within the Philippines. Any soil laboratory seeks permit from PDEA to ensure that chemicals they used are approved and legal.

4.3. Soil laboratories as service provider

Among the organizations and companies that soil laboratories relate to are manufacturers, distributors, suppliers and customers represented by cooperatives, individual farmers, multinational companies from the agri-sector, students and researchers from the academe. The target customers of most soil labs are farmers, plantations, NGOs, students and researchers from universities. The focus area and where most customers come from is Region XI. In the case of DA-Regional Soils Lab, some customers come as far as Region IV and Region VI and the neighbouring Region IX and Region X like Palawan, Bohol, Bukidnon and Surigao. Senior Agriculturist Mrs. Charito Valenzuela was quoted as saying:

“These customers from farther provinces still chose to send their samples here in our lab because they trust the organization”.

Most of the soil laboratories in the regions target customers directly or indirectly involved in agriculture development. They are categorized into the following: (a) plantations (b) cooperatives (c) Individual farmers (d) universities and (e) NGOs. Among these types of customers, farmers, cooperatives and plantations are the ones who frequently avail the soil lab services. DALInc however since they are offering ore analysis has small-scale miners as regular customers also.

Services are delivered to customers by way of a printed copy of the results. Should the customers intentionally request for an electronic copy, the soil lab prepares for it and send it via email to the requesting customer. The ten labs existing in the regions offered soil analysis on physical and chemical properties of soil and organic matter composition. Although only one out of ten labs in the region, the Davao Analytical Laboratory Inc. (DALInc) had the most complete services offering other services like water analysis, fertilizer analysis, plant tissue analysis, feeds analysis, food analysis, activated carbon and charcoal analysis, oils and fats analysis, pharmaceutical analysis,

sediments and sludge and pesticide residue analysis, they emerged as the one with the most expensive prices (see Annex 6). These labs depending on the kind of services they offer to customers have different price offers per service. Among the ten labs, DA-Regional Soils Laboratory had the cheapest prices followed by Davao Trade Exponents Inc. (see Table 1).

Table 1. Comparison of service fees per parameter of the three soil laboratories studied

Parameter/Test	DA-Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.
A. Chemical			
pH	50.00	150.00	72.00
Nitrogen	100.00	550.00	124.00
Phosphorus	100.00	500.00	124.00
Potassium	100.00	--	124.00
Organic matter	150.00	400.00	158.00
Sodium	100.00	--	124.00
Calcium	100.00	300.00	124.00
Magnesium	100.00	--	124.00
Sulfur	150.00	480.00	87.00
Zinc	100.00	--	93.00
Copper	100.00	--	93.00
Iron	100.00	--	93.00
Manganese	100.00	--	93.00
Boron	300.00	--	202.00
Electrical conductivity	100.00	180.00	--
Cation exchange capacity	200.00	630.00	--
B. Physical			
Soil texture	200.00	--	--
Water holding capacity	150.00	280.00	--
Bulk density	150.00	290.00	--
Grain size particle	150.00	--	--
Plastic limit	150.00	--	--
Particle density	150.00	--	--

Note: Fees are charged per sample/parameter. All figures are expressed in Philippine peso (1 Php = 0.017 euro)

Since the soil laboratories in the region were not only offering soil analysis, a competition matrix is presented in Table 2 to show their various service portfolio. A supplementary table showing the prices of these labs to specific services is found in Annex 6.

Table 2. Competition matrix of soil labs in the region

Name of laboratory	Focus region	Service portfolio						Fertilizer recommendation
		Soil analysis	Plant tissue analysis	Microbiological analysis	Water analysis	Fertilizer analysis	Relevant others	
Regional Soils Laboratory - DA Bangoy St. Davao City	Region XI	yes	no	no	no	yes	tissue preparation, compost distribution, feed analysis	yes
Davao Analytical Laboratory Inc. Mc Arthur Highway cor. Union Ave., Bangkal Davao City, 8000 Davao City	Region XI	yes	yes	yes	yes	yes	activated carbon and charcoal analysis, feed analysis, food analysis, oils and fats analysis, ore analysis, sediments and sludge, pharmaceutical analysis, pesticide residue analysis, chemical analysis, wastewater analysis	no
Davao Trade Exponents Inc. Highand Banana Corp. Guianga, Tugbok Dist., Davao City	Region XI	yes	yes	no	yes	yes	wastewater analysis, fruit analysis	conditional
Science Resource Center, University of Immaculate Conception Main Campus, Fr. Selga St. Davao City	Region XI	yes	yes	yes	yes	yes	feed analysis, food analysis, wastewater analysis	no
Lapanday Foods Corp. Maryknoll Drive, Bo.Pampanga, Davao City 8000	Region XI	yes	yes	yes	yes	yes	wastewater analysis	conditional
Jefcor Laboratories, Inc.; Rm. 213, GRDC Building Lanang, Davao City	Region XI	yes	no	no	yes	no	wastewater analysis, pesticide residue, pesticide registration, sediments	--

Table 2 continued

Name of laboratory	Focus region	Service portfolio						Fertilizer recommendation
		Soil analysis	Plant tissue analysis	Microbiological analysis	Water analysis	Fertilizer analysis	Relevant others	
Twin Rivers Research Center, Madaum, Tagum City	Region XI	yes	yes	no	yes	yes	feed analysis, banana tissue culture	--
Chemistry Research Laboratory Ateneo de Davao University Davao City	Region XI	yes	yes	--	yes	yes	feed analysis, food analysis,	--
Dole-Stanfilco Inc. Belisario Heights, Lanang, Davao City	Region XI	yes	yes	yes	yes	yes	--	--
Marsman Drysdale Inc. Sto.Tomas, Davao del Norte	Region XI	yes	yes	--	--	yes	compost/manure analysis	--

Note: -- unverified

4.4. Flow of product, cash and information

The product of soil laboratories is service. Through the samples that the farmers are bringing into the labs, the laboratory analysts process the sample based on what parameters would the customer like to know. Nine out of ten farmers interviewed availed tests determining the chemical properties of soil which includes NPK (nitrogen, phosphorus, potassium) levels, organic matter level, and micronutrients levels such as zinc, manganese, boron, magnesium and calcium. Least popular are the tests on physical characteristics of the soil like texture, moisture content and bulk density¹ where one out of the ten respondents preferred such kind of test to be included in the analysis of his soil.

The government lab, DA-Regional Soils Lab required full payment upon submission of samples while the two private labs – Davao Analytical Lab Inc. and Davao Trade Exponents Inc. required full payment from customers only upon release of results. Payments were made in cash, bank transfer or check. However, there were few cases especially for the Davao Trade Exponents Inc. where some of their frequent customers negotiated for extended payment period but such instances were decided by the top management of the company (see Annex 7). The three labs interviewed provide the results to customers in printed form.

However, it was observed that the soil labs defied efforts to relay to farmers in the provinces the prices of the services they are offering. Likewise, soil labs were not aware of the constraints of the farmers why they were not able to avail such kind of service.

¹ Bulk density is the measure of soil compaction. It is determined by the volume of pores among soil particles (USDA, 2008).

5. Results of case study on farmers as existing customers

This chapter deals with the results obtained from the case study conducted to the farmers from the banana and rice sectors who became customers of the three soil laboratories studied. Their opinions were summarized in sections based on which sector and lab they are from.

5.1. Banana

Department of Agriculture - Regional Soils Laboratory

The two customers (see Annex 4 for names) of the DA- Regional Soils Laboratory were banana farmers for more than 10 years. Both of them said that soil analysis was important for them to determine the status of their soils, the deficient nutrients and thus determine the accurate fertilizers to be applied that could improve their productivity. Both of the two farmers chose analysis on the chemical properties of the soil particularly macronutrient and micronutrient analysis and pH level.

Respondent 1 said that when she chose this laboratory she had no idea there were other soil labs existing in the region (see Annex 8). However, she was quite satisfied of the lab service when she saw improvement on the banana bunches months after she followed the recommendation given by the lab. She added that she was satisfied with their service since the prices were almost the same in the recent years. According to her, technical knowledge, good facilities and on time release of results were among the reasons that makes her satisfied as a customer.

However, the issue on timeliness on release of results of the government lab was opposed by Respondent 2. He expressed that he only sought the service of DA lab once and transferred to another lab stating he was dissatisfied with the long duration of time before he was able to obtain the results. According to him, due to several customers that the government lab had, time from submission of samples up to release of results was often too long. The second time he conducted analysis, he chose another lab which he thought provided him a better and efficient service by delivering lab results on time.

While Respondent 1 stated that she had soil analysis thrice a year, Respondent 2 conducted soil analysis only once every two years. However, both of the farmers said that what they consider important in deciding which laboratory to go was the credibility of the lab where their needs will be met and satisfied. And lastly, service quality, affordability and timeliness emerged as the top reasons that could keep their loyalty to the soil lab.

Davao Analytical Laboratory Inc.

Respondent 1 grew bananas for 10 years and had been a loyal customer to Davao Analytical Laboratory Inc. He decided to avail the service because according to him soil analysis was important to monitor the acidity level of his soil since acidity affects the absorption of nutrients by plants. He chose DALInc. because he was a friend of the owner. The services that he usually availed were soil analysis to determine pH, nitrogen, potassium, phosphorus and organic matter levels. Aside from soil analysis he also often sought service on fertilizer analysis.

He availed the service once a year for soil analysis while fertilizer analysis was conducted only when he had uncertainties of the fertilizer products. Moreover, he added that he was satisfied with the service of DALInc. because he was aware of the strict policy of the company on quality. As a customer, he narrated that service quality, availability of needed parameters, and accessibility of the laboratory were the major factors he considered upon deciding which lab to go.

Respondent 2 likewise said that he became satisfied with the service of the soil laboratory when he saw that his productivity improved after he based his fertilizer application program on the results of the analysis conducted by DALInc. lab. He was happy when he witnessed improved growth of his bananas months after. For him, as long as the services of the lab meet his needs as a farmer, he said his loyalty will be with the lab.

Davao Trade Exponents Inc.(DTEI).

Respondent 1 who was a customer of DTEI for two consecutive years said, that soil analysis was important to him as a farmer since it gave him an idea on the level of fertility of his soil. He chose this lab because in his opinion, among the three private labs in the region, DTEI was the cheapest in terms of service fees. Aside from soil analysis, he also availed the analysis for leaf to determine the available nutrients taken up by the plants from the exchangeable nutrients in the soil. He stated that if there were questionable data in the results he received, he felt comfortable to ask the lab personnel and had the analysis reviewed or re-ran without additional cost. According to him, DTEI personnel accommodated questions from customers politely and without any violent reaction.

Respondent 2 affirmed by saying that soil analysis was significant for him as he aimed precision farming and one of the practices to do such was accurate fertilizer application. He was confident that DTEI laboratory standards were high among other labs in the region. He knew that the lab aligned its standards to Wageningen University in the Netherlands and considering this technical capability, he believed that results were more accurate then (see Annex 8).

Both farmers stated that they availed the service from DTEI lab once a year although as desired, they wanted to have an analysis twice a year however financial constraints restricted them to do so. They also both availed services which analysed the physical and chemical properties of the soil which includes the micro and macronutrient levels (N, P, K Mg, zinc) and organic matter content.

The two farmers expressed that they were satisfied with the service given by DTEI considering the reliability and timeliness on the release of results. Their satisfaction on the service of the lab came from the manner the lab treated them as customers. Convenience was another reason of satisfaction as the formats stated in the results were easier to read. According to Respondent 1, the units of measurements used by the lab were easier to read and no need for conversions. In other labs, he was forced to convert the measurements into units most appropriate and easiest for interpretation which was a hassle on his part. Respondent 2 stated that his loyalty remained to the lab since the staff were more approachable especially during payment negotiations. Other labs do not release their results if they don't have the payment at hand. Since he already established a certain level of relationship with the lab, payment negotiation became easier for

him. Lab personnel also were willing to understand when the results need to be urgent. In general, the farmers cited friendliness and integrity of the lab keeps them loyal as customers.

5.2. Rice sector

Department of Agriculture - Regional Soils Laboratory

A rice farmer for four years, Respondent 1 had 14 hectares of rice fields in Sulop, Davao del Sur. He stated that he sought the service of DA-Regional Soils Laboratory to determine the accurate kind and quantity of fertilizer that should be applied in his farm. The respondent was quoted saying:

‘Without knowing the real condition of the soil before fertilizer application, there is a very high chance of wasting the fertilizer because the real nutritional need the soil is not determined’.

He expressed that he chose the government lab to take charge of analysing his soil because he was confident that the lab had higher reliability in terms of results. He added that in his opinion, the lab receives higher budget from the government prompting him to expect that they have better facilities in carrying out the tests. Since he started availing their services, he added that he had been a satisfied customer from then on. He often availed the chemical analysis to determine the nitrogen, phosphorus and potassium levels of his soils. However, he only availed the service once a year due to financial considerations.

