WASTE DISPOSAL BEHAVIORS AND PREFERENCES FOR WASTE MANAGEMENT SERVICES OF HIGHLAND HOUSEHOLDS: THE CASE OF MAE SALONG NAI SUB-DISTRICT, CHIANG RAI PROVINCE

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IN
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Aranee Wikee

Thesis Title	Waste Disposal Behaviors and Preferences for Waste Management Services of Highland Households: the Case of Mae Salong Nai Sub-district, Chiang Rai Province
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ABSTRACT

Municipal solid waste is a challenging task especially for local governments in highlands. Mae Sa-long Nai Sub-district Administrative Organization (SAO) has included the procurement of garbage trucks and small-scale waste incinerators in its 3-year Development Plan (2011-2013). Objective of the current research is to explore an appropriate MSW management in the study area to support the future development of the community. The study is based on a survey with 400 samples drawn from households in two villages in Mae Sa-long Nai Sub-district. The survey was conducted between September and October 2012. The questionnaire consisted of 5 parts: socio-demographic information, waste disposal behaviors, willingness to pay and future waste management options, knowledge and sources of information about waste incineration, and attitudes toward waste problems.

The results show that most households in Mae Sa-long Nai Sub-district had handled waste by themselves in several ways: 90.8% fed food waste to domestic animals and 86.4% separated recyclables for selling. Income influenced separation of recyclables while farmers were more likely to make a good use of food waste. On average, the volume of solid waste that a household needed to dispose of was

23.2 liter per day. Households that practiced source separation of food waste or recyclables tended to generate less waste. 54.7% of the surveyed households said they burned their waste. Waste burning was more common among Tai Yai households but less common among Chinese households.

Overall, households were willing to pay for the clean-up of the existing open-dump sites. The most popular future waste management option was a combination of source separation of waste and incineration, although the results show that households were more informed about the advantages of incineration from the SAO than its disadvantages in particular the potential health impacts.

In conclusion, households preferred to continue their practices at source in exchange for a discount in future waste management fees. Local governments should incorporate source separation in their waste management plan and have a right incentive structure. Another key suggestion is to provide complete information on the proposed plan or projects to the stakeholders.

Keywords: SolidWaste Management/Recycling/Waste Incinerator/Willingness to Pay

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CHAPTER 1

INTRODUCTION

1.1 Background

Municipal solid waste (MSW) is a challenge facing local governments around the world fueled by population and economic growth. Waste problem is an even more urgent concern in developing countries. Traditional inappropriate open dumping and backyard burning are current state of waste disposal especially in rural non-metropolitan area (Ngoc & Schnitzer, 2009; Chiemchaisri, Juanga, & Visavnathan, 2006). Open dumping or uncontrolled waste disposal can lead to grave damages to human health and the environment (Corvalan, Kjellstrom, & Smith, 1999; Tadesse, 2004).

This problem is prevailing in the study area, Mae Salong Nai sub-district (MSN), Chiang Rai, Thailand. MSN is governed by a small-sized Sub-district Administration Organization (SAO), located in Mae Fah Luang district, province of Chiang Rai. The total area is about 269.3 km^3 or 168,312 Rai. The mainland boarders Myanmar to the north and the west, Terd Tai sub-district to the east, and Mae Sa-long Nork sub-district to the south. (Figure 1.1). The area is characterized by high mountains alternating with forest (Figure 1.2).

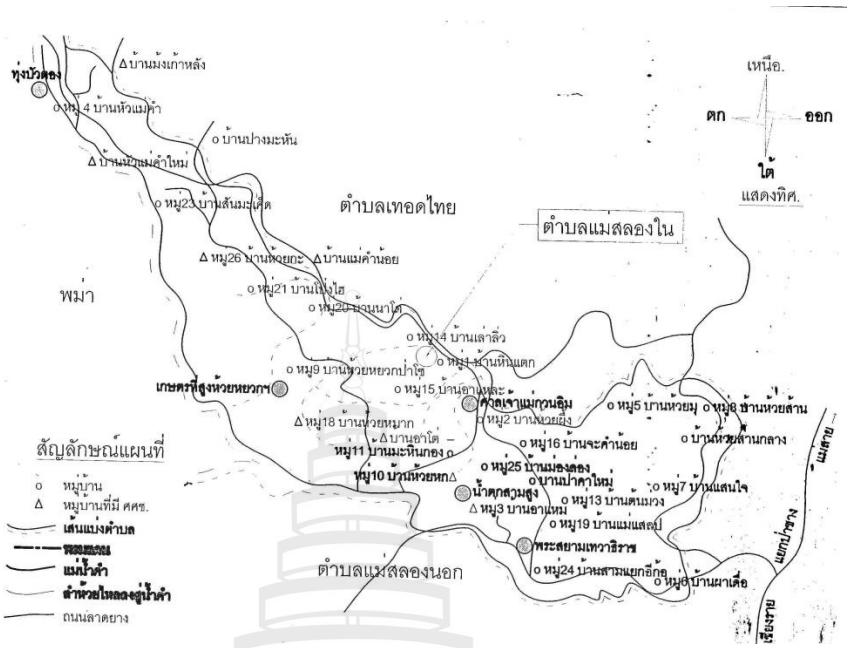

Figure 1.1 Map of Township of MSN Sub-District

Figure 1.2 MSN Geographic

Populations in MSN are very diverse with 7 different ethnic groups: Akha, Tai, Chinese, Lahu, Lisu, Yao, and Lua. Besides these groups, there are local Thais and other groups in the area. According to the housing registration, 26,740 names appeared in the official registration: 13,435 men and 13,305 women. However, the census on 30th May 2011 only found 14,130 people. Agriculture is the main occupation for the citizens. Agriculture land 51,910 rai accounts for approximately 30% of the total area. Asphalt road under the responsibility of Department of Rural Roads No. CR 4206, is main transportation of the area. The total distance from the Pasang junction, Mae Chan district to Hua Mae Kam Village is 72 Km. Five rivers flow through the area: Kham, Mark, Yuak, Hok and Selab; there are 30 dikes; 6 shallow pools; 12 mountainous water supplies.

1.2 Problem Statement

In the past, households in MSN could manage waste generated on their own. Food waste was used to feed animals or turned into organic fertilizer. Waste from agriculture was burned. Some recyclable waste such as plastic bottle or can was sold to a recycle shop that seldom came to the area. Non-recyclable waste and hazardous waste were rarely found at that time. However, waste problem in MSN has become critical in past five years as the increasing of waste quantity in general and of some waste types that were difficult to handle such as plastic bags, throw away tablewares, etc. Place for dumping waste is getting more difficult to find. In the most densely populated Huaypung village, waste was thrown away along the roadside and at a dumpsite some 2 kilometers from the village (Figure 1.3). In Hintaek village, the second most populated village, waste was reportedly thrown away into the river of Kham affecting downstream villages.

Figure 1.3 Environmental Problems According to The Unsanitary Waste Dumping

As the MSN SAO planed to upgrade itself from SAO into a municipality, MSW management will soon become one of its obligatory functions. To prepare for the future work, the local government proposed a three-year plan management, (2011-2013) for MSW management. The plan included the "non-polluting" incinerator and a model or a solution for community waste management. The present research aimed to make a contribution for the development of such a model by surveying present situation and future preferences of households regarding the MSW management in MSN.

1.3 Research Objectives

Major objective of the present research is to explore an appropriate MSW management in the study area to support the future development of the community.

1.4 Research Questions

To fulfill the objective, the following research questions were formulated:

1.4.1 How did households manage MSW?

1.4.2 How would households prefer MSW to be managed in the future?

1.4.3 What were factors influenced the behaviors and households preferences?

1.5 Conceptual Framework

The framework in figure 1.4 elaborated the independent variables that were hypothesized to have influences on the behavior and the preferences of the households based on the literature review presented in Chapter 2. The descriptive norm was hypothesized having influences to the behaviors of waste management and waste generation. Demographic backgrounds of income level, profession, size of households, education level and ethnicity were proposed that might have influences to the behaviors and preferences of the waste management in the future as well as the intrinsic incentive. The information was hypothesized that having significant power on households' waste management preferences at the same time source of knowledge households getting from might have influence to the knowledge level of the households.

The influences were hypothesized the occurring in the dependent variables themselves as well as the behaviors of waste management and generation of the

households might influence the households' preferences and the management of waste in households might affect the behavior of waste generation.

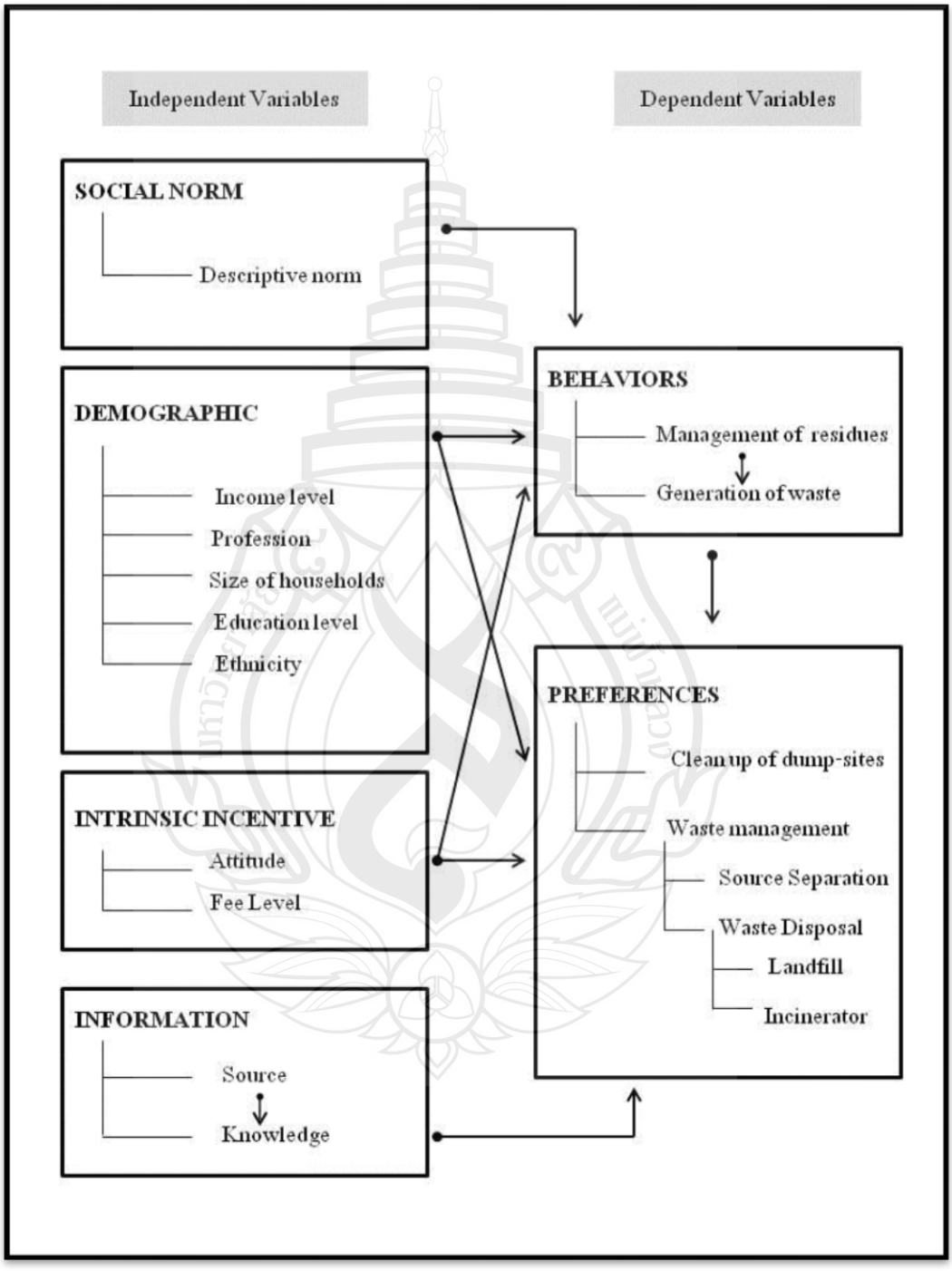

Figure 1.4 Conceptual Framework

1.6 Definitions

The following definitions are used in this study: “Clean-up of dump-site” means removing the waste at the illegal dump sites in the community.

“Descriptive norm” means a specific behavior that the respondent perceives as normal according to what his/her social circle does.

“Full services” means households do not have to perform waste separation.

“Knowledge” means knowledge regarding key advantages and disadvantages of an incinerator.

“Waste separation” means separating unburnable waste or wet waste before waste is collected.

1.7 Structure of the Thesis

The thesis consists of 5 chapters. The current chapter introduces thesis objectives and some questions to support the objective of the study. Chapter 2 reviews previous studies related to the thesis objectives and questions. Chapter 3, Research Methodology explains the procedure of the data collection and analyses. The results are described and discussed in chapter 4, Result and Discussion. The whole thesis is concluded in chapter 5 including the recommendations and suggestions for the future research. The Appendices provide a sample of the final questionnaire, some pictures collected from the study sites and tables of tested statistics.

CHAPTER 2

LITERATURE REVIEW

2.1 Municipal Solid Waste

2.1.1 Definition

The Public Health Act of 1992 provides the following legal definition of municipal solid waste (MSW): "the leftovers such as scraps of food, remnant of cloth, or scraps of wood and paper including waste from road cleaning, from market, and from farming". Pichtel (2005) mentioned that sometimes MSW is also called domestic waste or household waste generated from several sources such as residential, commercial and institutional, etc. World Bank (1999) defines MSW by its sources of generation that: MSW is generated by households, commercial activities and other sources whose activities are similar to those of households and commercial enterprise. The characteristics of MSW, however, have changed over time; although organic waste remain the largest portion (World Bank, 1999; Kaewsawang, 2002; Bai & Sutanto, 2002; AEA Technology, 2001), the amount of new materials notably plastic waste have continued to increase (Porkhel & Viraraghavan, 2005).

2.1.2 Generation

Different countries generate different levels of waste. America generates the highest waste amount per capita at 700 kg per capita, followed by Australia and Western Europe with 600-700 kg per capita. Japan and other industrialized countries such as Korea and Eastern Europe collected 300-400 kg per capita. China collected 500 kg per capita. The lower figures were reported for less developed countries such as Kenya with estimated 220 kg per capita and India 120 kg per capita in 2004

(Lacoste & Chalmin, 2007). Income is a key factor that influences the waste generation rate. Higher income countries tend to generate more waste than the ones with lower income. The Swiss Federal Institute of Aquatic Science and Technology (EAWAG) (2008) noted that amount of waste generation could be linked directly to lifestyles and income level. Dennison, Dodd and Whelan (1996) mentioned that the size of households also influences the level of waste generation in households**.** Sivakumar and Sugirtharan (2010) also found that generations of food waste, plastic, paper were influenced by family size. Chandrappa and Das (2012) pointed to another key factor: the level of urbanization. It is because a higher level of urbanized populations generally consumes more. According to UN-HABITAT (2010), half of the world population had been urbanized already by 2010. Even though Asia and Africa were listed as least urbanized countries, they plan to attain a higher level of urbanization by 2030.

2.1.3 Composition

Waste composition is depending on consumer pattern, life styles, culture, climate, economic development and energy sources (Worldbank, 1999; Chiemchaisri, et al., 2006). Low-income countries generate more organic waste than other kinds of waste while high-income countries generate more paper, plastic or any other inorganic wastes. Waste in most Asean countries has high moisture content and high biodegradable, organic fraction. Chiemchaisri, et al. (2006) listed "food waste, plastic/foam, paper, rubber/leather, wood/grass, metal, glass, and textiles are the common MSW components". Waste components are changed over time. Chandrappa and Das (2012) presented the components of waste changing over time according to the developing and innovating of new technology (table 2.1)

Table 2.1 The Waste Components Changing Over Time

Prehistory	Animal hide, fruit/vegetable peel
Up to 5000 BC	Cotton cloths, wood, ash
5000 BC to 1200 AD	Metal slag, metal pieces, paper, plastic, chemical infectious waste
1200 AD to till date	Radioactive substance, hazardous waste, waste from electronic and electronic equipment

Source Chandrappa and Das (2012)

2.1.4 Environmental Impacts

Waste management is considered a challenging task for local governments in developing countries (Henry, Yongsheng & Jun, 2006; Jones, Evangelinos, Halvadakis, Iosifides & Sophoulis, 2010). Inappropriate solid waste management causes several environmental and health problems. Figure 2.1 identifies the key environmental and public health problems related to solid waste orderly according to the steps of collection, transferring, and disposal (Tadesse, 2004):

- *Uncollected wastes often end up in drains, causing blockages which result in flooding and unsanitary conditions.*
- *Flies breed in some constituents of solid wastes, and flies are very effective vectors that spread disease.*
- *Mosquitoes breed in blocked drains and in rainwater that is retained in discarded cans, tires and other objects. Mosquitoes spread disease, including malaria and dengue.*
- *Rats find shelter and food in waste dumps. Rats consume and spoil food, spread disease, damage electrical cables and other materials and inflict unpleasant bites.*
- *The open burning of waste causes air pollution; the products of combustion include dioxins which are particularly hazardous.*
- *Aerosols and dusts can spread fungi and pathogens from uncollected and decomposing wastes.*
- *Uncollected waste degrades the urban environment, discouraging efforts to keep streets and open spaces in a clean and attractive condition. Solid waste management is a clear indicator of the effectiveness of a municipal administration, if the provision of this service is inadequate large numbers of citizens (voters) are aware of it. Plastic bags are a particular aesthetic nuisance and they cause the death of grazing animals which eat them.*
- *Large quantities of waste that have not been placed according to good engineering practice can slip and collapse, burying and killing people.*
- *Dumps of waste and abandoned vehicles block streets and other access ways.*
- *Heavy refuse collection trucks can cause significant damage to the surfaces of roads that were not designed for such weights.*

Figure 2.1 The Key Environmental and Public Health Problems

- *Dangerous items (such as broken glass, razor blades, hypodermic needles and other healthcare wastes, aerosol cans and potentially explosive containers and chemicals from industries) may pose risks of injury or poisoning, particularly to children and people who sort through the waste.*
- *Waste collection workers face particular occupational hazards, including strains from lifting, injuries from sharp objects and traffic accidents.*
- *Waste items that are recycled without being cleaned effectively or sterilized can transmit infection to later users. (Examples are bottles and medical supplies.)*
- *Polluted water (leachate) flowing from waste dumps and disposal sites can cause serious pollution of water supplies. Chemical wastes (especially persistent organics) may be fatal or have serious effects if ingested, inhaled or touched and can cause widespread pollution of water supplies.*
- *Waste that is treated or disposed of in unsatisfactory ways can cause a severe aesthetic nuisance in terms of smell and appearance.*
- *Liquids and fumes, escaping from deposits of chemical wastes (perhaps formed as a result of chemical reactions between components in the wastes), can have fatal or other serious effects.*
- *Landfill gas (which is produced by the decomposition of wastes) can be explosive if it is allowed to accumulate in confined spaces (such as the cellars of buildings).*

Figure 2.1 (continued)

- *Methane (one of the main components of landfill gas) is much more effective than carbon dioxide as a greenhouse gas, leading to climate change.*
- *Fires on disposal sites can cause major air pollution, causing illness and reducing visibility, making disposal sites dangerously unstable, causing explosions of cans, and possibly spreading to adjacent property.*
- *Former disposal sites provide very poor foundation support for large buildings, so buildings constructed on former sites are prone to collapse*

Figure 2.1 (continued)

2.2 Management at Source

The environmental and public health problems according to the waste problem can be reduced by the appropriate waste management. Integrated waste management is an effective combination of waste preventing, waste recycling and waste disposal. Integrated waste management was studied in great depth throughout 1970s when solid waste disposal problems were considered as a crisis since enormous waste was buried or burned. The concept of integrated waste management (Ngoc & Schnitzer, 2009; Zurbrugg, Gfrerer, Ashadi, Brenner & Kuper, 2012; Chandrappa & Das, 2012) is an application of reducing waste at source before enter the waste stream (Prevention) and the waste materials generated must be reused and recycled (Recycling), before the rest can finally be disposed of (Disposal). Therefore, the comprehensive approach of the preventing, the recycling and the disposal is an efficient way to protect human health and the environment concerning the waste problems. According to Agenda 21, the agreement reached among participating nations at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, emphasized, in Chapter 21,

priority should be given to reducing wastes and maximizing environmentally sound waste reuse and recycling (Tadesse, 2004)

2.2.1 Waste Prevention

Waste prevention (Tadesse, 2004; Chandrappa & Das, 2012) is to reduce waste at the point of generation therefore that there is less left to be disposed. United States Environmental Protection Agency (US EPA) (2002) calls source reduction waste prevention and gave the meaning as "reducing waste by not producing it." There are 3 major steps to reduce waste (Tadesse, 2004; Makmattayan, 2003).

Reject–not use product creates pollution such as foam container

Reduce–lowering solid waste quantity, for example purchase product with less packaging

Refill–using refilling type of product such as liquid soap

2.2.2 Source Separation

Different types of waste require different treatment methods (Ngoc & Schnizer, 2009). Therefore, waste separation is necessary because the separation increases the quality of waste entering treatment processes such as composting and recycling (Zhuang, Wu, S.W., Wang, Wu, Y.X. & Chen, 2008; Strange, n.d.). Waste separation is also needed for incinerator to increase the potential of the machine (Manomaivibool, 2005). Waste separation is recognized as a critical component of a successful integrated waste management. Petts (n.d), for example, set waste separation the first priority option for waste management.

The importance of source separation highlights the role of the participation of the households in waste management. Participation of households in doing waste preventing, waste recycling and waste disposal, significantly supports the successful municipal waste management (Henry et al., 2006; Suttibak & Nitivattananon, 2008; Grodzinska-Jurczak, Tarabula & Read, 2003; Visuthduangdusdee, 2008). Tadesse (2004) mentions that the whole culture of solid waste management needs to put in place from households and neighborhood at a micro level to state and nation at a macro level.

Recycling generally is a process of changing materials into the secondary resources for manufacturing new products (Tedasse, 2004; Vaughn, 2009). Therefore, recycling is considered as a method of landfill diversion that can stretch the capacity and life of landfill. The recycling starts from a grassroot level (Visavanathan, Adhikari & Ananth, 2007). Households in developing countries simply do the recycling by selling recyclables to the scrap buyers or recycling shops and get paid from the selling as well (Vaughn, 2009). The next subsection reviews several factors that influence recycling behavior of the households in some previous research.

2.2.3 Factors Influencing Behaviors

Hornik, Cherian, Mandansky and Narayan (1995) classified factors influencing recycling behavior into 5 groups, according to his review of over 200 journals within 20 years and the analyze of 67 cases:

1. Extrinsic Incentives including return-monetary value, social norms or laws.

2. Intrinsic Incentives such as environmental values and preferences in recycling measured by Psychological Scales.

3. Internal Facilitators such as the awareness of the problem and perceptions on recycling.

4. External Facilitators such as the physical management that influences the convenience of recycle.

5. Demographic Variables such as education level, age, and type of households which found that have impact on recycling behavior.

The current research has covered on reviewing the 5 groups of factors which are Demographic Variables, Intrinsic Incentives, Internal Facilitators, Extrinsic Incentives and External Facilitators.

Demographic Variables were influential in recycling behavior in previous researches. Many researches revealed the relationship between Demographic Variables and recycling behavior even though not in the same direction. The studies reviewed the relationship tendency as the example;

Direct Variation of Income and Recycling (Nixon & Saphores, 2007; Karousakis & Birol, 2008; Bohara, Caplan & Grijalva, 2007; Jin, Wang & Ran, 2006)

refers to the significant of income level is influential in recycling. However, Saphores, Ogunseitan and Shapiro (2012) found that income has no significant role in E-waste recycling similarly to Hage, Soderholm and Burglund (2009) who said that did not find significant of socio-economic of the households in explaining recycling behavior. Lee and Paik (2011) again found the rich participate more in recycling than the poor because the more social concern in rich people.

Direct Variation of education level and recycling (Nixon & Saphores, 2007; Karousakis & Birol, 2008; Saphores, Hilary, Ogunseitan & Shapiro, 2006; Jin et al., 2006) as well as Duroy (2005) mentioned that education level is significantly affected to environmental behavior, but Bohara et al. (2007) found that people in Bachelor degree have less willingness to reduce amount of waste.

Nixon, Saphores, Ogunseitan and Shapiro (2009); Nixon and Saphores (2007); Saphores et al. (2006) found that people aged less than 35 years were the least recyclers. Hage et al. (2009) explained that recycling effort increases with age. Williams and Kelly (2003) found that 25-44 age-group from case of England is the least recyclers. However, Berglund (2006) came up with the result of reverse variation of age and willingness to pay for other to recycle.

Female recycle more than male (Nixon et al., 2009; Bohara et al., 2007; Saphores et al., 2006) but Chung and Poon (2000) found that Chinese female recycle less than male. Jin et al. (2006) and Berglund (2006) resulted that male willing to pay for recycling more than female.

Ethnicity can also has influence on recycling (Nixon et al., 2009). Moreover, Lee and Paik (2011) found that more seniority influence to recycling behavior because seniority are sensitive to the social concern while gender, size of household, and educational level were not significant influence the recycling behavior.