It appeared that the opinions given by the first respondent was affirmed by Respondent 2 who happened to be a coordinator of a rice project in a university as he expressed same satisfaction by saying he was quiet happy with the services of the government lab because of two reasons— it’s cheaper and the results were reliable based on the increase in yield after following the recommendation given by the lab along with the test results. Given the meager budget allocated to state universities for research projects, acquiring a cheap service provider like soil laboratories is very helpful for them.

Davao Analytical Laboratory Inc. (DALInc).

Due to unavailability of customers from the rice sectors, answers cannot be drawn from the services of this lab from the perspective of customers.

Davao Trade Exponents, Inc. (DTEI)

Soil analysis was important to Respondent 1 who was a rice farmer for ten years. According to him, the fertilizer recommendation provided by DTEI helped him to determine the right kind and amount of fertilizers he needed to apply in his soil. The analysis allowed him to know the fertility status of his soil based on the results. Although he only availed the DTEI services twice prior to changing crop, he emphasized that he was satisfied with the service of the lab because there was already a fertilizer recommendation included. He added that he had high confidence for the lab because of their credibility as a good laboratory in the banana industry. To note, Davao Trade Exponents Inc. is a subsidiary of Tristar Group of Companies, a banana company in Davao

Region. His satisfaction arose when following the recommendation given by the lab, his productivity increased months later.

Respondent 2 also showed satisfaction on the services of DTEI lab as his production also increased when he followed the recommendation of the lab. He stated that he could keep his loyalty to the lab because of good relationship and trust.

4.5. Customers satisfaction

The responses of the farmers being customers of the three soil labs studied is summarized in Table 3. The farmers in general were satisfied with the quality of the service from the lab they selected. However, one respondent expressed dissatisfaction with the government lab citing timeliness of result delivery as the major reason where he believed that there were higher number of customers going to the government lab due to cheaper price resulting to extended time for release of results. However, the level of satisfaction or dissatisfaction was not a detailed measurement and was considered to be one of the limitations of this study.

Table 3. Satisfaction of customers on the soil labs they availed services with

Crop	Gov't lab (DA-Regional Soils Laboratory)	Private lab 1 (Davao Analytical Laboratory Inc.)	Private lab 2 (Davao Trade Exponents, Inc.)
Banana			
			
Rice		n/a	
		n/a	

6. Results of survey on potential customers

This chapter deals with the outcome of the survey conducted to farmers from the banana and rice sectors who so far did not experience availing services from a soil laboratory. This chapter presents the perception and opinion of the farmers from both sectors which are significant to draw answer to the main research question 3, 'What influences the decision of farmers in Davao Region to avail soil laboratory services?'.

6.1. General characteristics of sample

In order to better understand the results that will be discussed in the succeeding sections and chapter, it is necessary to first set out some general characteristics of the participants from the sample. However, due to the non-representativeness of this study, the results presented in this section cannot be generalized to the total population of the farmers from the banana and rice sectors in Davao Region. Still, these characteristics have provided this study with additional information of the characteristics of banana and rice farmers who were considered as potential customers of a soil laboratory.

6.1.1. Age and educational level of respondents

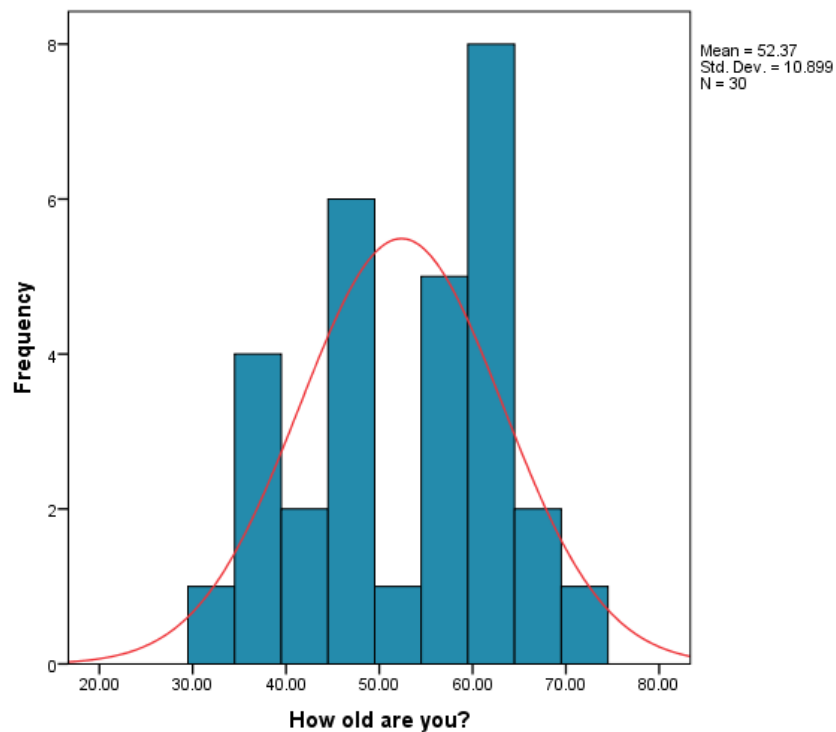


Figure 19. Age distribution of respondents

Thirty farmers were involved in this activity (see Annex 9). Figure 19 shows that the mean age of the farmer-respondents is 52 years indicating that majority of the respondents are elderly (see Annex 10).

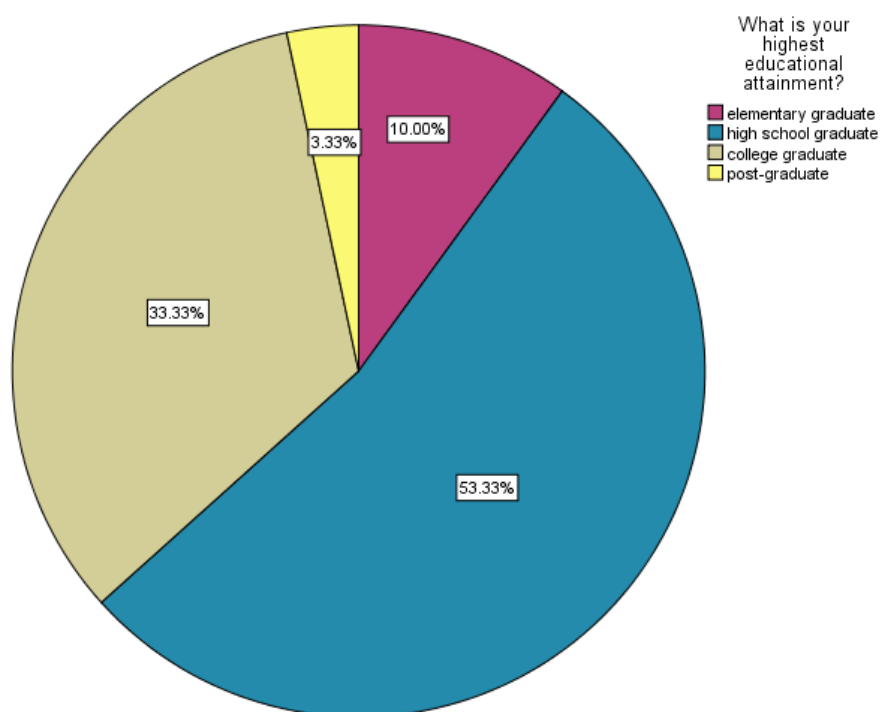


Figure 20. Educational level of the respondents (n=30)

Moreover, the level of educational attainment of the respondents was determined. Figure 20 shows that most of the respondents were high school graduates followed by respondents who were college graduates. Only one out of 30 respondents reached post-graduate studies while there were three elementary graduates (see Annex 9). In the later section, this data was used to determine the relationship between educational level and the reason why farmers did not avail soil lab services.

6.1.2. Farm size of respondents

Figure 21 shows that most of the respondents have an average of 3.5 hectares of farm. This observation is clear especially for respondents from the banana sector (see also Annex 11) as opposed to the farmers in the rice sector where the values are spread with a range of 2 to 8. However, it can be noted that 9 out of 15 respondents from the rice sector own 2 hectares of rice farms (Annex 9). The figure indicates that the respondents are considered small scale farmers.

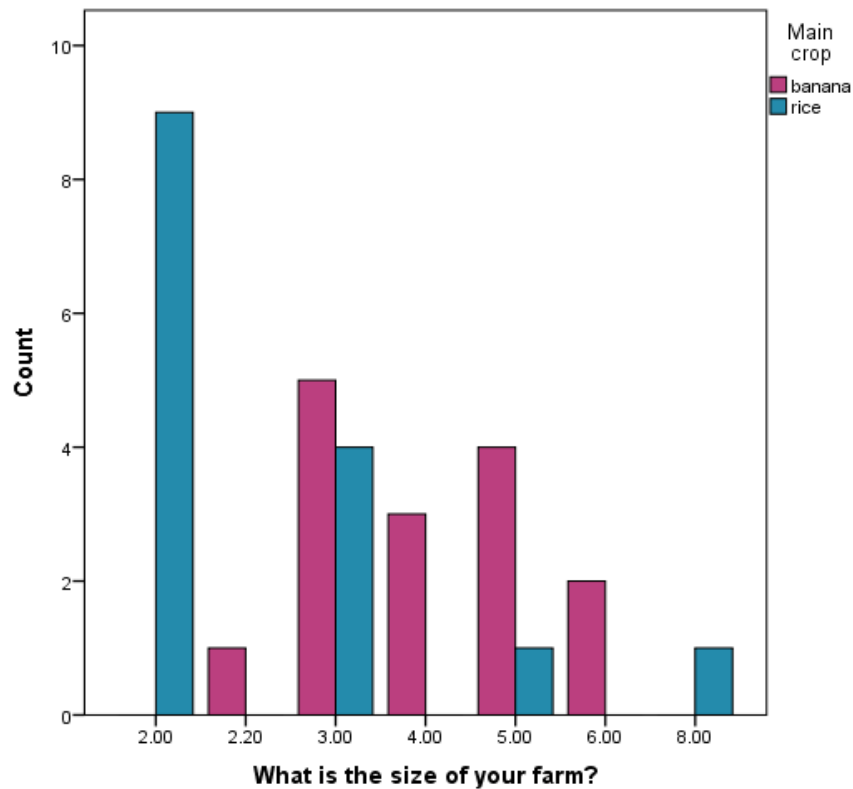


Figure 21. Farm size of the respondents (n=30)

6.2. Respondents' idea of soil analysis

Figure 22 shows that more farmers from the rice sector (13 out of 15) were aware of soil analysis while barely half of the farmers from the banana sector heard about the technology. Based on the interviews with the rice farmers, most of them knew about soil analysis from the government extension workers who were working with them in the previous years. Such scenario was non-existent especially for small scale farmers in the banana industries where technical personnel usually dealing with these kind of activities are only existent in multinational companies.

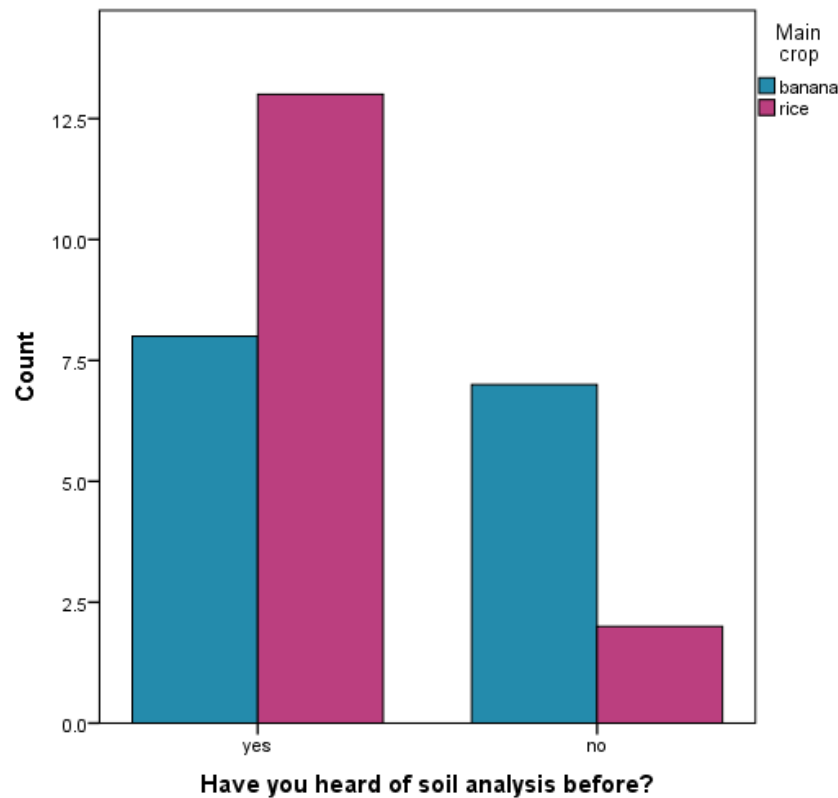


Figure 22. Respondents' idea of a soil laboratory (n=30)

The role of extension workers from government agencies to the Regional Soils Laboratory of the Department of Agriculture have a strong contribution how these farmers knew about the technology. And since there are more projects administered by the government in the rice sector through the extensionists, more rice farmers became aware of the service compared to banana farmers who acquire less intervention from the government. Among the government projects administered by government in the rice sector prompting rice farmers to know about the technology were Agri-Pinoy Rice, Mindanao Rural Development Program (MRDP) and Organic Agriculture. These projects urged the farmers involved to employ agricultural practices that would enhance their productivity where one of them is accurate fertilization through regular analysis of their farm soil.