Intrinsic factors are the personal motivation according to the attitude, experience, or responsibility (Fenech, 2002). Environmental value is a variable usually studied to describe behavior of recycling in households according to Psychological Theory going through extensively. There are whether Value Theory, Norm-activation theory by Schwartz (1973) or theory of planned behaviors/reasoned actions by Ajzan (1991).

Extrinsic Incentives, Shaw (2008) mentioned that near-by neighbors have influences to ones' recycling behavior. Brekke, Kipperberg and Nyborg (2007) explained that the people usually learn responsibility from observing the others' behaviors. In additional, Bruvoll, Halvorsen, and Nyborg. (2002); Jones, Evangelinos, Halvadakis, Iosifides and Sophoulis (2010) and Hage et al., 2009 discussed that some people might want to gain neighbors' or social acceptance regarding on maintaining a self-image as morally responsible.

Lacking of provided information is also considered as a barrier to the action of people in separating, recycling and disposing of the households (Fenech, 2002; Naing, 2009; Tadesse, 2009; Hazra & Goel, 2009) where agreed by Strange (n.d.) who reported that households expected more detailed information on how to recycle.

Recycling behavior is also influenced by money. For example, there are some researchers studied on people willing to pay for having the environmental improvement. In the case of Ethiopia, Hagos, Mekonnen and Gebreegziabher (2012) found households' willingness to pay for improved solid waste management is significantly related to income, awareness of environmental quality and age of household head. The result also revealed that the amount of money that the households willingly pay depends on the amount of solid waste generated. The research employed method of Single-bound dichotomous choice followed by open-ended question.

Jones et al. (2010) studied on the social factors influenced personal decision on willingness to pay for municipal solid waste management on the proposed policy. Willingness to pay significantly more affected by the higher level of income and more personal trust on the management policy than the lower income and citizens who consider the policy will be ineffective. In addition, the study of municipal solid waste management in China suggested that to improve MSW management financial mechanisms, foreign investment and international services might be needed (Zhang, Tan & Gersberg, 2010).

Internal Facilitators include environmental problem awareness, environmental perception, or literacy which is recognized as variables explaining recycling behavior. Thøgersen (2005) suggested that skill training or educating the specific information might empower the customer to environmental friendly behavior. Saphores et al. (2012) found that educating people about e-waste caused better e-waste recycling behavior as well as Panasomboon (2004) who found more literacy on the environmental

problem, higher willingness to pay for environmental improvement. Chuenwong (2000) also found that awareness of the environmental problem caused higher willingness to pay alike Muangchan (2009) studied on the environmental problem in San Saeb Canal, the result found that the significant factors making people willing to pay more for improving was people's level of the problem awareness. Lee and Paik (2011) found that higher in personal interest with waste management influenced the higher participation with food separation and recycling in Korean households, but Bruvoll et al. (2002) found that person with high concerned about environment will not necessarily contribute to better environmental behavior.

External Facilitators or the facilities that make more comfort are considered as an important variable related to recycling behavior as well. The previous research investigated the higher better environmental friendly behavior was correlated to the convenience level of the provided facilities such as distance to recycling center (Fenech, 2002; McCarthy & Shrum, 1994). Pap (2003) found that most rural areas have limited access to garbage collection service where occurs the illegal open dumping.

2.3 Waste Treatment and Disposal

Inappropriate MSWM or inadequate practices of waste disposal creates environmental and public health concerns, alternative treatment and disposal methods therefore have been developed to prevent or minimize health and environmental impacts (Dijkgraaf & Vollebergh, 2003; Petts, n.d.; Vaughn, 2009). AEA Technology (2001) gave the major different options appropriate for MSW which are landfill and incineration while Chandrappa and Das (2012) mentioned open dumping and sanitary landfill are the main disposal method.

2.3.1 Landfill

US EPA (2002) and Blumenthal (2011) defined landfill as a discrete area of land or an excavation that receives households wastes and temporary storage in the area over a year, and that is not a land application unit, surface impoundment,

injection well, or waste pile (households waste includes any solid waste, including garbage, trash and septic tank waste derives from houses, apartments, hotels, motels, campgrounds and picnic grounds). Landfill is the last method of depository after all of options of waste management have been carried out.

Landfill is characterized mainly according to open dumps and controlled dumps or sanitary landfills (or secured landfills or engineered landfill) (Chandrappa & Das, 2012). Nowadays landfills have been built differently from the hundred years ago because the different new technology can deal with the changing characteristics of waste (Vaughn, 2009). During the life time, landfill's processes involves: waste dumping at the working face, waste spreading, shredding and compaction and waste cover (Chandrappa & Das, 2012). During the processes within the landfill, there are leachate and gas produced from waste therefore some important components working to manage and to collect the produced leachate and gas. Landfill built up with the flexible liner made of clay. Liner helps to keep gas or leachate and other banned material such as motor oil, batteries, and pesticide (Vaughn, 2009). This method is the cheapest comparing to other technologies of waste management and the method to keep biogas to use again. However, the challenge for the method is the seeking site because of the opposition from the local community (Energy Policy and Planning Office [EPPO], n.d.)

2.3.2 Incineration

Blumenthal (2011) gives the definition of incineration as a treatment of waste by combustion. The practice of burning waste to reduce the quantity of waste has a long history of development and applications as well as its environmental problems. The first MSW incinerator was in England in 1874. The obvious benefit of incineration is the volume reduction achieved can be up to 70-90% (Srisatid, 2010). Moreover, incinerator is suitable for the space-limited communities such as in Japan and Korea according to the size of incinerator contain the less space than a landfill up to 5 times (Corey, 1969). However, the most highly concern for having incinerator is financial issue as there are many costs such as investment cost, operational cost which more expensive than a landfill, including pollution control costs. Figure 2.2 lists some advantages and disadvantages of the disposal option by incinerator.

There are time series ordered types of incinerator that have been used in the past until the present as the following (Srisatid, 2010).

Open burning is a traditional and popular method until the present. Open burning is an open-air burning by collect waste together and then use fire to burn all waste. The method is also called an uncontrolled air because while burning there is no concern about whether the waste is combustible or not or the waste is toxic or not. This kind of burning produces pollution to the air. Unfortunately, the open burning is still seen in many communities.

Open-pit incinerator is a waste burning in a hole or a square pit in order to control the fire reducing the spreading of pollution or dust from the burning. The advantage of this incinerator is also to reduce the expand of fire, but it is not much different from the first type because it cannot control the temperature as well. It is also called an uncontrolled air. This type of incinerator is not yet an appropriate community incinerator.

Single chamber incinerators is a controlled air incinerator because the incinerator is closed while the waste burning. There is only a room for waste burning by putting the waste on the sieve. The combustion takes only 1 second and then the smoke will goes through the smokestack and ashes to the bottom sieve. Fast combustible and low humidity waste are suitable for the kind of incinerator. Nevertheless, the incinerator still produces air pollution to the environment.

Multiple chamber incinerators is a development of air and temperature control in combustion room. There are at least 2 rooms in order to reduce the pollution before goes to environment. Therefore, pollution from the incinerator is standard controlled. Moreover, dust from the combustion is controlled not to spread out in the environment by the systems of trapping dust such as Wet Scrubber. The multi chamber incinerator is popular nowadays, but there are some disadvantages such as ability to burn waste not yet appropriate to a big community yet.

Large-scaled incinerator is bigger than the mentioned above incinerators. It is appropriate for a large amount of waste to burn from 50 ton/ day to 500 ton/day. The incinerator contains a large building area. The processes of the incinerator are a charging chamber, furnace chamber, dust collection, air pollution control, bottom ash pit and stack. This incinerator is usually an excess air incinerator because the

municipal solid waste characterized differently needed to be burn for a large amount. Figure 2.2 listed some incinerator's advantages and disadvantages.

Advantages of Incinerator

- *Less land is required than for landfills*
- *A central location is possible - allow short hauling for the collection service.*
- *Ash and other residue produced are free of organic matter, nuisance- free, and acceptable as fill material.*
- *Many kinds of refuse can be burned. Even non-combustible materials will be reduced in bulk.*
- *Climate or unusual weather does not affect it.*
- *Flexibility is possible - no restriction for its operation*
- *Getting income through the sale of waste heat for steam or power is possible.*

Disadvantages of Incinerator

- *involves with heavy investments*
- *Cannot burn all kind of waste together*
- *Operating cost is relatively high*
- *Skilled staff are required for operation and maintenance*
- *The residues can contaminate the environment if not handled appropriately*
- *There may be difficulty in getting a site.*

Figure 2.2 Advantages and Disadvantages of Incineration

Source Tedesse (2004), World bank (1999)

Even though there are new modern technologies to manage waste problem, there are still the opposition to the ways of management. The issue of seeking sites for the facility has been facing the opposition since the early 1980s in the protest, driven

by the group of residents who did not want a facility in their neighborhood. The acronym expresses the un-wanting facilities syndrome is NIMBY (not in my backyard). For example, Azapagic (2011) mentioned that incinerator is an option that tend to be mistrusted or rejected by the community. To respond to the opposition one solution is to share the benefits with the community. For example, in 1990 a rubble landfill was planned to build in Marylad's Chesapeake Terrace area. The proposed project was rejected first, but it was agreed later after the company agreed to donate money to the community organization, set up ball field and build a new high school for the county (Vaughn, 2009).

2.4 MSW Management in Thailand

2.4.1 Institutions

Waste Management in Thailand consists of different level of institutions working together. Ministry of Interior where local authorities organization including is the responsibility for waste management according to the related regulations. Ministry of Public Health is in charge of assigning policy, regulations according to the Public Health act 1992. One key area of regulations under the Public Health Laws is charging waste handling fees. According to Charge Rate of Waste Management Services 2004 and 2005 (second edition) mentioned in Srisatid, 2010, the charge of services was assigned are as the following;

1. 20 Baht per month (less than 20 Liters per day)
2. 40 Baht per month (20 Liters to 500 Liters per day)
3. 2000 Baht per month (500 liters to more than 1 ton)

The waste generator has been divided into 14 different groups according to report of the appropriate of the charging for waste management in local government (Srisatid, 2010) as the following;

1. Households residents
2. Apartment
3. Public official government/state enterprise
4. Educated organizations

5. Hospitals
6. Hotels
7. Department stores
8. Restaurants
9. Markets
10. Entertainment spots
11. Gasoline station
12. Industries
13. Religion places
14. Other enterprises

The Ministry of Natural Resources and Environment assigns the pollution controlling, doing the system development, and figuring other appropriate method to develop and conserve environment according to the Enhancement and Conservation of National Environmental Quality Act 1992.

2.4.2 System Performance

The situation of waste in Thailand in 2010, Pollution Control Department estimated the annual increase of amount of waste at 15.16 million Ton or 41,532 Ton per day whereas only 15,819 Ton or 38% were disposed sanitarily. Waste generation in Bangkok was 8,766 Ton or it is 21% of the total amount. Municipalities and Pattaya generated another 16,620 Ton or it is 40% of the total amount. The other 16,146 Ton, or 39% was generated in rural areas under the responsibility of SAOs (table 2.1). Comparing waste generation of local communities in 2009 and 2010, the figure of rural waste was decreased by 0.38% possibly because several SAOs were upgraded into municipalities.

Many local governments cannot provide sufficient waste collection and disposal services. Local governments could manage waste sanitarily 1,410 Ton per day or only 9% of total waste collection. However, the general waste management directed to burning and dumping in open area which cause the contamination to the environment.

Table 2.2 Waste Amount in 2009–2010 (PCD Annual Report)

Zone	Solid waste quantity				Increase/decrease (%)
	2009		2010		
	Ton/day	%	Ton/day	%	
Bangkok	8,834	21	8,766	21	-0.77
Municipalities and Pattaya	16,368	40	16,620	40	+1.54
Local Authority Organization	16,208	39	16,146	39	-0.38
Total	**41,410 ton/day**		**41,532 ton/day**		**+0.29**

Waste composition in municipalities and Bangkok is dominated by food waste (41-61%) followed by paper (4-25%), and plastic (3.6-28%) (Chiemchaisri et al., 2006) as showing in the figure 2.3.

Waste composition (%)											Generation rate
Province	Food waste	Paper	Plastic	Glass	Metal	Rubber/ leather	Textile	Yard waste	Ceramic	Others	kg/capita/day
Bangkok	43	12.1	10.9	6.6	3.5	2.6	4.7	6.9	3.9	5.8	1.5
Angthong	42	13.5	12.4	4.0	3.5	4.1	7.2	9.8	1.9	1.6	0.6
Chiangmai	54	11.0	15.1	9.6	2.1	0.9	2.6	1.2	2.1	1.4	–
Chiangrai	45	10.0	12.0	10.0	5.0	2.0	2.0	10.0	–	4.0	1.1
Kanchanaburi	50	17.7	19.7	2.4	2.0	0.3	0.9	4.6	1.4	0.9	0.9
Nakornratchasima	44	20.1	21.0	6.4	2.6	0.5	2.3	1.6	0.9	0.6	1.2
Nakornsawan	53	13.2	13.7	0.3	0.4	0.1	0.2	15.7	0.6	2.9	0.6
Nonthaburi	52	6.8	28.4	4.3	0.6	1.9	2.1	1.3	1.4	1.2	0.6
Pattaya	41	25.0	17.6	4.5	1.3	–	2.6	6.0	–	2.0	1.0
Petchburi	55	11.3	19.3	0.6	3.9	4.0	2.7	2.6	0.3	0.3	0.9
Phitsanulok	58	5.0	26.2	1.7	1.1	0.7	2.2	3.5	0.5	1.1	0.9

Figure 2.3 Physical Composition of Waste in Thailand

Source Chiemchaisri, et al. (2006)

2.5 Summary

There is no single solution for successful waste management (Vaughn, 2009). Its success depends on cooperation between administrative authority and the households in community. The households will need to change behaviors, and take responsibility to manage waste management. The literature identifies five groups of variables affecting the recycling behaviors: intrinsic incentives, extrinsic incentives, demographic variables, internal facilitators, and external facilitators. The current study focuses on the effect of demographic variables, intrinsic incentives, and extrinsic incentive to the recycling behaviors and disposal behaviors of the households in study area. With these behaviors bring about to the preferences of public waste management in the community. According to the demand of public waste management, the significant of the information provided, another variable, had been studied to investigate the role of information affecting the households' demand for the public waste management according to Panasomboon (2004) and Fenech (2002)'s suggestion of information is necessary to provide to the community in order to level up the waste management efficiency. At the same time, the studied independent variables also tend to affect to the demand of the waste management.

CHAPTER 3

RESEARCH METHODOLOGY

The present research is mainly a quantitative study based on a survey supplemented by qualitative data from direct participatory observation, focus group workshops, and unstructured interviews. This chapter documents the data collection that took place between May-October 2012 and the analysis of these data.

3.1 Study Site

The research focuses on two villages in Mae Salong Nai sub-district: Hintaek and Huaypung. The two were the most populated villages in the sub-district and the target areas of the SAO to start its pilot project of MSW management. The direct observation was conducted while spending time working on distributing questionnaires, having a focus group workshop and while being accommodated in the study area.

3.2 Sampling

There were in total 3,852 households in Mae Salong Nai in (at July 2009). 579 households were in Hintaek and 528 households in Huaypung. The 200 households sampling were drawn systematically from each village as a representative of the case study. The questionnaires were spread out covering whole areas and skipped the households near by the answered households at that time, i.e. systematic sampling

3.3 Household Survey

The household survey was mainly conducted by the questionnaire. The questionnaire was developed from the studies of theory and other reviews. The questions covered all research objectives and divided into parts of questions for benefits in explaining to the villagers. The research collected the data by conducting the questionnaire with the 2 sampling villages during the 23 September to 3 October 2012.

3.3.1 Pilot Surveys

There were 3 times pilot questionnaire survey; on 9-10th May for 6 testing, 28-29th May for 5 testing, and 200 testing on 12-20th September 2012. The survey was aimed to study the community context in order to develop the most appropriate and effective questionnaire to the households.

First survey was on during 9-10th May 2012. There were 6 testing copies of the questionnaire. The questionnaire consisted of 5 parts: socio-demographic information, waste disposal behaviors (the part include distant of dumping waste area and households and also included environmental activities ever attended by villages), willingness to pay (dichotomous choice[1]) and future waste management options, attitudes toward waste problems and New Environmental Paradigm (NEP) questions. The pilot led to a revision of the questionnaire. Questions especially the NEP part were made less formal to ensure greater understanding. The question parts were remained as in the first survey, but changed some detailed question into less one such as changing writing detail of household members to the checking list, etc.

Second survey was on during 28-29th May 2012. There were 5 questionnaires adjusted from the first survey lessons learning. The part of NEP questions was too difficult for the villagers although the SAO officers did not find them difficult. The key important learning from the first two surveys was that there were few samples: the too small number of questionnaire testing lead to the repetition of the same mistakes therefore the pilot questionnaire survey should be more than 10 testing.

Third survey was on during 12-20th September 2012. The survey was conducted with 200 subjects. In addition to the questions asked in earlier surveys, new questions were added on future waste management choices. With 200 testing, drawbacks of the questionnaire were emerged. Many items were removed or simplified to make the questionnaire more understandable to the samples. Table 3.1 compares different versions of the questionnaire.

3.3.2 Final Questionnaire

The development of the questionnaire is to make the questions simple; the scoring of 5 scored check list of strongly disagree, disagree, not sure, agree, and strongly agree, were transformed to 2 point scale of agree/disagree or know/don't know. Some parts were hard to understand for people's educational level conditions especially NEP questions. NEP questions were dropped in the final questionnaire. Simpler questions were used to measure people's environmental concern. The way of questioning was changed in some parts. For example, the double bound dichotomous method of WTP level[i] asking was inappropriate for the people, so the way of asking method and answering were changed into selecting WTP level scaled from 0-100 Baht accordingly (figure 3.1).

Pictures illustrating was added to make the respondents more understandable. The knowledge of incinerator; the source of the information and comments part were added in the questionnaire in order to provide information for the SAO policy planning.

Therefore, the final questionnaire (see in Appendix) resulted with the following items;

Part 1 socio-demographic information: The close ended checklist was applied to informant giving their information.

Part 2 waste disposal behaviors: The present way practicing on waste management is the checking boxes of yes or no to make it easier for the sampling groups to answer.

Part 3 willingness to pay and future waste management options: This part is investigating villagers' WTP for the cleaning-up the dumpsite and the preference of the households on future public waste management in the community. The question

provided 4 choices in different options of waste management completed by checking box. The options provided were different in waste sorting place, final treatment and the charging level. The charging levels were from the agreement of the community leader in the focus group meeting.

The WTP part had been developed from applying Contingent Valuation Method in the pilot survey to the simple scale of WTP price from 0–100 Baht maximum in order to study the households' attitude toward waste problem in the community.

0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**

Figure 3.1 The Part of WTP Question

Part 4 knowledge and sources of information about waste incineration: The questions of literacy of incinerator were designed to be completed by checking box of 'know' or 'don't know'

Part 5 attitudes toward waste problems: This part contains with the most reading part which checking boxes of 'agree' and 'disagree' is more effective than Likert scale.

Table 3.1 The Overview of The Questionnaire Developments

Questions	Version 1	Version 2	Version 3	Final version
Village	Checklist	Checklist	Checklist	Checklist
Gender	Checklist	Checklist	Checklist	Checklist
Age	Not incorporate	Not incorporate	Fill in	fill in
Ethnicity	Fill in	Fill in	Fill in	Check list
Religion	Fill in	Fill in	Fill in	Check list
Education level	Fill in	checklist	Fill in	Check list
Number of household member	fill in	fill in	Fill in	fill in
Number of kids in household	Fill in detailed	Fill in choice	Fill in Detailed	Not incorporate
Occupation	Checklist	Checklist	Check list	Checklist
Income	Fill in	Checklist	Fill in	Checklist
Waste amount a day	fill in	fill in	Fill in	Fill in + Check list
Picture to waste amount	Not incorporate	Not incorporate	Not incorporate	yes
Distance from the dumping area	Checklist	Checklist	Check list	Not incorporate
Environmental activity	checklist	checklist	Check list	Not incorporate
Food waste management	Fill in	Fill in	Fill in	Yes/No
Recyclable waste management	Fill in	Fill in	Fill in	Yes/No
Hazardous waste management	Fill in	Fill in	Fill in	Not incorporate
Plastics management	Fill in	Fill in	Fill in	Not incorporate
Burning	Not incorporate	Not incorporate	Not incorporate	Yes/No
Neighbor waste management opinion towards	Not incorporate	Not incorporate	Not incorporate	4 items Likert (2 point scale)
Attitude toward waste	7 items Likert (5-point scale)	7 items Likert (5-point scale)	7items Likert (5 point scale)	7 items Likert (5-point scale)
New environmental Paradigm (NEP)	15 items Likert (5-point scale)	15 items Likert (5-point scale)	15 items Likert (5 point scale)	Not incorporate
Picture to WTP	Yes	Yes	Yes	Yes

Table 3.1 (continued)

Questions	Version 1	Version 2	Version 3	Final version
WTP	double-bound CVM, starting 30 B	double-bound CVM, starting 30 B	double-bound CVM, starting 30 B	Scale (0-100)
Future waste management options	Multiple answers	6 items Likert (5-)	Check list (3 chlices)	Check list (4 choices)
Reason	Not incorporate	Not incorporate	Fill in	Fill in
Incinerator information	Not incorporate	Not incorporate	Not incorporate	4 items Likert (2 point scale)
Source of the information	Not incorporate	Not incorporate	Not incorporate	Multiple answers
Future seminar interesting	Not incorporate	Not incorporate	Not incorporate	Checklist
Comments and suggestions	Fill in	Fill in	Fill in	Fill in

3.3.3 Actual Survey

The actual survey was conducting with the 2 sampling villages during the 23 September to 3 October 2012. There were 397 responses in the survey, but 6 were incomplete leave the valid responses at 391 or 97.07%. The valid responses from the village of Hintaek are 193 households or it is 49.36% and from Huaypung the village at 198 households which is 50.64%.

The overall data collecting of the actual survey method began with contacting the native speakers in each sampling village who are able to speak and understand Thai language in order to be a research assistant. The assistants were practiced how to collect the data in the work field. The gotten data was checked the completeness in order to continue the data analyzing.

3.4 Qualitative Research

The quantitative data was supported by the qualitative data getting from the unstructured interview with some villagers and some SAO officers conducted during working on the questionnaire and from the attending the focus group meeting. The supporting data of unstructured interview with some villagers and some SAO officers also conducted the accommodating in the area while studying. The focus group workshop was conducted with the leaders of the community: on 8 May 2012, 30 May 2012, and 3 December 2012.

3.4.1 Unstructured Interviews

Unstructured interview is a conversation naturally with no plan or hypotheses. The interview is the capture of interviewees' narrations (Zhang & Wildemuth 2009). The interview was conducted with some people in the study area to figure out their comments and idea about problem of waste in the area. The interview with some SAO officers focused on the waste problem evolution and the officers' point of view regarding the problem and way to improve. The interview also went to the villagers about their opinion toward the problems, the situation of waste problem in the living community and the recommendation to the SAO.

3.4.2 Focus Groups

The meeting was conducted with a group of leadership of the area including the chairman of SAO and the villages' leaders in order to observe their point of view of the problem and the improvement projects. The meeting was conducted on 8 May 2012, 30 May 2012, and 3 December 2012 at a meeting room of MSN SAO.

On 8 May 2012, the leaders and the local government officers were introduced to the project of the study of waste management in the MSN. They were informed about the coming of the questionnaire survey in the villages of Huaypung and Hintaek. According to the introduction, the leaders were willing to go along with the study because they are aware to the occuring problem in the community and require the solution to solve the problems.

On 30 May 2012, the topic issues emphasized on the idea of future waste management in the community; collection spot, frequency of the collection and the charging. The question about incinerator was left behind for the leaders to consider about its disadvantages and how to deal with them. The meeting brought the agreement that there will be a meeting with the households regarding to the waste management in the villages if the pilot study in Huaypung and Hintaek is successful in order to let the households to share some ideas and to figure out the appropriate way of management according to the condition of each village.

On 3 December 2012, the community leaders were provided with the results of the survey on household waste management; willingness to pay which show the households' awareness to the problem of waste; preference on the future waste management options; and some comments or requests suggested by the households.

3.4.3 Observations

The observation was during May-December 2012, conducted while the researcher accommodating in the area such as attending the meeting, training the questionnaire helpers, observing the study area, and accommodation duration the observation was done by taking a walk and a motorbike in the village and taking a look around to the households. The researcher could observe only the outdoor condition supporting the behavior on waste management of the households.

3.5 Data Analysis

3.5.1 Statistical Analysis

The survey data showed strong bias toward affirmative answers, as will be seen in the next chapter. This limited the usefulness of regression models. However, bivariate analyses can still show some patterns that might have practical values. Therefore, instead of advanced predicting models, simple techniques were used in the statistical analysis that can be easily understood by stakeholders:

To calculate the data of personal demographic, the frequency was calculated into percentage.

Households income, WTP were calculated mean value (Mean: $\bar{x}$) and Standard Deviation (S.D.).

To calculate the amount of waste, each waste bag sizes were calculated to find the volume of waste.

To calculate the pair data of households' waste practices identified by social norm, demographic and intrinsic incentive factors and data of households' preference on waste management options identified by demographic, intrinsic incentive and information, Crosstabs was applied and conclude in percentage.

To analyze the relationship of households' waste practices and the factors related of social norm, demographic, and intrinsic incentive, Chi-Square was figured out by Pearson's analyzing method in order to analyze the relationship.