6.3. Reasons for not availing soil analysis service

Price emerged as the top reason why farmers did not avail soil analysis service (Figure 23). Eighteen out of thirty farmers answered 'prices are expensive' as their main reason why they did not avail the soil analysis service. Four farmers answered they did not avail because of an available previous analysis; they just followed the recommendation written on an old soil test results. Three farmers also stated lack of access to soil labs was their reason of rejecting the service. Since most of the farms were located in the rural areas and the labs were based in Davao City which is more or less 50 to 60 kilometers away, farmers were reluctant to make efforts in bringing samples to the labs which they don't know where they are located in the first place. This was observed from the responses of farmers from the rice sector. Ignorance to benefits of technology was another reason where two farmers answered they didn't know the benefits they could obtain if they avail the service.

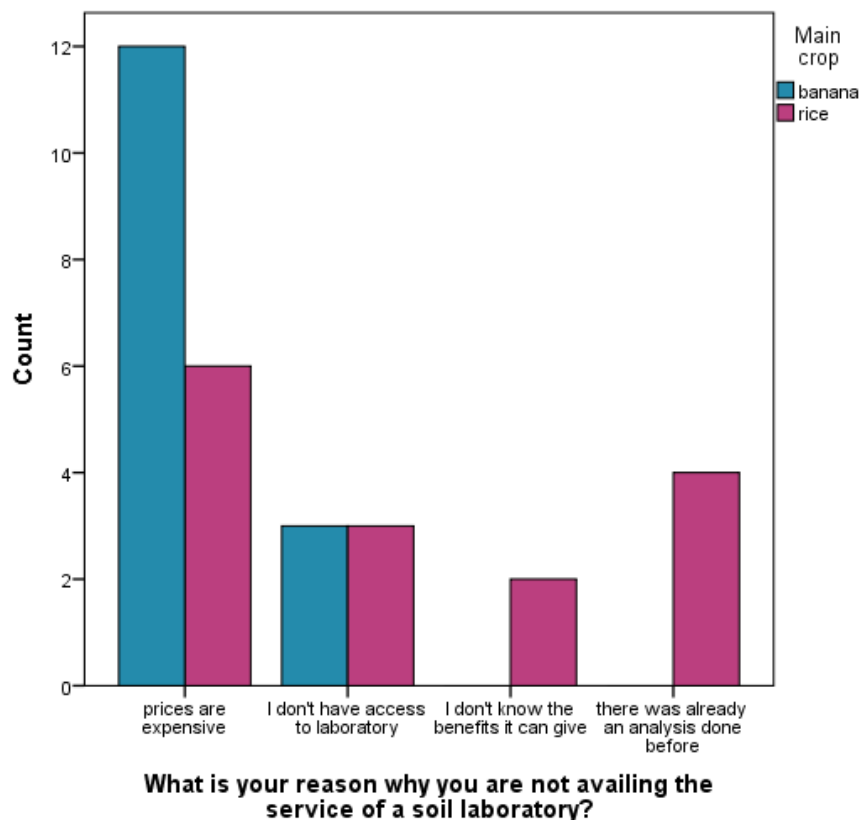


Figure 23. Reason of farmers of not availing services of a soil laboratory (n=30)

With further investigation, the effect of educational level of respondents to the reasons why they did not avail soil analysis service was determined. Chi-square test results revealed that there is a significant difference between the education level and reason why they did not avail the soil lab service, with p value of 0.039 at $p < .05$ level (see Annex 12). Data indicate that the higher the educational level of the respondents, the higher also was there understanding about the service. Although one outlier was observed where one college graduate was not aware of the benefits of

soil analysis. Probing deeper, this respondent was found out to have a different background entirely different from agriculture.

6.4. Willingness of respondents to avail soil laboratory services

Figure 24 reveals that both banana and rice farmers are willing to avail the services of a soil in the future. Figure shows that most of the farmers (18 out of 30) have understood the contribution of the technology in attaining improved productivity of their crops. However, two farmers out of fifteen rice farmers answered reluctance to the service and expressed they would only do so if it will be offered as free.

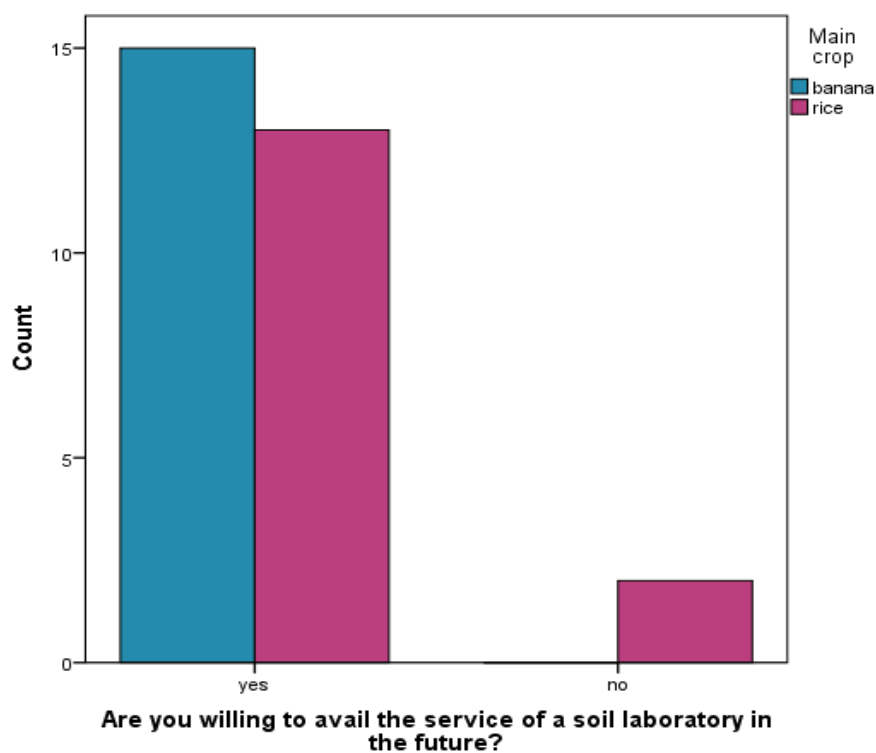


Figure 24. Willingness of farmers to avail soil lab services (n=30)

In the previous years, the Department of Agriculture offered free soil analysis to the rice farmers in Hagonoy, Davao del Sur. This was the reason why there were still farmers in the rice sector who were expecting that the program will be revived by the local government so they could not pay some amount plus they can benefit by an obtaining the opportunity of an improved yield. However, due to unknown reasons the program was stopped and farmers also developed a feeling of alienation on the service.

6.5. Planned frequency of availing soil laboratory services

Figure 25 shows that most farmers from the banana and rice sectors planned to avail the service once a year. Although this is the general observation, there is a clear difference between the farmers from the two sectors where banana farmers planned a more closer interval ranging from quarterly to once a year. While the rice farmers on the other hand, planned a longer interval reaching up to once every two to three years. The long intervals favoured by the rice farmers emanated on their concern to improve their productivity first before investing to other costs like soil analysis. Since most of the rice farmers in Hagonoy had low yields in the recent years (less than 4,500kg per hectare of unmilled rice per cropping season, the average is 5,000 to 6,000kg per hectare), additional cost on other inputs was of less concern. Apparently, farmers from the banana sector were more interested of the soil analysis service as opposed by farmers from the rice sector who were less interested of the service. Rice farmers preferred to pay more attention to other farm costs like labour, pesticides and fertilizers.

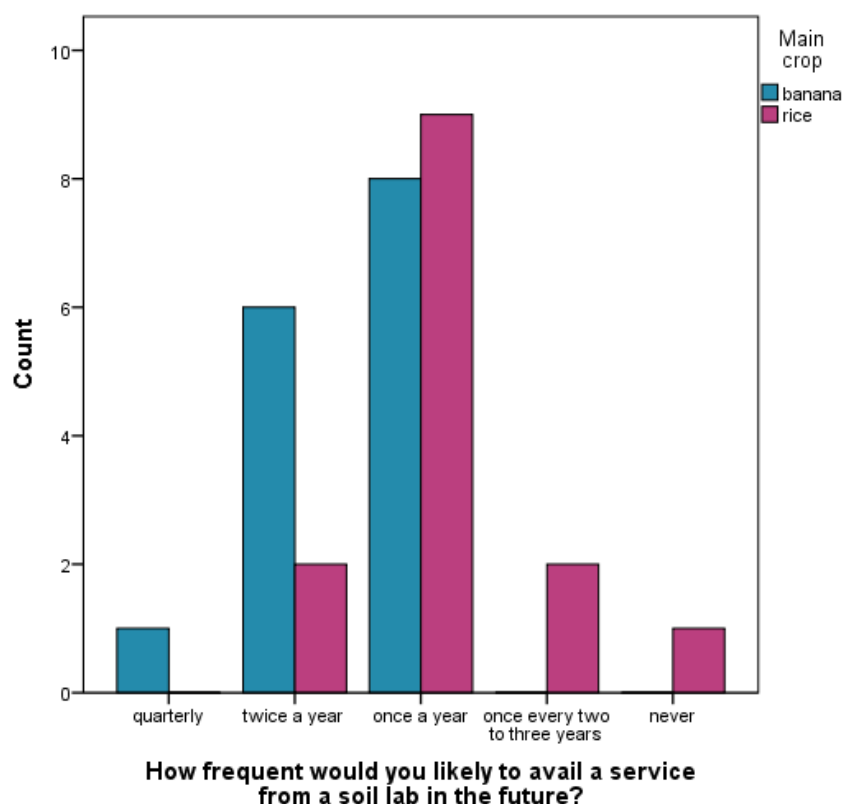


Figure 25. Frequency of availing the soil lab service (n=30)

Natural calamities like typhoon that destroyed the crops of farmers also influenced the decisions of farmers on frequency of conducting soil analysis. This was confirmed by Davao Trade Exponents when one of their customers, Dizon Farms which used to avail the service twice a year changed frequency to once a year after their farms were devastated by successive typhoons. To note, there were two huge typhoons that hit the region in the last two years. Several banana growers went bankrupt due to serious losses.

6.6. Respondents' considerations in decision-making

Respondents were also asked about their considerations should they decide to avail soil lab services in the future. Figure 26 indicates that the highest percentage goes to financial capacity of the respondents with 53%. This was followed by the benefits they could get from the technology with 33%, meaning the impact of the technology to their productivity. Service quality falls lastly with 13% where farmers considered it of least importance compared to price and perceived benefits.

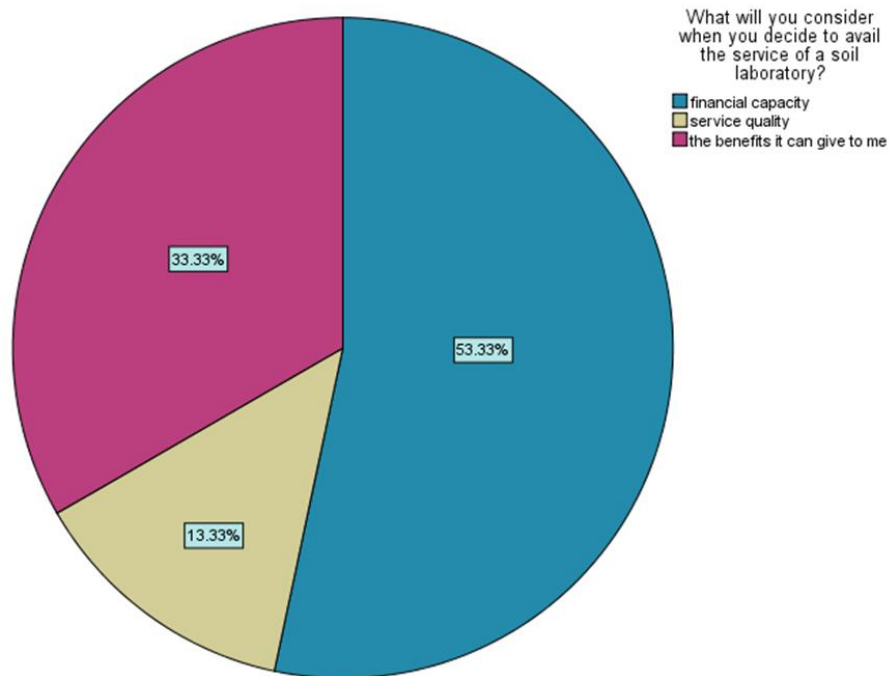


Figure 26. Major consideration of farmers in deciding to avail the services of a soil laboratory (n=30)

Results reveal that most of the respondents were conscious of their financial capability rather than the value they get from the service. Though quality of service was cited as another important consideration but it was given the least concern by the thirty respondents. This information support to the observation on the farmers' consciousness to price as explained further in this study.