To analyze the relationship of households' preference on waste management options and factors of demographic, intrinsic incentive and information, Chi-Square was figured out by Pearson's analyzing method in order to analyze the relationship.

To compare two villages on waste amount and number of member in household, T-test was applied to analyze the difference.

To analyze the comments and suggestions which are open-ended questions, the content analysis technique was used to group the data, and then calculate the frequency into percentage.

3.5.2 Triangulation

To overcome the limits of quantitative data survey results were supplemented by the information from the unstructured interview, the focus group and the observation. Some of quantitative information might be necessarily explained by the qualitative information because the current research did the simple analysis where weakness of the information might occur. To triangulate the questionnaire information with the qualitative information was weighted reliability of the information.

The significant of waste problems was triangulated with the SAO unstructured interview, households interview and questionnaire information. The households' present behaviors as no services providence from the SAO regarding to recycling behavior were triangulated with the questionnaire information, the unstructured interview with the households and the observation. The behavior of recycling food

waste as animal feeds from the questionnaire information was triangulated with the observation of the basic infrastructure of the households. The burning behavior was studied triangulate with the interview and questionnaire. Finally, the information of incinerator was triangulated with the questionnaire and the observation of leadership meeting.

[1]-If the respondent is willing to pay for the first offer price, the price will be priced two times higher. The reason of pricing two times higher is due to the study on reliability test of statistic value from more than 30 samplings which the result is 1.96 for 95% (estimated to 2).
If not, the price will be priced down by half with the same reason of the second price offering.

CHAPTER 4

RESULT AND DISCUSSION

The current chapter reports and discusses key findings. The survey results are based on 391 valid responses: from the village of Hintaek 193 households (49.36%) and from Huaypung the village 198 households (50.64%). After reporting descriptive statistics, results of the statistical tests focus on household behavior on waste management, willingness to pay for the cleaning up of dumpsite, and waste management options that households preferred. Full tables of statistical tests can be found in Appendix C. The quantitative research is then triangulated with qualitative data on the waste problem in the area by the interview with some SAO leaderships, the burning behavior from the local people point of view, the information provided by the SAO and the leadership agreement on the recycling promote in the area for a more in-depth discussion.

4.1 Demographic Background

Table 4.1 presents key socio-demographic of the sample. Overall, the respondents are from the different backgrounds. Different ethnicity groups of people in responses are Chinese (35.3%), Tai (32.2%), Lahu (14.9%), Akha (10.7%), Lisaw (1.5%) and Thai (5.4%). In the following analysis, to figure out how ethnicity relate to waste management behaviors, groups of Tai and Chinese were separated from the others.

From 386 respondents only 18.2% were schooled. Household size was mostly 1-4 people (50.6%), 5-8 people (44%) and 9-12 people (5.4%). Most respondents' occupation (61.9%) were "others" which are mainly specified as a daily worker and

an unemployed and 27.1% were a farmer. Some residents (10.7%) were a merchant. Only 0.3% was a government officer. A farmer and a merchant were analyzed and discussed on the relation between occupation and waste management practices by grouping a farmer out of the other professions and another grouping of merchant and other professions.

Total income per month per household were ranged 5,001-7,000 Baht (49%), 3,001-5,000 Baht (22.5%), 1,000-3,000 Baht (11%), 7,001-10,000 Baht (10%), and more than 10,000 Baht (7.4%). Looking at the two villages, Hintaek has averagely higher income level than Huaypung. In the following analysis, income was grouped into two different group setting; first group cutting point at 5,000 Baht, the second one groping into 3 groups (0-5,000; 5,001-7,000; and 7,001up).

Table 4.1 Selected Socio-Demographic Data of The Sample

	Total	**Hintaek**	**Huaypung**
Total valid responses	391	193	198
Ethnicity (valid 391)			
Thai	5.4%	0.5%	10.1%
Chinese	35.3%	19.7%	50.5%
Tai	32.2%	57.5%	7.6%
Lahu	14.9%	15.5%	8.1%
Lisaw	1.5%	1.0%	2.0%
Akha	10.7%	3.1%	18.2%
Educational status (valid 386)			
Had education in school	18.2%	25.9%	10.6%
No education in school	81.8%	74.1%	89.4%

Table 4.1 (continued)

	Total	Hintaek	Huaypung
Size of Household (valid 391)			
Average (person/household)	4.70	5.14	4.25
S.D. (person/household)	2.03	2.1	1.87
Maximum (person)	12.0	12.0	10.0
Minimum (person)	1.0	1.0	1.0
4 or less	50.7%	39.4%	61.7%
5-8	44.0%	53.4%	34.9%
9 or more	5.4%	7.3%	3.5%
Profession (valid 391)			
Farmer	27.1%	21.2%	32.8%
Merchant	10.7%	8.8%	12.6%
Government officer	0.3%	0.5%	0.0%
Others (Daily worker, unemployed)	61.9%	69.4%	54.5%
Monthly income level (valid 391)			
3,000 or less	11.0%	21.2%	1.0%
3,001-5,000	22.5%	5.2%	39.4%
5,001-7,000	49.0%	47.2%	51.0%
7,001-10,000	10.0%	11.4%	8.6%
10,001 or more	7.4%	15.0%	0.0%

As can also be seen from Table 4.1, some differences between the two villages were pronounced. While Tai was the largest group in HinTaek (57.5%), the largest ethnic group in Huay Phung was Chinese (50.5%). The impacts of these significant differences in the proportions of Tai people (Pearson Chi-square=111.592, df=1, n=391, p-value=0.000) and Chinese people (Pearson Chi-square=40.640, df=1, n=391, p-value=0.000) on the waste management practices and preferences in the two villages will be explored in next sections. Uneducated respondents were more in Huaypung (89.4%) than in Hintaek (74.1%) (Pearson Chi-square=15.396, df=1, n=391, p-value=0.000). Hintaek has a bigger household size than Huaypung (t=4.411, df=389, p-value=0.000).

4.2 Waste Disposal Behaviors and Attitudes

Table 4.2 presents waste disposal behaviors and attitudes towards waste problems of the people in Hin Taek and Huay Phung villages. Overall, 90.8% used food waste as animal feeds. 86.4% of the households sold recyclable waste. 54.7% admitted they burnt waste. Most households generated 22 Liters of waste a day (92.1%); only few generated more: 57 Liters (6.9%) and 200 Liters a day (1%). On average each household generated 23.19 Liters per day with SD at 22.86.

Regarding the descriptive norms, overall 99.7 % believed the others were burning waste in backyard. 99.3% believed other households recycle food waste into animal feeds. 97.9% believed the others throwing waste into river and along the road. 94.2% believed that other household selling recyclable waste. Most people agreed to the sentences provided.

The overall of attitude towards waste problem, 99.5% agreed that waste amount was increasing. 99.2% agreed that waste problem was an urgent issue to be solved. 99% agreed that uncontrolled disposal leads to disease infection and destroy environment. 98% agreed that they should participate on recycling. 97.7% agreed that having sanitarily waste management makes healthy community and good environment. 97.4% agreed that they should pay the waste management fee 92.3% agreed that financial burden is on SAO when waste is increasing. This part of the collected data

could not be analyzed statistically because of the same direction of the answer from the responses.

Table 4.2 Waste Disposal Behaviors and Descriptive Norms

	Total	**Hintaek**	**Huaypung**
Disposal behaviors (valid 391)			
Use food waste as animal feed	90.8%	82.9%	98.5%
Sell recyclables	86.4%	74.1%	98.5%
Burn waste	54.7%	77.7%	32.3%
Waste generation (valid 387)	387	189	198
Average (liter/day)	23.19	26.44	22.53
S.D. (liter/day)	22.86	22.53	4.29
Descriptive norms (valid 292)			
Believe others use food waste as animal feed	99.3%	99%	100%
Believe others sell recyclables	94.2%	91.2%	100%
Believe others burn waste	99.7%	99.5%	100%
Believe others litter waste along the road or into the stream	97.9%	98.4%	97%

Table 4.3 Attitude Towards Waste Problem

	Total	**Hintaek**	**Huaypung**
Attitude (valid 391)			
Waste amount is increasing	99.5%	99.0%	100.0%
Uncontrolled disposal leads to disease infection	99.0%	97.9%	100.0%
Financial burden is on SAO when waste is increasing	92.3%	86.0%	98.5%
Should participate on recycling	98.0%	96.4%	99.5%
Should pay for the waste management fee	97.4%	96.4%	98.5%
Waste problem is an urgent issue to be solved	99.2%	98.4%	100.0%
Sanitarily waste management makes healthy community and good environment	97.7%	99.0%	96.5%

Again some differences are pronounced between the two villages. Huaypung was found that selling recyclables more than Hintaek does (Pearson Chi-square=49.623, df=1, n=391, p-value=0.000). Huaypung again use food waste as animal feed more than Hintaek does (Pearson Chi-square=28.391, df=1, n=391, p-value=0.000) but in Hintaek found burning practices more than in Huaypung (Pearson Chi-square=81.295, df=1, n=391, p-value=0.000). Table 4.4 presents the difference of waste generation that Hintaek generates more waste per day than Huaypung. Hintaek generated averagely 26.44 liters per day while Huaypung generated 22.53 liters per day.

Table 4.4 Differences in Waste Generation in Two Villages

Villages	n	Mean	Std. Deviation	t	df	p-value
Hintaek	189	26.44	11.68	4.34	235.69	0.000
Huaypung	198	22.53	4.29			

4.2.1 Disposal behaviors

On using food waste as animal feeds.

Overall 90.8% used food waste as animal feeds. The hypotheses proposed that a farmer would better use food waste than other professions because there are some animals to feed in a farmer's household as a basic function to reduce food waste in the household. The statistic finding reported the positively agreed of the proposed hypotheses that the portion of a farmer make a good use of organic waste more than other occupations (Pearson Chi-Square=9.322, df=1, n=391, p-value=0.002).

On selling recyclables

Overall 86.4% sold recyclables. The hypotheses proposed that lower income households would much sell the recyclables more than higher ones. Another hypotheses predicted that selling recyclables behavior would affected by the type of profession. The finding reported that statistically households with limited income, less than 5,000 Baht per month, tended to selling waste higher than the higher income households (Pearson Chi-Square=5.895, df=1, n=391, p-value=0.015) as Letcher and Vallero, editors (2011) compare the behavior of wealthy communities and the poor ones that wealthy ones do more in discarding waste while the poor ones do more the recycling. The types of profession did not statistically affect to the behavior.

On burning waste

Overall 54.7% admitted burning waste in household. The hypotheses first proposed education and environment attitude would play a significant role affecting the burning behavior, but the result pointed to the two villages leading to that Tai

people burn waste more than other ethnic groups (Pearson Chi-Square=42.646, df=1, n=391, p-value=0.000) and less burning in Chinese group of people (Pearson Chi-square=12.350, df=1, n=391, p-value=0.000). Education level did not significantly affect on burning behavior case (Pearson Chi-square=4.678, df=3, n=386, p-value=0.197). Waste problem attitude and education surprisingly did not statistically significant affect on the burning behavior.

4.2.2 Generation Amount

According to the finding of average waste generation (23.19 liters a day), the different amount of waste generated was statistically significant affected by size of household, income level, and the behavior of management of fractions of waste; the selling recyclables and the using food waste as animal feed.

Generation of waste affected statistically significant by size of household (Pearson Correlation=0.174, n=391, p-value=0.001); the bigger size the households, the more waste was generated.

Generation of waste affected statistically significant by income level (Pearson Correlation=0.178, n=391, p-value=0.000); the higher the income level, the more waste was generated.

In addition, portion of the management of fractions of waste by selling recyclables (Pearson Chi-square=9.879, df=1, n=387, p-value=0.002) and by using food waste as animal feed (Pearson Chi-square=9.507, df=1, n=387, p-value=0.002) tended to reduce waste generation in households.

4.3 Future Preferences

4.3.1 WTP for Clean-up

Table 4.5 presents the willingness to pay to get the current dump site cleaned up. Overall, the WTP for cleaning-up the dump site averagely was 22.7 Baht/site (Mean=22.7, Mode=20, SD=12.64, Min=10, Max=100). 85.9% willing to pay 20 Baht. Another 7.6% was willing to pay 30-60 Baht but only 4.7% was willing to pay from 70 to 100 Baht.

Table 4.5 Willingness to Pay for Clean-Up of a Dumpsite

	Total	Hintaek	Huaypung
Willingness to pay for clean-up of dump site (valid 391)			
Mode (bath/site)	20.00	20.00	20.00
Average (bath/site)	22.70	25.13	20.35
S.D. (bath/site)	12.64	17.59	1.85
0 bath/site	0.0%	0.0%	0.0%
10 bath/site	4.1%	8.3%	0.0%
20 bath/site	85.9%	75.1%	96.5%
30-60 bath/site	7.6%	23.0%	3.5%
70-100 bath/site	4.7%	9.0%	0.0%

The hypotheses proposed that income level, size of household, amount of waste generation, and environmental attitude could not be affirmed statistically.

4.3.2 Future management options

Facing with alternative waste management options, almost all respondents (98.2%) chose incineration over controlled dumping (1%) or the status quo (0.8%). In addition, among those choosing incineration as the preferred disposal option, most preferred to do source separation, i.e. option 2 (20 Baht/month+sorting at source+ incinerator), instead of leaving all the work to the local government and paying a higher monthly fee, i.e. option 1 (50 Baht/month+full services of waste sorting+ incinerator).

Table 4.6 Preferences and Willingness to Pay for Future Waste Management

	Total	Hintaek	Huaypung
The most preferred management options in the future (valid 391)			
Option 1: 50 Baht/month+full services of waste sorting+incinerator	5.6%	11.4%	0.0%
Option 2: 20 Baht/month+sorting at source+incinerator	92.6%	86.5%	98.5%
Option 3: 20 Baht/month+sorting at source+controlled dumping	1%	0.5%	1.5%
Option 4: no fee+no service	0.8%	1.6%	0.0%

Again the difference is pronounced between the two villages. Hintaek households chose option no.1 (50 Baht with full services) more than Huaypung statistically affirmed (Pearson chi-square=28.106, df=3, n=391, p-value=0.000).

Higher income level group of people tended to choose the option 1 more than lower one; income more than 7,001 chose the option more than less income level ones (Pearson Chi-square=9.112, df=2, n=391, p-value=0.011). The households with higher income level are affordable for waste management charging (50 Baht) therefore it is obviously shown up that the income level is influential for the charging level of the option.

Size of household significantly affected on option no.1 choosing; households with 9-12 members tended choosing the option more than the less members' households (Pearson Chi-square=10.916, df=2, n=391, p-value=0.004) because bigger size of households generate much more waste amount. Therefore for larger households there would be more to gain by paying 50 baht instead of paying 20 baht

but need a lot of effort in managing more waste amount in the household by their own than smaller households.

Indeed, waste amount affected on choosing more option no. 1; waste amount 22 liters/day tended to choose option no.1 less than 57 liters/day waste generated households (Pearson Chi-square=17.225, df=1, n=387, p-value=0.000). It is because much waste generated households tended to trade a lot of effort putting with the charging of 50 baht instead of paying the 20 baht charging. In case of the less waste generating households, they are able to sort waste by their own because of the small number of waste and get to pay less as well.

Selling the recyclables affected the portion of choosing option no.1; higher rate of selling waste for recycling influence less preference on option no. 1 (Pearson Chi-square=20.244, df=1, n=391, p-value=0.000). It is because the recyclables selling households understand the value of selling waste that they can earn some money from the selling and households are already used to do it.

4.3.3 Informed choices

As the choices and the willingness to pay can be influenced by information, Table 4.7 presents the levels of knowledge and the sources of information about the waste management option that was chosen by the MSN SAO, waste incineration. 96.2% knew that incineration saved space for waste disposal. 91.6% also knew that incinerator can reduce the amount of waste by 70-90%. But, 94.4% knew that it costs much more when there is no separation before putting waste in the incinerator. 80.1% knew that burning stuff like PVC can cause dioxin which is a carcinogen. In the following analysis, the information would be grouped into two groups of positive information (containing small space of incinerator and 70-90% waste eliminating) and negative information (putting cost of wet waste burning and dioxin causing).

Respondents could choose multiple answers regarding the sources of information: 72.4% getting information from SAO staff, 49.9% got information from TV, 43.2% from a village leader, 38.9% got information from executive of SAO, Only 3.1% got information from radio, 1.8% got the information from newspaper, 1% got information from field trip (in Chiang Rai, Bangkok and Mae Chan), while 16.1 never got the information. In the following analysis, the sources of information

were grouped into information from authority (SAO executive, SAO staff), from media (Newspaper, Radio, TV), and from neighborhood (village leader, neighbors).

Table 4.7 Knowledge and Sources of Information About Waste Incineration

	Total	**Hintaek**	**Huaypung**
Knowledge about waste incineration (valid 391)			
It requires small space	96.2%	92.2%	100%
It reduced waste by 70% (by weight) - 90% (by volume)	91.6%	95.3%	87.9%
It costs much more when there is no separation before putting waste in the incinerator.	94.4%	94.3%	94.4%
It can produce dioxins and furans which are carcinogens	80.1%	95.3%	65.2%
Known both positive aspects	89.8%	91.7%	87.9%
Known at least one positive aspect	8.2%	4.1%	12.1%
Known both negative aspects	78.0%	93.3%	63.1%
Known at least one negative aspect	18.4%	3.1%	33.3%
Source of information (can choose more than one) (valid 391)			
executive of SAO	38.9%	62.2%	16.2%
SAO staff	72.4%	74.1%	70.7%

Table 4.7 (continued)

	Total	Hintaek	Huaypung
Knowledge about waste incineration (valid 391)			
a village leader	43.2%	76.2%	11.1%
Neighbors	52.4%	76.2%	29.3%
Newspaper	1.8%	3.6%	0.0%
TV	49.9%	70.5%	29.8%
Radio	3.1%	6.2%	0.0%
field trip	1.0%	0%	2.0%
never got the information	16.1%	21.2%	11.1%

The result reported that households mostly get positive information of incinerator from authority (Pearson Chi-square=8.733, df=1, n=391, p-value=0.003) while negative information were from media (Pearson Chi-square=9.907, df=1, n=391, p-value=0.002) and neighbors (Pearson chi-square=8.735, df=1, n=391, p-value=0.003). According to the results, covered information of waste management and the incinerator must be provided to the villagers.

4.4 Triangulation

This section triangulates the results of statistical analysis with qualitative data in order to confirm and enhance the understanding.

According to the discussion with some SAO officers, it is more severe in the increasing of quantity of waste such as plastic and foam which are difficult to households to handle where affected by the economic development in the area; transportation is more comfortable which take people from highland being closer to

town: the more convenient stores have been established many in the area. Therefore, the characteristic of waste is likely in urban waste affecting on the more complicated waste management in the households.

The growth of the economic in the area has made waste more complexes with the increase in plastic packaging and foam. The plastics and foam are difficult for households to handle. Therefore they have to use the method of illegal dumping to the empty spaces, into the river as the 97.9% of households said other households litter waste on the road and river (see table 4.2) or even burning in households' backyard. According to the observations, the problem of illegal dumping was seen in the river, along the road, and the most critical, on the dumping area further from the village about 2 kilometers. In the survey, many households claimed in an open-ended question the reason of dumping waste into the river and on the side road that they do not have a proper place where to dispose their households' waste.

As mentioned in the earlier series on the reduction of waste generation by doing the source separation, the leaders in the focus group meeting also supported the source separation before dispose to the SAO since it will not be much of a financial burden for the households and the SAO: the households would not pay much for the service fee; the SAO would reduce the management cost. SAO also agreed to contact with the recycling shop to come to the area more frequently in order to promote the recyclable waste separation which is beneficial for the households as well.

Since the households would like to eliminate the waste, there is a traditional method such as burning which recognized as an easy method to make waste gone away from the households. Following the questionnaire information, the survey data from interview the households is supported that people believe incinerating is easily making waste disappeared. It resulted in burning waste in the community normally. However, since the development project of the MSN proposed, the households requested for a pollution-free incinerator. It reflects the households' awareness on the air pollution from the traditional open burning and the desire to have an appropriate waste management.

The focus group meeting among the community leaders supported the relationship between positive information about the incinerator and the sources of information. SAO has promoted its development plan and already set the incinerator

setting site already. Therefore, it is the reason why people get more positive information from the SAO more than other sources. The people therefore be informed the benefit of the incinerator. Actually, the uninformed decision provided may lead to the future mistakes and problems of the management in the community.

4.5 Discussion

The waste management services are not yet provided to people in Mae Salong Nai sub-district. Households in Hintaek and Huaypung village, the case studies, have their own way to manage waste in household by recycling food waste and recyclable waste before dispose. However, because the types of waste that they cannot reuse or recycle have increased rapidly, most resort to open burning or littering. The comments of respondents reflected the perceived severity of waste problem they are facing with. Therefore, they are pushed to find some easy and fast method to clear up waste. As the practices are not appropriate enough, the waste problems are therefore cumulative and in needed of a solution.

The agriculturist is a group that makes a good use of food waste because it can be turned into animal feed in household. An agriculturist is almost 1/3 of the variety of profession which supported by the survey data that over 90 percent of the households raising animals such as chicken, pig and dog. Therefore, the waste dumping portion reduced according to the using of food waste. Selling the recyclables is another activity that affects on the waste generation amount. Even though the recycles buyer would seldom come to the area, the households still collect recyclables and wait until the buyers coming because the households realize that some kind of waste has economic worth. The households selling recyclables according to the area observation were mostly have own business both small and large such as a retail store. Therefore, the activities are like a turning point to consider for the future policy in the issue of promoting the important of basic structure in household and the motivation of selling recyclables.

The households' attitudes towards waste problems that need to be solved were reflected by the WTP level. Hintaek and Huaypung villages both willing to pay for

waste problems solving which reflect both village considered waste problem is significant but as paying level is different. The significant factor related to WTP level is amount of waste generate in households. Households which generate more waste amount tended to pay more WTP. This pointed to the households' responsibility realized to the waste problem they generated.

The future model of waste management options were selected mostly but only few percent selected non-options as currently doing. This also reflects the demand for change from households who require a more appropriate waste management by the SAO. Most people prefer selecting the option no. 2 (households manage waste at source+incinerator+20 Baht charging) which implied that people prefer the option provided by SAO but still willingly take a participate on source management, which bring sustainable waste management that the success of solid waste management is according to the promote of waste minimization, what households think they familiar with because looking at the current practices, households hardly found the problem on disposing stage more than sorting stage as related to the largest comments on the scarcity of waste facilities such as trash bin or track to pick the waste up.

Pap (2003) supported that most rural non-metropolitan areas have no access to garbage collection service and people have historically taken care of waste through backyard burning and informal dumping. The option with full services on waste separation from the SAO or the option no.1, where problems on waste management tended to be more than other options, was selected. The study therefore figured out the significant factors related to the selection of the waste management options no.1 (full service+50 Baht charging+incinerator dispose). The factors are waste amount generated, income level and number of household member. Households with more waste amount tended to select the option no.1 more than the less ones. It infers that high amount waste households tended to trade the amount of money and the comfort in lifestyle. The higher income level tended to select the option more than less ones. It implied that 50 baht is a tradable price for high income household to not self manage waste but by the services of the SAO instead. This might predict the more burden that the SAO will take the role because all kinds of waste will come to the SAO' s hands to re-manage and dispose instead of disposing waste with full potential after the households manage the waste at source which is more efficient. Another factor is size

of household. The more member households tended to select the option. It is apparently related to amount of waste in households; more members, more waste which is better trade 50 Baht with more comfortable life style to the households' opinion.

The households' knowledge level on the advantages of waste incineration is very high but knowing less on negative points of incinerator especially regarding health issue. The result reported that different source of knowledge provided different significant level to different kind of information. The SAO tended to give the positive information of incinerator more than the negative ones while households getting information from media and neighbors tended to know more negative information than the positive ones. The result implied the SAO provided more positive information because incinerator has been planned to use in final waste disposal. It is unsurprising that the SAO would highlight its benefits in order to gain acceptance from villagers. Negative information, that getting more from media and neighbors, is because there might be some concern from people in the community about using incinerator as the mentioning of NIMBY syndrome which related to the suggestions on the sanitary waste management requirement.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Overview

Waste is a challenging problem for every local government. In Mae Salong Nai, Chiang Rai province, the Sub district Authority Organization officer and local people realized to the increasing gravity of the waste problem that is a result of economic development and a changing lifestyle. As part of a plan to promote MSN to municipality a three-year plan to install a small scale incinerator is proposed by SAO. To provide information to policy makers and stakeholders, this research studies factors influencing households' waste disposal behaviors and their preferences regarding future management options. The research is based on a questionnaire survey in twovillages; Hintaek and Huaypung. The villages are the most crowded having 579 households in Hintaek and 528 households in Huaypung out of the total 3852 households in Mae Salong Nai. The survey systematically covered 200 households in each sampling village. The supportive information from a direct observation: focus group and unstructured interview with the villagers and some leaders of the community, was combined with the results of the survey for more explanation and confirmation.