6.7. Kind of service respondents planned to avail

Figure 27 shows the type of service the respondents were likely to avail from a soil laboratory. Most of the farmers (46%) answered they would choose chemical analysis as a priority. Chemical analysis includes determining the elements present in soil. They are classified according to their availability being a micro-nutrient or a macronutrient. The second choice was physical analysis (39%) which determines the physical properties of the soil like soil texture², available water capacity³ and pH⁴.

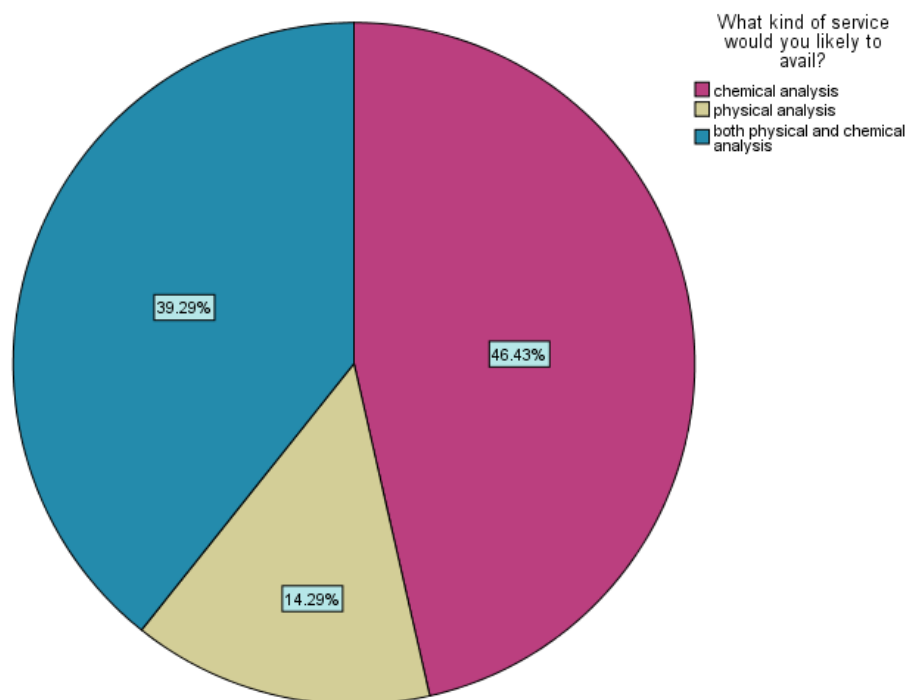


Figure 27. Kind of analysis that farmers are likely to avail from a soil lab (n=30)

Few farmers chose both physical and chemical analysis be conducted at the same time (14%). The observation obtained from the hesitation of the farmers to do physical and chemical analysis in similar schedules is related to cost. Conducting both tests at the same time means a higher cost to be paid by farmers to the soil laboratory.

² Soil texture is the look and feel of the soil and is determined by the size and type of particles that make up the soil (including the organic but mostly referring to the inorganic material) (MEA, 2013).

³ Available water capacity is the maximum amount of plant available water a soil can provide. It is an indicator of a soil's ability to retain water and make it sufficiently available for plant use (SoilQuality.org, 2011)

⁴ pH is simply a measure of how acid or alkaline a substance is, and soil acidity or alkalinity (soil pH) is important because it influences how easily plants can take up nutrients from the soil (Organic Gardening, 2013).

6.8. Price willing to pay

Figure 28 shows that the average price the farmers were willing to pay for a service per sample is Php 187 or approx. 3 euros (see Annex 13). However, two out of thirty farmers answered zero since they wanted the service as free as possible, another two had no idea what were the price ranges set by soil labs on their services.

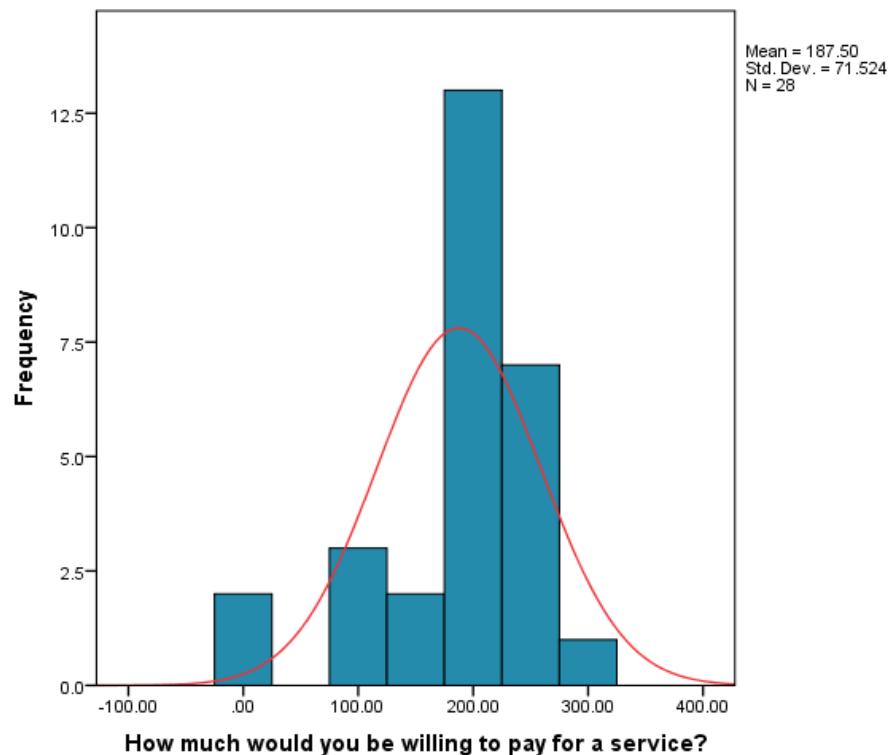


Figure 28. Price of service that farmers are willing to pay (n=30)

Further analysis using Chi-square test reveals that there is no difference in price that customers were willing to pay for a service between the farmers from banana and rice sectors based on the results with p value of 0.062 at $p < .05$ level (see Annex 14). This observation indicates that regardless of which sector they come from, farmers are willing to pay a laboratory service as long as the price is below Php200.

Further testing using ANOVA revealed that type of analysis for soil (whether physical properties or chemical properties) has no significant effect on the price which the farmers are willing to pay with p value of 0.078 at $p < .05$ level (see Annex 15). This means that banana and rice farmers expected that prices are similar (not more than Php200) for tests determining nutrients levels in soil and tests on soil texture or moisture capacity. Relating to the data obtained from soil labs, most of the tests determining chemical properties of soil were lower than the physical property tests.

6.9. Willingness to pay more

Since there were 16 out of 30 farmers who answered that financial capacity was their major consideration in deciding to avail the soil lab services, Figure 29 shows a confirmation to this observation where respondents' reluctance to pay more for a service is presented.

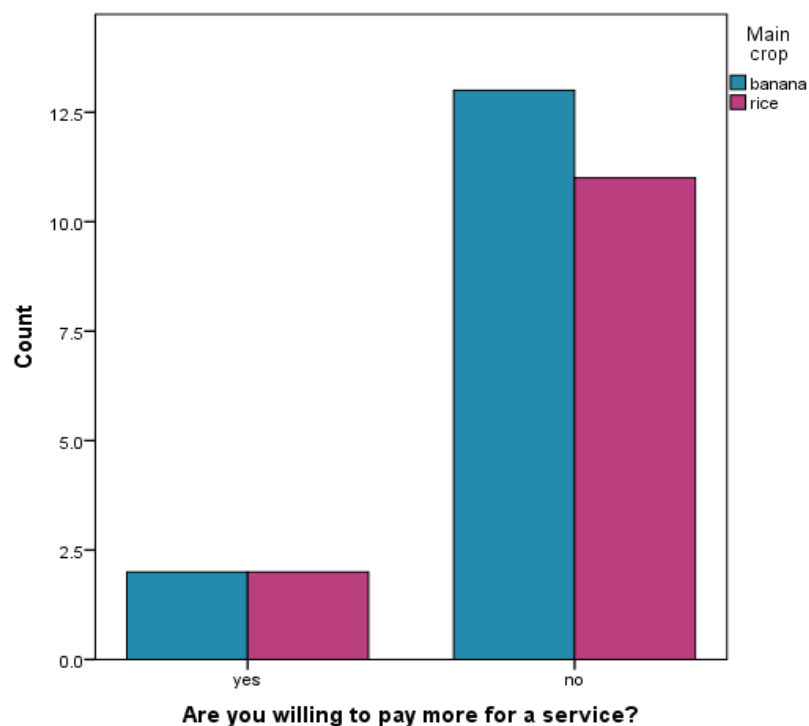


Figure 29. Willingness of farmers to pay for an additional charge of a service (n=30)

The bar graph shows that 24 out of 30 farmers from banana and rice sectors were not willing to pay additional amount for a laboratory service. Linking this to the observation obtained from the case studies where DTEI charges additional 25% cost (from the cost of a particular service) for a fertilizer recommendation to be included in a test result, indicate that farmers have higher possibility of declining the service because of financial consideration (see Annex 7).

7. Discussion

This chapter deals with interpretation based on the given results of the methods used to answer the research questions.

7.1. The significant role of soil laboratories

Major findings of the case study among the three soil laboratories studied revealed that in both banana and rice chains, soil laboratories play the significant role of being a support service provider to the main chain actors. They are considered as a significant chain supporter by providing services to farmers crucial in the formulation of an accurate fertilizer program. This is true as Baker in 2002 cited that the primary objective of these soils laboratories is to give farmers a service leading to better and more economic use of fertilizers and better soil management practices for increasing agricultural production. High crop yields cannot be obtained without applying sufficient fertilizers to overcome existing deficiencies.

In the perspective of the farmers as customers, they were clearly convinced that availing the services of a soil laboratory can bring higher returns on their income. Farmers who availed the soil lab services expressed satisfaction when they experienced increased productivity after following fertilizer program with scientific-basis. Most of the farmers were quite satisfied with the services of the soil lab they had tried to availed service with. However, a clear interpretation as to the level of satisfaction of the customers could not be determined in detail and was considered also one limitation of the study. The questions could have been formulated in a way that could generate a score on satisfaction levels but this could be an area to be considered for future study then.

How the soil laboratories relate to its customers also play a significant role on the success of their business. A good customer relationship often keeps customer's loyalty to a lab. Among the three labs studied, it came out that Davao Trade Exponents handled their customers better than DA-Regional Soils Lab and Davao Analytical Lab based on the answers of the respondents expressing trust, accommodating-nature and good customer treatment as major reasons of satisfaction and loyalty.

7.2. Barriers in availing soil analysis services

Survey findings revealed that farmers cited inaccessibility, ignorance to benefits and price issues among the reasons why they chose to neglect the soil analysis services. Price was important to farmers as it emerged as the major reason why most of the respondents did not avail of the soil laboratory services. Most of the farmers expected that soil lab prices were expensive. Although perception on price is subjective, on the perspective of the farmers creating an impression of expensive prices charged by soil laboratories prompted them to ignore the service. This false impression of the farmers can be linked to the actual prices set by soil labs versus the price these farmers were willing to pay for a certain service. Two labs, the DA-Regional Soils Lab and Davao Trade Exponents Inc. had prices lower than Php 150 compared to the Php 187 (average) that the farmers were willing to pay. In reality, the true prices were lower than their assumptions.

Moreover, financial capability was a major consideration during decision-making of the farmers when availing soil analysis. They considered soil analysis as another farm cost which especially the rice farmers were hesitant to invest. Most of them considered soil analysis of least importance and instead paying more attention how to increase their productivity by focusing on other farm costs such as pesticides, fertilizers and labour. Unfortunately, these farmers failed to appreciate that soil analysis can in fact lead to an improved productivity instead of being a financial burden and save costs on fertilizers by reducing wastage; a clear indication that there was a gap of information on the benefits that can be obtained from the service.