On average households generated 23.2 liters of waste a day. The generation was affected positively by the size of household and income level but negatively by the behaviors on managing waste at source. Households can reduce the amount of waste by using food waste as animal feeds and separating recyclables. The low income level households sell recyclable waste more than the higher ones. A farmer benefit from organic waste more than other kinds of occupation. However, as waste management services are not yet provided in the community, many households

resorted to open burning and throwing away waste in open area such as into the river and unused land. Burning behavior found more in Tai group of people than other groups. The recommendation for the future research therefore goes to the study of burning behavior of Tai people. Overall, households see the problem of waste in the society and were willing to pay for the clean-up of the existing open-dump sites. The most preferred future waste management option was to pay for a combination of source separation of waste and incineration. This issue is pointing out to the recommendation for the SAO policy makers to consider the exchange between the discount services fee and the households' participation in recycling in order to generate the sustainable waste management in the context of highland community. The results also show that the households were more informed about the advantages of incineration from the SAO than its disadvantages in particular the potential health impacts. Therefore, balanced information is another key suggestion to the high potential of public participates on waste management.

5.2 Recommendations

The research can be useful in supporting the SAO to make the decision for the future development. It shows the important role of the management at source. SAO should consider how to promote and give the knowledge of the activities to the households as many households already did in their routine based on the understanding of the factors that influence their behaviors and preferences. The SAO should take households income into account because households do not earn a lot of money monthly. Considering of the future options, the results show that households preferred to continue their practices at source in exchange for a discount in future waste management fees. Local governments should incorporate source separation in their waste management plan and have a right incentive structure by having cheaper service charging to encourage people to do the separation. The charging of the service should not over 20 Baht per month.

A policy maker should provide regulations with punishment in order to prevent littering or putting all waste into trash-bag without sorting before hands of

SAO. In order to overcome the prevailing belief that littering is common, a policy maker might promote the campaign such as the “Eyes Everywhere” with the eyes all illegal of waste dumping and non-separation behavior will be watched from other people in the community to prevent the illegal behavior of waste dumping into the unused area and into the river. Eyes of neighbors have a strong influence to make households following the regulations of community. The campaign might be announced by the village leader weekly.

As there are various ethnic groups living together in MSN, the possible suggestion would go through the cooperation of the leader of each ethnic group including religion organization to communicate with the people in participate the waste prevention and recycling within household and the providing information about incinerator for the people in each different language. The cooperation of the groups in managing waste when there are some traditional festivals where more waste generated is another key suggestion to the SAO in cooperating with different ethnic groups.

Another key suggestion is to provide complete information on the proposed plan or projects to the stakeholders in order to prevent the misunderstanding which might lead to the difficulty in operating the policy. Information provided should cover environmental and health problems after the unsanitary waste dumping; why they must separate waste before dispose; advantages, disadvantages and limitation such as waste sorting ability of incinerator. Hintaek village should be informed about the problems of waste dumping to the river while Huaypung should be focused on the problems according to the open dumping site. The information might encourage people to appreciate the significance of their behaviors in the highland that can affect downstream places.

Information of burning waste unsanitary in household should be explained to the people especially Tai group, the biggest group reported to have burning behavior and the factors that influence their behaviors in a future study.

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APPENDICES

APPENDIX A

QUESTIONNAIRE (ORIGINAL)

☐ ชื่อผู้ให้สัมภาษณ์ วันที่สัมภาษณ์ No.

แบบสอบถามโครงการวิจัยเรื่อง การศึกษาพฤติกรรมและความต้องการจัดการขยะมูลฝอยในเขตพื้นที่ตำบลแม่สลองใน จ.เชียงราย

<u>ตอนที่ 1</u> ข้อมูลทั่วไปของผู้ให้สัมภาษณ์ (*ครัวเรือนละหนึ่งคน)

หมู่บ้านที่ท่านอาศัยอยู่

☐ บ้านหินแตก ☐ บ้านห้วยผึ้ง

เพศ

☐ ชาย ☐ หญิง

อายุ .....ปี

ชาติพันธุ์

☐ ไทย ☐ อาข่า ☐ จีน ☐ ไทใหญ่ ☐ ลาหู่ ☐ มูเซอ ☐ ลีซอ

☐ เย้า ☐ ละว้า ☐ อื่นๆ.....

ศาสนา ☐ พุทธ ☐ คริสต์ ☐ อื่นๆ .....

ระดับการศึกษา ☐ ระบุ..... ☐ ไม่มีการศึกษา

จำนวนสมาชิกในครัวเรือน รวม.....คน

อาชีพ

☐ รับราชการ/รัฐวิสาหกิจ ☐ ค้าขาย

☐ เกษตรกร ☐ อื่นๆ.....

รายได้ภายใน **ครัวเรือน** ต่อเดือน

☐ 1000-3000 บาท ☐ 3001-5000 บาท

☐ 5001-7000 บาท ☐ 7001-10,000 บาท

☐ 10,001 เป็นต้นไป

จำนวนขยะในครัวเรือนต่อวัน .....ถุง

☐ แบบที่ 1 ☐ แบบที่ 2 ☐ แบบที่ 3 (ตามรูป)

ทุกวันนี้กำจัดขยะในครัวเรือนอย่างไร

ในปัจจุบัน ที่บ้านท่านคัดแยกขยะ**ขาย**หรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบัน ที่บ้านท่านมีการเก็บเศษอาหารไปให้**สัตว์กิน**หรือ**ทำปุ๋ย**หรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบัน ที่บ้านท่าน**เผา**เศษขยะทิ้งหรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบัน ท่านคิดว่าคนส่วนใหญ่ในชุมชนคัดแยกขยะ**ขาย**หรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบัน ท่านคิดว่าคนส่วนใหญ่ในชุมชนเก็บเศษอาหารไปให้**สัตว์กิน**หรือ**ทำปุ๋ย**หรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบัน ท่านคิดว่าคนส่วนใหญ่ในชุมชน**เผา**เศษขยะทิ้งหรือไม่	☐ ใช่	☐ ไม่ใช่
ในปัจจุบันท่านคิดว่าคนส่วนใหญ่ในชุมชน ทิ้งขยะข้างทางหรือลงแม่น้ำหรือไม่	☐ ใช่	☐ ไม่ใช่

<u>ตอนที่ 2</u> ข้อมูลเกี่ยวกับความเต็มใจจ่ายค่าจัดการขยะมูลฝอย (*แสดงรูปภาพเปรียบเทียบก่อนและหลังการจัดการขยะให้ผู้ให้สัมภาษณ์ดู แล้วถามถึงความเต็มใจจ่าย)

คุณเต็มใจจ่าย **กี่บาท** *เพื่อให้ขยะกองนี้หมดไป* ? กรุณาวงกลม

0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**

<u>ตอนที่ 3</u> แบบจำลองทางเลือกการจัดการขยะภายในชุมชน: ให้เลือกรูปแบบการจัดการขยะในชุมชน (ต่อเดือน)

แบบ 1	**แบบ 2**	**แบบ 3**	**แบบ 4**
พนักงานแยกให้กำจัดโดยเตาเผาขยะ ค่าบริการ 50 บาท	แยกขยะเองกำจัดโดยเตาเผาขยะ ค่าบริการ 20 บาท	แยกขยะเองกำจัดโดยการฝังกลบ ค่าบริการ 20 บาท	ไม่มีการแยกทิ้งข้างทางแบบปัจจุบัน ค่าบริการ 0 บาท
□	□	□	□

เหตุผลที่เลือก

.....

.....

.....

<u>ตอนที่ 4</u> ข้อมูลด้านความรู้ความเข้าใจเกี่ยวกับเตาเผาขยะ

ข้อมูลเกี่ยวกับเตาเผาขยะ	ทราบ	ไม่ทราบ
ท่านทราบหรือไม่ว่าการเผาขยะเป็นการกำจัดขยะที่ใช้พื้นที่น้อย		
ท่านทราบหรือไม่ว่าการเผาขยะช่วยลดปริมาณขยะได้ 70-90%		
ท่านทราบหรือไม่ว่าขยะที่ไม่ได้แยกนั้นค่อนข้างเปียกเผาได้ยาก (ต้องใช้เชื้อเพลิงอื่น ๆ จุดไฟให้ลุกไหม้ก่อน ทำให้มีค่าใช้จ่ายเพิ่มขึ้น)		
ท่านทราบหรือไม่ว่านอกจากจะก่อให้เกิดเขม่าควันแล้ว การเผาขยะบางประเภทเช่นพลาสติกพีวีซียังทำให้เกิดสารก่อมะเร็ง		

ที่ผ่านมาท่านได้รับข้อมูลเกี่ยวกับเตาเผาขยะจากไหน (ตอบได้มากกว่า 1 ข้อ)

☐ ผู้บริหาร อบต. ☐ เจ้าหน้าที่ อบต. ☐ พ่อหลวง ☐ เพื่อนบ้าน

☐ หนังสือพิมพ์ ☐ โทรทัศน์ ☐ วิทยุ

☐ จากการศึกษาดูงานเตาเผาขยะ (โปรดระบุสถานที่ .....)

☐ อื่นๆ (โปรดระบุ) .....

☐ ไม่เคยได้รับข้อมูล

ในอนาคต หากมีการทำประชาคมให้ความรู้และรับฟังความคิดเห็นเกี่ยวกับเตาเผาขยะ ท่านสนใจจะเข้าร่วมหรือไม่

☐สนใจ ☐ไม่สนใจ ☐ ไม่แน่ใจ

<u>ตอนที่ 5</u> **ข้อมูลด้านความตระหนักถึงปัญหาขยะมูลฝอยและทัศนคติต่อสิ่งแวดล้อม**

(*ผู้สัมภาษณ์ควรอ่านให้เข้าใจก่อนเพื่อความสะดวกในการเรียบเรียงคำพูดในกรณีที่ผู้ให้สัมภาษณ์ไม่เข้าใจ)

เห็นด้วยหรือไม่เห็นด้วย	เห็นด้วย	ไม่เห็นด้วย
ขยะมูลฝอยมีปริมาณเพิ่มมากขึ้นเรื่อย ๆ ในทุก ๆ ปี		
การกำจัดขยะมูลฝอยที่ไม่ถูกสุขลักษณะ เป็นการแพร่กระจายเชื้อโรค และทำลายสิ่งแวดล้อม		
ปริมาณขยะมูลฝอยที่เพิ่มขึ้นนั้นทำให้อบต.จ่ายเงินเพิ่มมากขึ้นด้วย		
ในฐานะผู้ทิ้งขยะ คุณควรมีส่วนร่วมในการลดและคัดแยกขยะมูลฝอย		
ในฐานะผู้ทิ้งขยะ คุณควรมีส่วนร่วมจ่ายค่าธรรมเนียมในการจัดเก็บขยะมูลฝอยเพื่อให้ อบต. นำไปจัดการ		
ปัญหาขยะมูลฝอยเป็นปัญหาสำคัญที่ต้องเร่งแก้ไข		
ระบบการจัดการขยะมูลฝอยที่ถูกสุขลักษณะจะทำให้สภาพแวดล้อมและสุขภาพของคนในชุมชนดีขึ้น		

คำแนะนำเพิ่มเติมเกี่ยวกับขยะ

.....

.....

APPENDIX B

QUESTIONNAIRE (TRANSLATED)

Household Questionnaire for the Study of Household Waste Practices and Preferenes of Waste Management, Mae Salong Nai, Chiangrai

□ Name of the respondent ……Date……...……

Questionnaire No. ……

General Household Information

Village you are in

□ Hintaek □ Huaypung

Gender

□ Male □ Female

Age .....Years

Ethnicity

□ Thai □ Akha □ Chinese □ Tai □ Lahu

□ Lisaw □

□ Yao □ Lawa □

other.....

Religion □ Buddhism □ Christian □

other .....

Education Level □

specify..... □ no

Members in household total.....people

Occupation

□ a government officer □ a merchant

□ an agriculturist □

other.....

Income per household per month (Baht)

□ 1000-3000 □ 3001-5000

□ 5001-7000 □ 7001-10,000

□ from 10,001

Waste amount/day ..... bag(s)

□ No. 1 □ No. 2 □ No. 3

Presently, how do you manage waste in household?	□Yes □ No
Sorting waste for selling?	□ Yes □ No
Recycle organic waste to feed animals or produce fertilizer?	□Yes □ No
Do backyard burning?	□ Yes □ No
Do you think other people sort their waste to sell?	□ Yes □ No
Do you think other people recycle organic waste to feed animals or produce fertilizer?	□ Yes □ No
Do you think other people do backyard burning?	□ Yes □ No
Do you think other people dump their waste into river or on the road side?	□ Yes □ No

Information of Willingness to Pay for the improving of environment (see the picture of before and after improving)

0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**

Future option model of waste management

Choice No. 1	**Choice No. 2**	**Choice No. 3**	**Choice No. 4**
Full-service incinerator 50 Baht/month charged	Sorting at household incinerator 20 Baht/month charged	Sorting at household Controlled dumping 20 Baht/month charged	No sorting Open dumping to river and road side No charging
□	□	□	□

Reason of choosing

……

……

……

Literacy and knowledge of incinerator information

Incinerator information	Know	Don't know
Do you know burning by incinerator cover small area?		
Do you know burning by incinerator can eliminate waste 70-90%?		
Do you know burning wet waste take a lot of time and produce higher costing?		
Do you know burning PVC cause Dioxin?		