7.3. Gaps in information flow

The 'false impression' by farmers on price is a valid example that there were gaps in the flow of information from soils laboratories to farmers and vice versa. Farmers assumed that soil lab services are expensive because there were no means for them to know the price or payment schemes of these labs. The 'high price belief' caused the farmers to ignore the technology and rely on the traditional 'guessing' method of fertilizer application. Farmers believed that soil analysis is a costly investment because they were not aware of the prices in the first place. This belief prompted them to ignore the technology and focus on other farm needs. Ignorance of these farmers to soil analysis prices and benefits of the technology caused them to lose the opportunity of an improved production.

Information exchange is important to determine the needs between soil labs and farmers. The soil lab could have been a major help for farmers in achieving their goal of improved productivity should they relayed information to each other especially on price, sample procedure and sample requirement including the benefits. Communication and information sharing is important in any chain. Kotabe, et al. in 2003 pointed out that these two are vital chain coordination mechanism that contributes in creating efficiencies in the chain operations. A study conducted by Coronado et al. in 2010 concluded that sustainable business relations are founded on well-established information exchange along and within the value chain.

7.4. The marketing mix (3Ps)

Understanding the marketing combination employed by soil laboratories in the Davao Region at present is important to prepare NEH Phils. how to strategize its market entry in the future. The roles played by product, price and promotion are crucial in the soil lab business environment as they could determine success or failure of the business.

7.4.1. Product

In the soil lab business, the product is service and the value proposition is to provide soil analysis services to companies involved in the agribusiness industry. The quality of the product is often based on intangible results which can be seen months after implementation of the analysis and recommendation. Customers stated they are most satisfied with the service when they see improvement on the size of their fruits or increase in number of sacks of rice harvested.

It is then important to package this service that would attract the customers from the banana and rice sectors better. Looking back to the information gathered, customer satisfaction to a soil lab

service boils down to obtaining a fertilizer recommendation as an inclusion to test results with no additional cost. This is quite convenient especially for small scale farmers who don't have the capacity to hire a soil scientist or consultant to do the interpretation and prepare for them a fertilizer program which is a common scenario in multinational companies. When a soil lab hand in a ready-to-use fertilizer recommendation, farmers will just implement the program, wait until harvest time and see the results. Customers become happy when they see results of their financial investment improved their productivity.

Timeliness is another issue being pointed out in the case study. DA- Regional Soils Lab lost a customer because of delayed release of the test results. The faster the release of results, the better it would be for the farmers as implementation of analysis results has direct effect on time. The earlier the farmer can implement the fertilizer program means the earlier also is his time to see the effect on his production.

Customers are important in any business as they are viewed as assets that bring value to the firm. Therefore, it is important to meet the requirements he needs from a product or service. An ideal customer is one who is inexpensive to acquire, who delivers regular profits from his purchases each year, and who remains a customer for a long period of time.

7.4.2. Price

The decisions whether to avail or not soil analysis service is a battle between price and value. However most of the farmers' responses indicate that price is the first consideration being looked upon when availing soil lab services more than the value they could obtain from the service. Based on this finding, the farmers' perception on soil lab services can be summarized through a grid in Figure 29 where price is given more importance during decision-making than the value obtained.

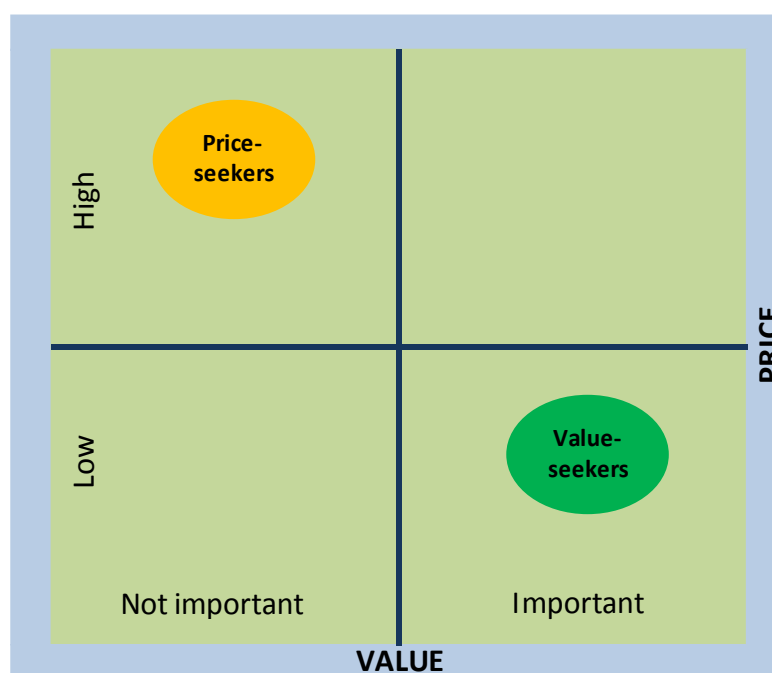


Figure 30. Segmentation of respondents based on their given level of importance of value and price

Looking back into the chain maps, a gap on price information was identified as the major barrier for the farmers to avail the soil lab services. Most of the farmers lack knowledge on the different prices set by the three soil labs studied. Having the false impression of expensive price set by soil labs, farmers were hesitant to avail the service as they were thinking that the service is a costly farm investment. However, examining closely the observations gathered by comparing the price perceived by the potential customers and the price they are willing to pay, it came out that in reality, prices are just within the budget of these farmers. Thus, there is a clear lapse on the flow of information concerning the two actors.

Financial matter is a delicate issue for farmers struggling in their production especially in the case of rice farmers in Hagonoy, Davao del Sur where they cited that if an organization could shoulder the service for free, they would be more than eager to avail. Given this situation, soil labs can strategize to convince these farmers to avail the service by offering a more affordable price packages or payment schemes. Like Davao Trade Exponents Inc. which allowed down payment (half of the price) upon submission of sample and then full payment upon release of results. This type of payment scheme is less worrisome for farmers who don't have ready payment at the time the analysis was done. A better payment scheme can help convince the farmers to avail the service.

7.4.3. Promotion

Banana farmers can be good customers but not rice farmers. However, advertising and promotion should be intensified to strongly persuade banana farmers to avail the service regularly.

Unfortunately, it is observed that promoting the service to customers is not given serious attention by soil laboratories. There is a kind of passive marketing on the part of soil laboratories. It is also observed that they pay less attention for promoting their company like use of flyers, utilizing the internet and social media (e.g. facebook page or twitter). One good example to cite was the customer of DA-Regional Soils Lab who had no idea on the presence of other labs in Davao Region (see Annex 8).

Passive promotion of service can be well attributed to affiliation of some labs to multinational companies like in the case of Davao Trade Exponents Inc. (DTEI) which is a subsidiary of Tristar Group of Companies, a company operating in the banana industry. This lab seemed to be inactive in promotion as they already have an assured internal customer, their own farms in the region. However, the lab still earned the trust of other banana companies and farmers in the region because of their good reputation, good customer relationship and competitive price.

Moreover, certifications, accreditation labels and international connections boost the credibility of a lab. This recognitions bring aesthetic benefit of trust and confidence from customers. Customers develop more trust to a company when they feel their concerns were listened to. When a customer trusts a firm, he shares this feeling of trust and satisfaction to another person who could be a potential customer. In effect, that customer sharing the information is indirectly doing marketing in behalf of the firm by 'word-of-mouth'.

Relating this to the opinions of the customers on the soil labs, it came out that ‘word of mouth’ is an important promotional tool to gain more customers. Sharing a product experience to another customer can boost the credibility of the lab and increase sales. ‘Word of mouth’ is an effective and cheapest marketing strategy. This is supported by Verlegh and Sodderland (n.d) that that word of mouth is, better than other forms of advertising is able to help consumers make purchases that they are more satisfied with.

7.5. SWOT Analysis

To gain a better understanding about the internal environment of the NEH Phils. who will undertake the plan of starting a new lab, it is worthwhile to consider a SWOT analysis highlighting the major strengths, weaknesses, threats and opportunities of the company. These factors will bring contribution in planning strategies for a possible market entry.

Table 4. SWOT analysis

Strengths ✓ Technical expertise in the banana industry ✓ Certifications and recognition (HPO, ISO 9001:2000 certified) ✓ Linkages to research universities (e.g. Wageningen University)	Weaknesses ✓ High start-up cost ✓ Absence of important skills (e.g. analysts)
Opportunities ✓ Funding and grants ✓ Technology access and development ✓ Research and innovation	Threats ✓ Competitor vulnerability ✓ Seasonality ✓ Inflation, interest and exchange rates ✓ Price wars ✓ Major events and influences (e.g. natural calamities)

7.6. Industry analysis using Porter’s Five Forces

Following the SWOT analysis, a further analysis using the Porter’s Five Forces Model was conducted to provide an in-depth understanding of the factors that were seen relevant into the analysis of market situation of soil laboratories in Davao Region. This analysis considering the findings of this study, hopes to create better strategic option for a market entry of NEH Phils in the future.

- Potential Competitors: Medium pressure
 - ✓ Farmers could potentially ignore the new lab
 - ✓ Entry barriers are relatively high: lab name, location, service portfolio, and financial capital

- ✓ A small number of customers and only few sectors (example only banana and not rice) are interested to avail the service
- ✓ Cost and customer service advantage over other labs
- Rivalry Among Established Companies: Medium Pressure
 - ✓ Currently, there are ten soil labs that exist in the same market: DA –Regional Soils Lab. and Davao Trade Exponents are the two strongest of the ten labs in relation to price, reputation and customer service
 - ✓ Davao Trade Exponents has established their credibility in the industry and have defined their market quite effectively
 - ✓ Davao Analytical Lab offers wider range of services but high prices is the major issue
- Bargaining Power of Customers: Low to medium pressure
 - ✓ Customers could complain about the pricing techniques
 - ✓ Customers could avail service at a competitor who offers same service at comparable prices
 - ✓ Customers may pressure lower prices or better payment schemes
- Bargaining Power of Suppliers: Low pressure
 - ✓ Creating a wide array of input suppliers to gain more bargaining power
 - ✓ Creating a strategic alliance with suppliers for chemicals (Chemline, Belman, Damilab)
 - ✓ Create partnership with and lab equipment and technology providers (Merck, Perkin Elmer or Shimadzu)
- Threat of Substitute Products: Low pressure
 - ✓ Customers could use an old analysis results to save on cost

Considering the above analysis, it may be valid to claim that there is a potential for NEH Phils. to start for a new soil lab but certain conditions (internal and external factors relating to competition, capacity, price, etc.) as stated in the SWOT and Porter's Five Forces Model must be looked further into.

8. Conclusions and recommendations

This chapter finalizes the outcome of this study by presenting the conclusive answers to the research questions as outlined. The first section presents the conclusion drawn from the study while the last section lays out recommendation for NEH Phils. presented in the last section.

8.1. Conclusion

Soil laboratories in the Davao Region is characterized by a number of service providers for soil analysis in the banana and rice sectors in the region. Soil laboratories play the significant role of being a support service provider to the main chain actors in the producing sectors. They are represented by small scale farmers, cooperatives and plantations. Banana farmers are considered potential customers but not the rice farmers as they considered soil analysis less priority.

'Word of mouth' is the most effective marketing strategy. Customers gain more trust and confidence to a lab known in the agri-industry. Payment schemes are designed to be elastic so farmers can afford for the service. Strategies like down-payment or extended payment terms were noted to better serve the customers. Farmers who availed the soil lab services expressed satisfaction when they experienced increased productivity after following fertilizer program with scientific-basis. A result with fertilizer recommendation is most preferred especially by small scale farmers.

Price was given more importance than value. Financial capability was a major consideration during decision-making of the farmers when availing soil analysis. Gaps in information flow led to misconception and ignorance of farmers to price of soil laboratory services including the benefits they could obtain from the service.

Moreover, the key success factors of soil labs are the combination of affordable price and better product delivery. Farmers favoured labs which provide fertilizer recommendation along with the results. In addition, reputation of the laboratory is one factor which attract customers of its services. Reputation defined by better facilities, certifications and accreditations, good customer relationship and timeliness gains the satisfaction, trust and loyalty of customers.

Finally, this study concludes that there is a potential for NEH Phils. to start a new soil lab but not in the near future as the perceived market is too slim and the investment is quite huge. Only one sector (the banana) out of two sectors studied showed interest on the soil lab services. Further studies on other sectors might be considered to determine the views of other farmers and obtain a wider grasp on the success potential of the project.

8.2. Recommendations

The study provided a good initial information for NEH Phils. but should not be considered as the end-all and be-all of the market analysis as there are still a number of areas to consider before venturing into the project. And as far the findings of this study are concerned, the following points are suggested to be undertaken by NEH in the coming months or years:

- Further study should be conducted to determine the perception of other farmers from other sectors. This can be achieved by conducting at least three more studies to three sectors with economic importance in the region in the next one or two years. Good example of products which are also of high-value and can be explored for the market study are durian, mango, coconut, corn, asparagus and bell peppers.
- Further study on competition, demand of the service and service portfolio (price schemes, service delivery, and customer relation) should be carried out to create effective market entry. This can be conducted during the peak and lean months of the service in order to achieve a realistic overview of the dynamics and seasonality of the service. A two-year feasibility on these aspects is quite helpful already.

Moreover, as to the improvement of this study, it is also recommended that questionnaires should be designed to obtain detailed information on the satisfaction levels of customers if customer satisfaction has to be determined. Lastly, when conducting interviews especially for case studies, a tape recorder should be available to record the information from the respondents and provide the researcher the freedom of tracking and tracing the information obtained in detailed as it was said by the respondents.

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Annex 1. Timetable of research activities

Activity	Jul.					Aug.				Sep.	
	1-5	8-12	15-19	22-26	29-2	5-9	12-16	19-23	26-30	2-6	9-13
Review of related literature											
Formulation of survey questionnaires											
Data collection											
Data processing											
Data analysis											
Further literature review											
Writing the draft report											
Finalizing the report											

Annex 2. Open interview questions for soil laboratories

1. Who are your input suppliers of which products?
2. Who are your target customers?
3. What are the different types of customers you have?
4. What type of customers frequently avail your service?
5. Which type of service is frequently sought or preferred by customers?
6. How often do they avail the service or a specific type of service?
7. What are the different services do you offer to your customers?
8. What are the prices for each type of service?
9. How are payments being made?
10. What is the manner of delivering service to customers?
11. Who do you consider as your support service providers in your chain?
12. What kind of relationship do you have with the actors you relate to in your chain? (e.g. suppliers, customers, supporters)

Annex 3. Open interview questions for farmers

1. How long have been planting banana or rice?
2. How important is soil analysis to you as a farmer?
3. Where do you get your soils analysed?
4. Why did you choose this laboratory?
5. What is your reason in availing the service of soil laboratory?
6. What kind of service do you usually avail?
7. How often do you avail this service?
8. What can you say about the service of (answer of #3)?
9. What do you consider important in availing the service of a soil laboratory? (e.g. price, service quality, proximity of lab to farm, etc.)
10. What makes you satisfied with the service of a soil laboratory?
11. What keeps your loyalty to a soil laboratory?

Annex 4. Respondents of the case studies

A. Soil laboratories

Category	No.	Type of lab	Name of lab	Reference person
A1	1	Government lab	Department of Agriculture (DA) – Regional Soils Laboratory	Charito Valenzuela Senior Agriculturist
A2	1	Private lab 1	Davao Analytical Laboratory Inc.	Johanna C. Claro Chief Chemist
	2	Private lab 2	Davao Trade Exponents Inc.	Iman Flores Chief Chemist

B. Customers

Category	No.	Sector	Customer of	Name of farmer
B1	1.1	Cavendish banana	DA-Regional Soils Laboratory	Joel Bayanay Fd.Rd.2, Sto.Tomas, Davao del Norte
	1.2			Maritess Cuasito Kapalong, Davao del Norte
	2.1		Davao Analytical Laboratory Inc.	Christopher Senas Good Method Technology Carmen, Baguio District, Davao City
	2.2			Mannix Cantaros Agro-K Phils. Maduao, Lasang, Davao City
	3.1		Davao Trade Exponents Inc.	James Jade Paraiso Ladislawa Ave. Buhangin, Davao City
	3.2			Bienvenido Cadion Samantha Homes, Catalunan Grande, Davao City
B2	1.1	Rice	DA-Regional Soils Laboratory	Robert C. Diones Poblacion Sulop, Davao del Sur
	1.2			Romy Bautista Tuganay, Carmen, Davao del Norte
	2.1		Davao Analytical Laboratory Inc.	none
	2.2			none
	3.1		Davao Trade Exponents Inc.	Criselda Soriano Hagonoy, Davao del Sur
	3.2			Hector Buladaco B.E. Dujali, Davao del Norte

Annex 5. Survey questionnaire

I am Methushella D. Bumaya, a Master student from Van Hall Larenstein University of Applied Sciences, Wageningen, The Netherlands. I am doing a research on 'Market Analysis of Soil Laboratory Services in Davao Region in Philippines'. You have been chosen as a respondent through random selection. I would like to seek your cooperation in answering some questions about the project. Your information will not be disclosed and your views and opinion will be kept confidential.

Background information

1. Name : _____
2. Address : _____
3. Age : _____
4. Highest educational attainment : _____
5. Farm size (ha): _____
6. Main crop/s planted in farm : _____

Farmer's opinion

7. Have you ever heard of soil analysis?
☐ Yes
☐ No
8. What is the reason why you are not availing the soil analysis service?
☐ Prices are expensive
☐ I don't have access to laboratory
☐ I don't know the benefits it can give
☐ Others, please specify: _____
9. Are you willing to avail the service of a soil laboratory in the future?
☐ Yes
☐ No
10. If yes, how frequent would you likely to avail a service from a soil lab in the future?

- ☐ Quarterly
- ☐ Twice a year
- ☐ Once a year
- ☐ Once every two to three years
- ☐ Others, please specify: _____

11. If no, why not? Please state reason: _____

12. What will you consider when you decide to avail the service of a soil laboratory?

13. What kind of service would you likely to avail? _____

14. How much would you be willing to pay for a service? State type of service if necessary.

15. Are you willing to pay more for a service?

- ☐ Yes
- ☐ No

Annex 6. Prices of lab services of some identified soil laboratories in Davao Region

Analysis	DA- Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.	Science Resource Center-UIC	Lapanday Foods Corp.
Water analysis					
pH	50.00				65.00
Electrical conductivity	100.00				
Sodium (Na)	100.00				
Potassium (K)	100.00				
Calcium (Ca)	100.00				160.00
Magnesium (Mg)	100.00				160.00
Bicarbonate	150.00				
Carbonate	150.00				
Sulfate	150.00				
Chloride	150.00				160.00
Copper (Cu)	100.00				
Zinc (Zn)	100.00				
Manganese (Mn)	100.00				160.00
Iron (Fe)	100.00				160.00
Dissolved oxygen					65.00
Total suspended solids					75.00
Chemical oxygen demand					260.00
Fertilizer analysis					
pH	50.00				
Total nitrogen	150.00				
Total phosphorus	200.00				
Total potassium	150.00				
Total calcium	150.00				
Total magnesium	150.00				
Organic matter	150.00				
Sodium (Na)	150.00				
Sulfur (S)	150.00				
Copper (Cu)	100.00				
Zinc (Zn)	100.00				
Iron (Fe)	100.00				
Manganese (Mn)	100.00				
Moisture content	50.00				
Boron (B)	300.00				

Annex 6 continued

Analysis	DA- Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.	Science Resource Center-UIC	Lapanday Foods Corp.
Plant tissue analysis					
Total nitrogen	150.00	550.00	246.40		
Total phosphorus	200.00	480.00	141.68		
Total potassium	150.00		141.68		
Total calcium	150.00		141.68		
Total magnesium	150.00		141.68		
Total sodium	150.00		141.68		
Copper (Cu)	100.00		141.68		
Zinc (Zn)	100.00		141.68		
Manganese (Mn)	100.00		141.68		
Iron (Fe)	100.00		141.68		
Sulfur (S)	150.00	480.00	190.40		
Boron (B)	300.00		201.60		
Ash	100.00	300.00			
Organic matter	150.00				
% moisture		280.00	71.46		
Chlorophyll			170.00		
Chloride		250.00			
Fruit analysis					
Sugar					200.00
Starch			247.00		200.00
pH			72.00		65.00
Total soluble solids			72.00		65.00
Total titrable acidity			72.00		65.00
Ore analysis					
Aluminum oxide		600.00			
Copper (Cu)		650.00			
Cadmium		850.00			
Iron (Fe)		800.00			
Gold		950.00			
Lead		750.00			
Manganese (Mn)		650.00			
Mercury		900.00			
Moisture		280.00			
Molybdenum		1,200.00			
Nickel		880.00			
Phosphorus		550.00			
Silver		880.00			
Sulfur (S)		1,320.00			
Zinc (Zn)		650.00			

Annex 6 continued

Analysis	DA- Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.	Science Resource Center-UIC	Lapanday Foods Corp.
Heavy metals/metals for soil					
Calcium (Ca)		385.00			
Copper (Cu)		400.00			
Cadmium		850.00			
Total chromium		840.00			
Iron (Fe)		460.00			
Lead		800.00			
Magnesium (Mg)		385.00			
Manganese (Mn)		395.00			
Mercury		900.00			
Molybdenum		440.00			
Nickel		830.00			
Potassium (K)		320.00			
Sodium (Na)		350.00			
Zinc (Zn)		350.00			
Food analysis					
Ash		400.00			
Carbohydrate and calorie		1,250.00			
Crude fat		530.00			
Crude protein		600.00			
Iodine content in salt		350.00			
Moisture content		280.00			
% salt purity (NaCl)		400.00			
Titrateable acidity		260.00			
Total acid		400.00			
Oil analysis					
Free fatty acid (FFA) or acid value		380.00			
Peroxide value of fats and oils		500.00			
Saponification value of fats and oils		440.00			
FFA (Lauric/Palmitic)		490.00			
Iodine value		700.00			
Microbiological analysis (drinking water)					
Total coliform		475.00			
Fecal coliform		475.00			
E. coli		700.00			
Heterotrophic plate count		550.00			
Microbiological analysis (riverwater, deepwell, etc.)					
Total coliform		600.00			
Fecal coliform		650.00			
E. coli		750.00			
Heterotrophic plate count		550.00			
Coal/Charcoal analysis					
Total ash		350.00			
Fixed carbon		260.00			
Bulk density		290.00			
Moisture		280.00			
Self-heating test @ 120 &140		1,100.00			
Total volatile matter		290.00			

Annex 6 continued

Analysis	DA- Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.	Science Resource Center-UIC	Lapanday Foods Corp.
Heavy metals/metals for fertilizer, food & fruits					
Calcium (Ca)		385.00			
Copper (Cu)		515.00			
Cadmium		790.00			
Total chromium		725.00			
Iron (Fe)		400.00			
Lead		680.00			
Magnesium (Mg)		385.00			
Manganese (Mn)		395.00			
Mercury		850.00			
Molybdenum		440.00			
Nickel		725.00			
Potassium (K)		310.00			
Sodium (Na)		525.00			
Zinc (Zn)		370.00			
Waste water analysis					
Acidity		300.00			
Alkalinity		300.00			
Biochemical oxygen demand		640.00			
Dissolved oxygen		130.00			
Chemical oxygen demand		460.00			
Chloride content		250.00			
Color		300.00			
Conductivity		150.00			
Chromium, hexavalent		440.00			
Formaldehyde		700.00			
Total hardness		600.00			
Nitrate as nitrogen		550.00			
Nitrite		550.00			
Ammonical nitrogen		500.00			
Oil and grease		500.00			
pH		90.00			
Phosphorus as phosphate		440.00			
Residual chlorine		300.00			
Salinity		115.00			
Settleable solids		250.00			
Total solids		275.00			
Total dissolved solids		275.00			
Total suspended solids		250.00			
Turbidity		200.00			
Sulfate		230.00			
Surfactants		880.00			
VS		280.00			
VSS		180.00			

Annex 6 continued

Analysis	DA- Regional Soils Laboratory	Davao Analytical Laboratory Inc.	Davao Trade Exponents Inc.	Science Resource Center-UIC	Lapanday Foods Corp.
Arsenic		900.00			
Calcium (Ca)		440.00			
Copper (Cu)		490.00			
Cadmium		680.00			
Chromium, total		725.00			
Flouride		660.00			
Iron (Fe)		520.00			
Lead		600.00			
Magnesium (Mg)		450.00			
Manganese (Mn)		500.00			
Mercury		800.00			
Nickel		720.00			
Potassium (K)		550.00			
Sodium (Na)		550.00			
Zinc (Zn)		600.00			
Soil analysis					
pH				110.00	65.00
nitrogen				312.00	
phosphorus				143.00	155.00
potassium				155.00	160.00
Organic matter				202.00	160.00
Exchangeable acidity				155.00	
Iron (Fe)				120.00	160.00
Copper (Cu)				120.00	
Manganese (Mn)				120.00	160.00
Magnesium (Mg)				155.00	160.00
Zinc (Zn)				120.00	160.00
Calcium (Ca)				155.00	160.00
Sodium (Na)					160.00
Sulfur (S)				155.00	160.00
Boron (B)					160.00
Soil texture				252.00	147.00

Annex 7. Summary of interviews to soil laboratories

Question	Government lab <i>DA- Regional Soils Laboratory</i>	Private lab <i>Davao Analytical Laboratory Inc.</i>	Private lab <i>Davao Trade Exponents Inc.</i>
1. Who are your input suppliers of which products?	Molave Trading for equipment like spectrometer, atomic spectrometer, pH meter Chemline for chemicals	Belman for liquid and solid chemicals Shimadzu and Merck for lab equipment	Damilab and Chemline for chemicals Perkin Elmer for equipment
2. Who are your target customers?	Farmer, plantations, students for projects and theses	Farmers, plantations like Dole, Dizon Farms, etc. Food companies like San Miguel, Jollibee Mining industries Fertilizer companies Universities	Originally internal projects of Tristar company (mother company of DTEI) but to generate income, management decided to commercialize service and accommodate analysis needs of banana companies. 95% of the customers were banana farmers
3. What are the different types of customers you have?	Cooperatives Farmers Plantations Non-government organizations (NGOs) Note: Some customers come from farther provinces like Palawan, Bohol, Surigao, Bukidnon	Small-medium scale farmers Companies Miners	Small-medium scale farmers Cooperatives Companies
4. What type of customers frequently avail your service?	farmers, banana plantations DA projects like MRDP, AgriPinoy Rice/Corn, Organic Agriculture	Plantations like Dole Miners farmers	Tristar as priority for highland banana Companies like Dizon Farms, NEH Phils.
5. Which type of service is frequently sought or preferred by customers?	Chemical analysis of soil, plant tissue analysis, fertilizer analysis	Water analysis, fertilizer analysis Ore analysis	Soil analysis especially tests determining chemical properties of soil

Question	Government lab <i>DA- Regional Soils Laboratory</i>	Private lab 1 <i>Davao Analytical Laboratory Inc.</i>	Private lab 2 <i>Davao Trade Exponents Inc.</i>
6. How often do they avail the service or a specific type of service?	Depends on cropping cycles of plants, some twice or once a year. For fruit trees it's once a year	Quarterly for water analysis Monthly for fertilizer analysis Summer season for ore analysis	Twice a year for Dizon Farms but after the typhoon Pablo
7. What are the different services do you offer to your customers?	Soil analysis (chemical and physical) Water analysis Fertilizer analysis Plant tissue analysis	Analysis on soil, ore, food, oil, microbiological, charcoal, plant tissue, fertilizer, fruits, water and wastewater	Soil analysis (chemical properties) Fruit analysis Plant tissue analysis Water and wastewater analysis
8. What are the prices for each type of service?	<i>refer to Table 1 and Annex 5 for price list</i>	<i>refer to Table 1 and Annex 5 for price list</i>	<i>refer to Table 1 and Annex 5 for price list</i>
9. How are payments being made?	Full payment upon submission of samples	Full payment upon release of results in cash, bank transfer, or check	Ideally, it should be paid upon release of results but some customers especially the frequent ones, they negotiate for extended payment period; decisions were made by management level however these cases are very seldom
10. What is the manner of delivering service to customers?	Results are printed in paper along with fertilizer recommendation	Results are printed but no recommendation included	Provides fertilizer recommendation which is usually an added charge (20-25% of the total payment for a service) but this is only made for individual farmers as NEH Phils and Dizon Farms are considered as competitors in the banana industry; these companies also usually have their own consultants

Question	Government lab <i>DA- Regional Soils Laboratory</i>	Private lab 1 <i>Davao Analytical Laboratory Inc.</i>	Private lab 2 <i>Davao Trade Exponents Inc.</i>
11. Who do you consider as your support service providers in your chain?	Department of Agriculture as they take charge all requests on lab supplies	Distributors who provide and bring materials needed by the lab	PDEA for the license to operate PDEA for the license to operate
12. What kind of relationship do you have with the actors you relate to in your chain? (e.g. suppliers, customers, supporters)	No contract agreement with suppliers or customers	Good relationship with other actors like suppliers and customers though agreements were non-existent.	Quotations are given to main office of Tristar Accounting Dept. Discounts are offered to loyal customers but the negotiations and decisions are done by top management No contract agreement with suppliers or customers

Total respondents: 3

Annex 8. Summary of interviews to customers (total respondents: 10)

Question	Banana sector		Rice sector	
	Respondent 1	Respondent 2	Respondent 1	Respondent 2
How long have you been planting your main crop?	10 years	10 years	4 years	2 years
How important is soil analysis to you?	For me to determine the status of my soil; know what nutrients are lacking	Important to determine soil fertility and improve productivity	Important to determine the kind and amount of fertilizer I should I apply to my soil	Important to determine the true condition of the farm soil
Where do you get your soil analysed?	DA lab	DA lab	DA lab	DA lab
Why did you choose this lab?	I have some friends working there	No knowledge about other labs	Because they have higher accuracy and reliability of results	They have the cheapest prices, since I worked for a proj. at a university, budget is meagre so we were lucky
What is your reason of availing the service of a soil laboratory?	To determine the acidity and alkalinity levels of my soil	To increase productivity and determine if my soil is acidic or not	To determine soil fertility and reduce fertilizer wastage since I know the soil's needs	To improve productivity of our rice project by applying the right fertilizers
What kind of service do you usually avail?	Chemical properties like N,P, K, sulphur, calcium, zinc, magnesium, etc	Soil pH, macronutrients like NPK	Soil analysis usually on NPK levels and micronutrients like zinc, calcium, magnesium	Macronutrients (NPK,S) Micronutrients (zinc, C, Na, Mg, Mn)
How often do you avail this service?	Once every two years	3x a year	Once a year	Once a year
What can you say about the service of (answer of #3)?	Not satisfied because it took me so long before I received the results; longer time of release due to several customers since it is cheaper	Satisfied as proven by bigger bunches and fruits after I implemented their fertilizer recommendation	Satisfied with their service; due date is reflected on receipts which is 2weeks	We are satisfied because they are cheap, and we saw the effect on our production after following their recommendation
What do you consider important in availing the service of a soil lab?	Reputation of lab Timeliness	Service quality Reliability of results	Savings on cost of fertilizer; 'guessing or estimating how much to apply is avoided	Price, service quality. Reliability of results
What makes you satisfied with the service of a soil laboratory?	Technical knowledge, good facilities/tools Complete personnel On-time delivery of results	No changes in prices of services	Up-to-date technology reliability of results based on the facilities being used	Service quality, price and reputation of lab
What keeps your loyalty to a soil lab?	Satisfaction of quality service Timeliness	Service quality Technical advise Affordability	Recommendation from a local government unit	As long as they could meet our needs at a cheaper price

Question	Banana sector		Rice sector	
	Respondent 1	Respondent 2	Respondent 1	Respondent 2
How long have you been planting your main crop?	10 years	5 years	n/a	n/a
How important is soil analysis to you?	To monitor acidity of soil as acid affects the absorption of nutrients by the plants	Important for me to know the right amount of fertilizer to apply base on the result		
Where do you get your soil analysed?	Davao Analytical Lab. Inc.	Davao Analytical Lab. Inc.		
Why did you choose this lab?	Because it is close to our farm and office; friends with owner of lab	Because we believe they give reliable results		
What is your reason of availing the service of a soil laboratory?	To determine the fertility status of our soil;	To determine the soil requirements on nutrients		
What kind of service do you usually avail?	Soil analysis like pH, NPK, OM and also fertilizer analysis	Soil analysis (NPK levels), OM, pH		
How often do you avail this service?	Soil analysis -1x a year Fert. Analysis - seldom	Once a year		
What can you say about the service of (answer of #3)?	Satisfied with service because of strict policy of company	Satisfied because our production improved after we based our fertilizer program on their results		
What do you consider important in availing the service of a soil laboratory?	Service quality Availability of needed parameters, accessibility in submitting samples	Reliability of results Service quality		
What makes you satisfied with the service of a soil laboratory?	The results of analysis is proven on the growth of the bananas; increased production	Same answer to no. 10		
What keeps your loyalty to a soil lab?	As long as they cater and meet our needs as customer	As long as we are happy with their service, our loyalty is with them		

Question	Banana sector		Rice sector	
	Respondent 1	Respondent 2	Respondent 1	Respondent 2
How long have you been planting your main crop?	8 years	2 years	10 years	10 years
How important is soil analysis to you?	Important to know the fertility status of the soil	For precision farming relevant to fertilizer use	To identify what kind of fertilizer should be applied	To determine the condition of my soil
Where do you get your soil analysed?	Davao Trade Exponents Inc.	Davao Trade Exponents Inc.	Davao Trade Exponents Inc.	Davao Trade Exponents Inc.
Why did you choose this lab?	They emerged as cheapest in price and known their standards are aligned to Wageningen University (NL)	I am confident based on their analytical capability, true analysis will come out	I trust that the lab is capable of giving reliable results	Reputation of the lab is remarkable
What is your reason of availing the service of a soil laboratory?	Accurate basis for fertilizer program	Because I want to know the level of soil fertility	To improve productivity	To determine the fertility status of my soil
What kind of service do you usually avail?	For analysis of soil and plant tissues, exchangeable nutrients	Chemical analysis (NPK, zinc, Na, Mg, Mn), organic matter, pH	Chemical analysis of soil	Chemical analysis (NPK levels, OM, zinc, S)
How often do you avail this service?	Once a year, usually June	Once a year to financial constraints	Once a year	Once a year
What can you say about the service of (answer of #3)?	I can freely ask the staff if I have questions regarding the results and they review w/ additional payment; satisfied	Reliable and results are delivered on time	Satisfied because they give recommendation on type and quantity of fertilizer	Satisfied because they give recommendation; the lab is known in the banana industry
What do you consider important in availing the service of a soil lab?	Expertise, integrity because the lab is also a company who owns a banana plantation	The technical information I get from the results	Service quality	Timeliness, service quality
What makes you satisfied with the service of a soil laboratory?	Formats of results are more convenient to read (use of user-friendly units of measurement); easy to read	The way they deal with their customers; they accommodate questions politely	Recommendation; accuracy of type and amount of fertilizer that I should apply	I've seen the results on my production after I followed their recommendation
What keeps your loyalty to a soil lab?	Easy to negotiate esp. payment; understanding	Integrity of the soil lab; being friendly to customers; reputation of lab since they have standards aligned to Wageningen University	Service quality, technical capability and credibility of lab	trust

Annex 9. Summary of survey among banana and rice farmers in the study areas in Davao Region

Name	Age	Highest Educ. Attainment	Farm size (ha)	Main Crop	Have you heard of soil analysis before?	Reason for not availing soil analysis service	Willingness to avail service in the future	Desired frequency of availing service	Consideration upon deciding to avail the service	Desired kind of analysis to avail	Price willing to pay per sample	Willingness to pay more for a service
Eric Montero	46	high school graduate	5	banana	no	prices are expensive	yes	twice a year	financial capacity	both physical and chemical analysis	250	no
Josephine Tabajonda	54	high school graduate	3	banana	no	prices are expensive	yes	once a year	the benefits it can give to me	both physical and chemical analysis	250	no
Paul Timtim	55	college graduate	6	banana	no	prices are expensive	yes	twice a year	the benefits it can give to me	physical analysis	200	no
Wilfredo Perez	62	high school graduate	5	banana	no	prices are expensive	yes	twice a year	the benefits it can give to me	both physical and chemical analysis	200	no
Armando Lumocso	60	high school graduate	3	banana	no	prices are expensive	yes	once a year	the benefits it can give to me	both physical and chemical analysis	100	no
Gilbert Ingles	59	elementary graduate	2.2	banana	no	I don't have access to laboratory	yes	once a year	financial capacity	both physical and chemical analysis	100	no
Ricky Castro	45	college graduate	3	banana	no	prices are expensive	yes	once a year	the benefits it can give to me	physical analysis	250	no
Joy Villanueva	35	college graduate	6	banana	yes	prices are expensive	yes	twice a year	financial capacity	both physical and chemical analysis	200	no
Maricel Tonido	37	college graduate	4	banana	yes	prices are expensive	yes	twice a year	the benefits it can give to me	physical analysis	200	no
Zim Vasques	59	high school graduate	3	banana	yes	prices are expensive	yes	once a year	the benefits it can give to me	both physical and chemical analysis	50	no
Marcelo Lagamao	45	college graduate	3	banana	yes	I don't have access to laboratory	yes	once a year	the benefits it can give to me	both physical and chemical analysis	50	no
Benito Beldua	45	college graduate	4	banana	yes	prices are expensive	yes	once a year	the benefits it can give to me	chemical analysis	250	no
Pedro Tagalo	48	college graduate	5	banana	yes	prices are expensive	yes	quarterly	the benefits it can give to me	both physical and chemical analysis	100	yes
Anabel Cuasito	72	high school graduate	4	banana	yes	I don't have access to laboratory	yes	twice a year	financial capacity	both physical and chemical analysis	250	yes
Jonaz Lagang	60	high school graduate	5	banana	yes	prices are expensive	yes	once a year	financial capacity	both physical and chemical analysis	200	no
Amel Lenciano	35	post-graduate	8	rice	yes	there was already an analysis done before	yes	twice a year	financial capacity	chemical analysis	300	no
Rufino Cubol	37	high school graduate	2	rice	no	I don't know the benefits it can give	yes	once a year	financial capacity	chemical analysis	200	yes
Rolando Talbos	64	college graduate	2	rice	yes	prices are expensive	no	never	financial capacity		0	
Josue Alegre	60	high school graduate	5	rice	yes	prices are expensive	yes	once a year	financial capacity	chemical analysis	200	no
Natalia Galacio	64	elementary graduate	2	rice	yes	there was already an analysis done before	yes	once a year	service quality	chemical analysis	200	no
Raymundo de Chavez	56	high school graduate	3	rice	yes	I don't have access to laboratory	yes	once a year	financial capacity	chemical analysis	250	no
Rodolfo Corpuz	32	high school graduate	2	rice	yes	prices are expensive	yes	once a year	service quality	physical analysis	200	no
Nena Mationg	65	high school graduate	2	rice	yes	there was already an analysis done before	yes	once every two to	service quality	chemical analysis	200	no
Rodelina Areno	60	high school graduate	3	rice	yes	I don't have access to laboratory	yes	twice a year	financial capacity	chemical analysis	200	yes
Arnold Lambunao	44	college graduate	2	rice	no	I don't know the benefits it can give	yes	once a year	service quality	chemical analysis	250	no
Antonia Tampus	66	elementary graduate	2	rice	yes	there was already an analysis done before	no		financial capacity		0	
Feliza Lucas	42	high school graduate	2	rice	yes	prices are expensive	yes	once a year	financial capacity	chemical analysis	150	no
Liea Manalo	56	college graduate	3	rice	yes	I don't have access to laboratory	yes	once a year	financial capacity	chemical analysis	200	no
Merlina Banluta	47	high school graduate	2	rice	yes	prices are expensive	yes	once every two to	financial capacity	chemical analysis	150	no
Rogelio Manalo	61	high school graduate	3	rice	yes	prices are expensive	yes	once a year	financial capacity	chemical analysis	200	no

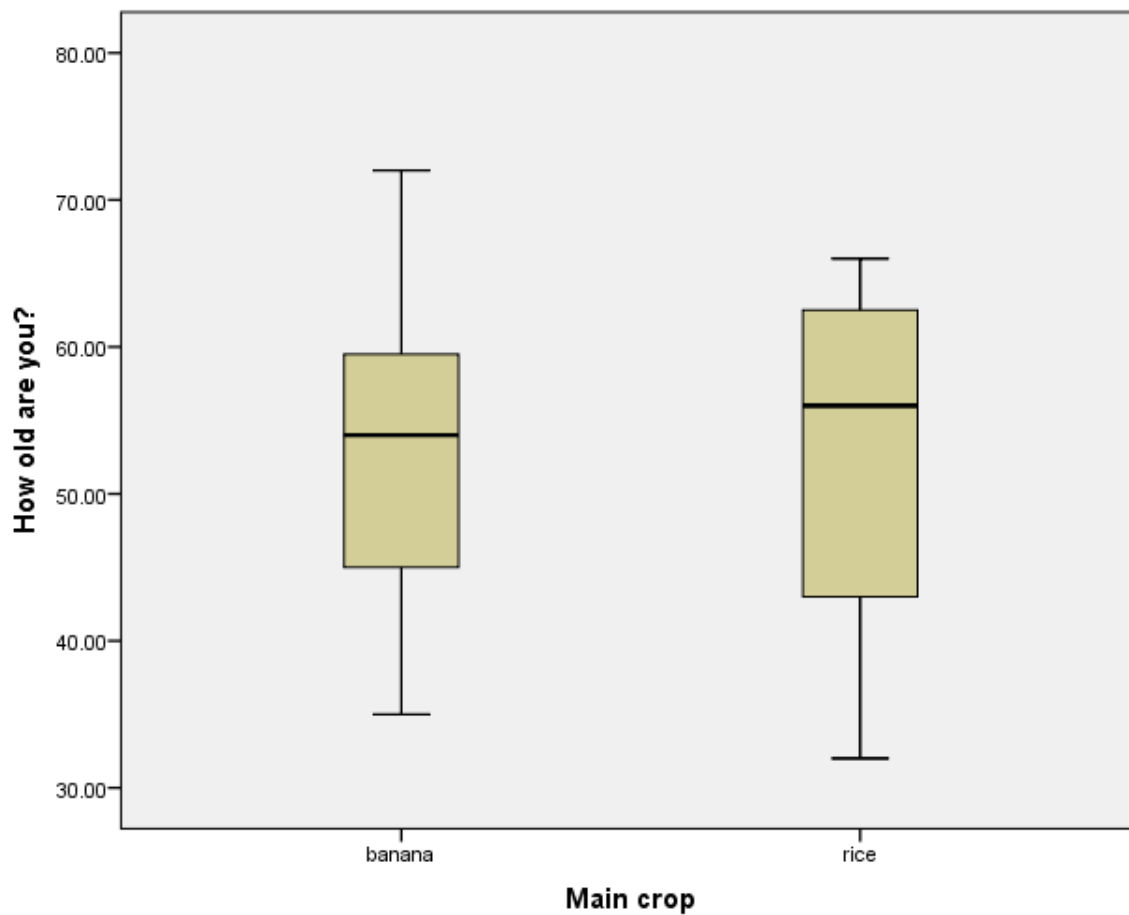
Total respondents: 30

Annex 10. Descriptive statistics and box plot showing the distribution of age among the 30 survey respondents

Statistics

How old are you?

N	Valid	30
	Missing	0
Mean		52.3667
Median		55.5000
Std. Deviation		10.89917



Annex 11. Frequency table of farm size among respondents

Statistics

What is the size of your farm?

N	Valid	30
	Missing	0
Mean		3.4733
Median		3.0000
Std. Deviation		1.54159

What is the size of your farm?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	9	30.0	30.0	30.0
	2.20	1	3.3	3.3	33.3
	3.00	9	30.0	30.0	63.3
	4.00	3	10.0	10.0	73.3
	5.00	5	16.7	16.7	90.0
	6.00	2	6.7	6.7	96.7
	8.00	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Annex 12. Cross tabulation and Chi-Square test results determining the effect of educational level of respondents to reason why they did not avail soil analysis service

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
What is your highest educational attainment? * What is your reason why you are not availing the service of a soil laboratory?	30	100.0%	0	0.0%	30	100.0%

**What is your highest educational attainment? * What is your reason why you are not availing the service of a soil laboratory?
Crosstabulation**

Count

		What is your reason why you are not availing the service of a soil laboratory?				Total
		prices are expensive	I don't have access to laboratory	I don't know the benefits it can give	there was already an analysis done before	
What is your highest educational attainment?	elementary graduate	0	1	0	2	3
	high school graduate	11	3	1	1	16
	college graduate	7	2	1	0	10
	post-graduate	0	0	0	1	1
Total		18	6	2	4	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.656 ^a	9	.039
Likelihood Ratio	15.421	9	.080
Linear-by-Linear Association	.776	1	.378
N of Valid Cases	30		

Annex 13. Frequency table of the price that farmers are willing to pay for a service in a soil lab

Statistics

How much would you be willing to pay for a service?

N	Valid	28
	Missing	2
Mean		187.5000
Median		200.0000
Std. Deviation		71.52441

How much would you be willing to pay for a service?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	2	6.7	7.1	7.1
	100.00	3	10.0	10.7	17.9
	150.00	2	6.7	7.1	25.0
	200.00	13	43.3	46.4	71.4
	250.00	7	23.3	25.0	96.4
	300.00	1	3.3	3.6	100.0
	Total	28	93.3	100.0	
Missing	System	2	6.7		
Total		30	100.0		

Annex 14. Cross tabulation and Chi- Square test results determining the difference in price willing to pay between banana and rice farmers

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
How much would you be willing to pay for a service? * type of farmer	30	100.0%	0	0.0%	30	100.0%

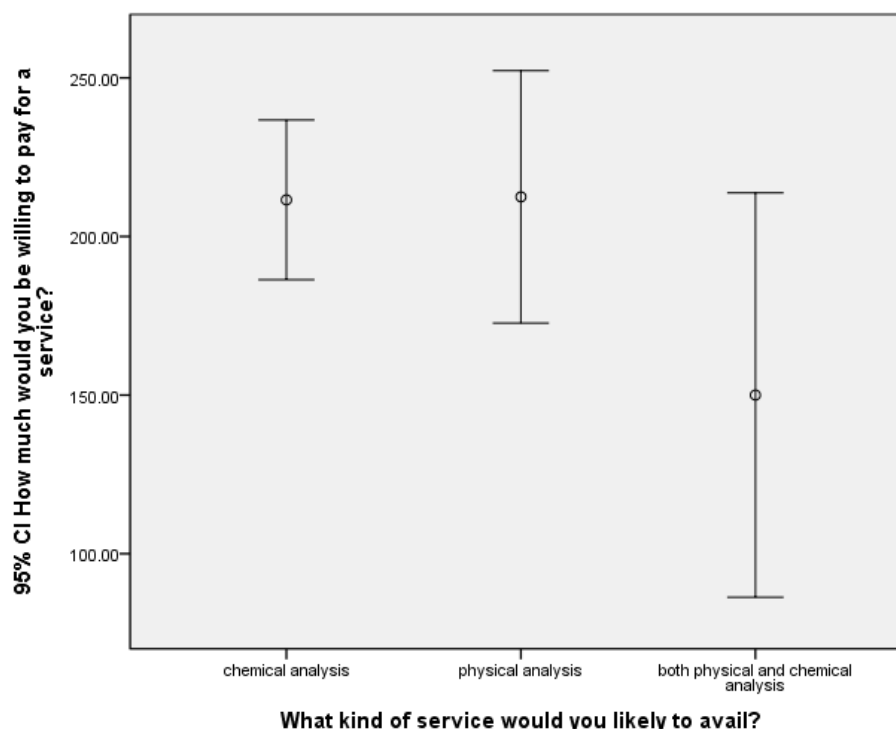
How much would you be willing to pay for a service? * Main crop Crosstabulation

			Main crop		Total
			banana	rice	
How much would you be willing to pay for a service?	.00	Count	2	0	2
		Expected Count	1.0	1.0	2.0
	50.00	Count	0	2	2
		Expected Count	1.0	1.0	2.0
	100.00	Count	3	0	3
		Expected Count	1.5	1.5	3.0
	150.00	Count	0	2	2
		Expected Count	1.0	1.0	2.0
	200.00	Count	5	8	13
		Expected Count	6.5	6.5	13.0
	250.00	Count	5	2	7
		Expected Count	3.5	3.5	7.0
	300.00	Count	0	1	1
		Expected Count	.5	.5	1.0
	Total	Count	15	15	30
		Expected Count	15.0	15.0	30.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.978 ^a	6	.062
Likelihood Ratio	15.890	6	.014
Linear-by-Linear Association	.348	1	.555
N of Valid Cases	30		

Annex 15. Error bar, ANOVA table and Post Hoc Test results showing the effect of kind of service that farmers would likely to avail and price they are willing to pay for a soil lab service



ANOVA

How much would you be willing to pay for a service?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25480.769	2	12740.385	2.828	.078
Within Groups	112644.231	25	4505.769		
Total	138125.000	27			

Multiple Comparisons

Dependent Variable: How much would you be willing to pay for a service?

Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) What kind of service would you likely to avail?	(J) What kind of service would you likely to avail?				Lower Bound	Upper Bound
chemical analysis	physical analysis	-.96154	38.38020	1.000	-96.5601	94.6370
	both physical and chemical analysis	61.53846	27.49933	.084	-6.9577	130.0346
physical analysis	chemical analysis	.96154	38.38020	1.000	-94.6370	96.5601
	both physical and chemical analysis	62.50000	39.19257	.266	-35.1220	160.1220
both physical and chemical analysis	chemical analysis	-61.53846	27.49933	.084	-130.0346	6.9577
	physical analysis	-62.50000	39.19257	.266	-160.1220	35.1220