Where did you learn about incinerator information? (answer more than 1 is allowed.)

□ TAO executive staff □ TAO general staff □ leader of village □ neighbors

□ Newspaper □ TV □ Radio

□ Fieldtrip (specify place .....)

□ others (specify)

.....

□ never get information

If there is a Learning Project about Incinerator Literacy in the future, are you interested in attending the lecture?

□ Yes, I am. □ No, I'm not □ I'm not sure.

Environmental waste problem awareness and attitude toward environment

Do you agree or not with the sentences?	Yes, I agree	No, I don't agree
Annually, solid waste is increasing.		
Unsanitary waste dispose spread out infection and damage environment.		
Increasing of waste put monetary burden to TAO		
As you are a disposer, you should reduce and separate solid waste.		
As you are a disposer, you should pay for waste management fee to TAO's management.		
Problem of solid waste is an urgent issue to be solving.		
Sanitary waste management brings better environment and public health.		

Comments and Suggestions

……

……

APPENDIX C

DATA ANALYSIS

Crosstab

			หมู่บ้าน		Total
			บ้านหินแตก	บ้านห้วยผึ้ง	
ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	ไม่ใช่	Count	50	3	53
		% within หมู่บ้าน	25.9%	1.5%	13.6%
	ใช่	Count	143	195	338
		% within หมู่บ้าน	74.1%	98.5%	86.4%
Total		Count	193	198	391
		% within หมู่บ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	49.623[a]	1	.000		
Continuity Correction[b]	47.564	1	.000		
Likelihood Ratio	58.385	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	49.497	1	.000		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 26.16.

b. Computed only for a 2x2 table

Figure C1 Chi-Square Testing of Villages and Behavior of Selling Recyclables

Crosstab

			หมู่บ้าน		
			บ้านหินแตก	บ้านห้วยผึ้ง	Total
ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	ไม่ใช่	Count	33	3	36
		% within หมู่บ้าน	17.1%	1.5%	9.2%
	ใช่	Count	160	195	355
		% within หมู่บ้าน	82.9%	98.5%	90.8%
Total		Count	193	198	391
		% within หมู่บ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	28.391[a]	1	.000		
Continuity Correction[b]	26.558	1	.000		
Likelihood Ratio	32.647	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	28.319	1	.000		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.77.

b. Computed only for a 2x2 table

Figure C2 Chi-Square Testing of Villages and Behavior of Using Food Waste as Animal Feeds

Crosstab

			หมู่บ้าน		
			บ้านหินแตก	บ้านห้วยผึ้ง	Total
ท่านเผาเศษขยะที่บ้านหรือไม่	ไม่ใช่	Count	43	134	177
		% within หมู่บ้าน	22.3%	67.7%	45.3%
	ใช่	Count	150	64	214
		% within หมู่บ้าน	77.7%	32.3%	54.7%
Total		Count	193	198	391
		% within หมู่บ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	81.295[a]	1	.000		
Continuity Correction[b]	79.473	1	.000		
Likelihood Ratio	84.594	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	81.087	1	.000		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 87.37.

b. Computed only for a 2x2 table

Figure C3 Chi-Square Testing of Villages and Behavior of Burning Waste in Backyard

การศึกษา * หมู่บ้าน Crosstabulation

			หมู่บ้าน		
			บ้านหินแตก	บ้านห้วยผึ้ง	Total
การศึกษา	ไม่มีการศึกษา	Count	143	177	320
		% within หมู่บ้าน	74.1%	89.4%	81.8%
	มีการศึกษา	Count	50	21	71
		% within หมู่บ้าน	25.9%	10.6%	18.2%
Total		Count	193	198	391
		% within หมู่บ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.396[a]	1	.000		
Continuity Correction[b]	14.384	1	.000		
Likelihood Ratio	15.754	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	15.357	1	.000		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 35.05.

b. Computed only for a 2x2 table

Figure C4 Chi-Square Testing of Villages and Educational Status

ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่ * อาชีพ Crosstabulation

			อาชีพ		Total
			เกษตรกร	อื่นๆ	
ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	ไม่ใช่	Count	2	34	36
		% within อาชีพ	1.9%	11.9%	9.2%
	ใช่	Count	104	251	355
		% within อาชีพ	98.1%	88.1%	90.8%
Total		Count	106	285	391
		% within อาชีพ	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.322[a]	1	.002		
Continuity Correction[b]	8.160	1	.004		
Likelihood Ratio	12.120	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	9.299	1	.002		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.76.

b. Computed only for a 2x2 table

Figure C5 Chi-Square Testing of a Farmer and Behavior of Use Food Waste as Animal Feeds

ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่ * INCOME2 Crosstabulation

			INCOME2		
			0-5000	5001 ขึ้นไป	Total
ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	ไม่ใช่	Count	10	43	53
		% within INCOME2	7.6%	16.5%	13.6%
	ใช่	Count	121	217	338
		% within INCOME2	92.4%	83.5%	86.4%
Total		Count	131	260	391
		% within INCOME2	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.895[a]	1	.015		
Continuity Correction[b]	5.160	1	.023		
Likelihood Ratio	6.415	1	.011		
Fisher's Exact Test				.018	.010
Linear-by-Linear Association	5.880	1	.015		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.76.

b. Computed only for a 2x2 table

Figure C6 Chi-Square Testing of Income Level and Behavior of Selling Recyclables

ท่านเผาเศษขยะที่บ้านหรือไม่ * ไทใหญ่ Crosstabulation

			ไทใหญ่		
			ไม่ใช่	ใช่	Total
ท่านเผาเศษขยะที่บ้านหรือไม่	ไม่ใช่	Count	150	27	177
		% within ไทใหญ่	56.6%	21.4%	45.3%
	ใช่	Count	115	99	214
		% within ไทใหญ่	43.4%	78.6%	54.7%
Total		Count	265	126	391
		% within ไทใหญ่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	42.646[a]	1	.000		
Continuity Correction[b]	41.238	1	.000		
Likelihood Ratio	44.869	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	42.537	1	.000		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 57.04.

b. Computed only for a 2x2 table

Figure C7 Chi-Square Testing of Tai People and Behavior of Burning in Backyard

ท่านเผาเศษขยะที่บ้านหรือไม่ * การศึกษา Crosstabulation

			การศึกษา		
			ไม่มีการศึกษา	มีการศึกษา	Total
ท่านเผาเศษขยะที่บ้านหรือไม่	ไม่ใช่	Count	142	35	177
		% within การศึกษา	44.4%	49.3%	45.3%
	ใช่	Count	178	36	214
		% within การศึกษา	55.6%	50.7%	54.7%
Total		Count	320	71	391
		% within การศึกษา	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.568[a]	1	.451		
Continuity Correction[b]	.387	1	.534		
Likelihood Ratio	.566	1	.452		
Fisher's Exact Test				.510	.267
Linear-by-Linear Association	.566	1	.452		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 32.14.

b. Computed only for a 2x2 table

Figure C8 Chi-Square Testing of Educational Status and Behavior of Burning in Backyard

Correlations

		จำนวนสมาชิก	รายได้	ขยะเป็นตัวเลข
จำนวนสมาชิก	Pearson Correlation	1	.166**	.174**
	Sig. (2-tailed)		.001	.001
	N	391	391	391
รายได้	Pearson Correlation	.166**	1	.178**
	Sig. (2-tailed)	.001		.000
	N	391	391	391
ขยะเป็นตัวเลข	Pearson Correlation	.174**	.178**	1
	Sig. (2-tailed)	.001	.000	
	N	391	391	391

**. Correlation is significant at the 0.01 level (2-tailed).

Figure C9 Correlations of Waste Generation and Size of Household, Income Level

Crosstab

			ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่		
			ไม่ใช่	ใช่	Total
ขยะเป็นตัวเลข	22.00	Count	43	317	360
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	82.7%	94.6%	93.0%
	57.00	Count	9	18	27
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	17.3%	5.4%	7.0%
Total		Count	52	335	387
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.879[a]	1	.002		
Continuity Correction[b]	8.125	1	.004		
Likelihood Ratio	7.664	1	.006		
Fisher's Exact Test				.005	.005
Linear-by-Linear Association	9.853	1	.002		
N of Valid Cases	387				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.63.

b. Computed only for a 2x2 table

Figure C10 Chi-Square Testing of Waste Generation and Waste Management at Source (Selling Recyclables)

Crosstab

			ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่		
			ไม่ใช่	ใช่	Total
ขยะเป็นตัวเลข	22.00	Count	29	331	360
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	80.6%	94.3%	93.0%
	57.00	Count	7	20	27
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	19.4%	5.7%	7.0%
Total		Count	36	351	387
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.507[a]	1	.002		
Continuity Correction[b]	7.507	1	.006		
Likelihood Ratio	6.943	1	.008		
Fisher's Exact Test				.008	.008
Linear-by-Linear Association	9.482	1	.002		
N of Valid Cases	387				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.51.

b. Computed only for a 2x2 table

Figure C11 Chi-Square Testing of Waste Generation and Waste Management at Source (Using Food Waste as Animal Feeds)

Crosstab

			INCOME2		
			0-5000	5001 ขึ้นไป	Total
WTP2	20 bath or less	Count	123	225	348
		% within INCOME2	93.9%	87.9%	89.9%
	more than 20 bath	Count	8	31	39
		% within INCOME2	6.1%	12.1%	10.1%
Total		Count	131	256	387
		% within INCOME2	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.445[a]	1	.063		
Continuity Correction[b]	2.815	1	.093		
Likelihood Ratio	3.718	1	.054		
Fisher's Exact Test				.074	.043
Linear-by-Linear Association	3.437	1	.064		
N of Valid Cases	387				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.20.

b. Computed only for a 2x2 table

Figure C12 Chi-Square Testing of WTP and Income Level

Crosstab

			WASTEAMOUNT		
			22 l/d	57 l/d	Total
WTP2	20 bath or less	Count	326	22	348
		% within WASTEAMOUNT	90.6%	81.5%	89.9%
	more than 20 bath	Count	34	5	39
		% within WASTEAMOUNT	9.4%	18.5%	10.1%
Total		Count	360	27	387
		% within WASTEAMOUNT	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.282[a]	1	.131		
Continuity Correction[b]	1.391	1	.238		
Likelihood Ratio	1.910	1	.167		
Fisher's Exact Test				.173	.122
Linear-by-Linear Association	2.276	1	.131		
N of Valid Cases	387				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.72.

b. Computed only for a 2x2 table

Figure C13 Chi-Square Testing of WTP and Waste Generation

Crosstab

			ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่		
			ไม่ใช่	ใช่	Total
WTP2	20 bath or less	Count	46	302	348
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	88.5%	90.1%	89.9%
	more than 20 bath	Count	6	33	39
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	11.5%	9.9%	10.1%
Total		Count	52	335	387
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.141[a]	1	.707		
Continuity Correction[b]	.017	1	.898		
Likelihood Ratio	.137	1	.712		
Fisher's Exact Test				.628	.430
Linear-by-Linear Association	.141	1	.707		
N of Valid Cases	387				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.24.

b. Computed only for a 2x2 table

Figure C14 Chi-Square Testing of WTP and Waste Management at Source (Selling Recyclables)

Crosstab

			ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่		
			ไม่ใช่	ใช่	Total
WTP2	20 bath or less	Count	31	317	348
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	86.1%	90.3%	89.9%
	more than 20 bath	Count	5	34	39
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	13.9%	9.7%	10.1%
Total		Count	36	351	387
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.636[a]	1	.425		
Continuity Correction[b]	.257	1	.612		
Likelihood Ratio	.583	1	.445		
Fisher's Exact Test				.389	.290
Linear-by-Linear Association	.635	1	.426		
N of Valid Cases	387				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.63.

b. Computed only for a 2x2 table

Figure C15 Chi-Square Testing of WTP and Waste Management at Source (Using Food Waste as Animal Feeds)

WTP2 * ท่านเผาเศษขยะที่บ้านหรือไม่ Crosstabulation

			ท่านเผาเศษขยะที่บ้านหรือไม่		
			ไม่ใช่	ใช่	Total
WTP2	20 bath or less	Count	164	188	352
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	92.7%	87.9%	90.0%
	more than 20 bath	Count	13	26	39
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	7.3%	12.1%	10.0%
Total		Count	177	214	391
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.491[a]	1	.115		
Continuity Correction[b]	1.984	1	.159		
Likelihood Ratio	2.548	1	.110		
Fisher's Exact Test				.129	.078
Linear-by-Linear Association	2.484	1	.115		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.65.

b. Computed only for a 2x2 table

Figure C16 Chi-Square Testing of WTP and Behavior of Burning in Backyard

Fee50 * WASTEAMOUNT Crosstabulation

			WASTEAMOUNT		
			22 l/d	57 l/d	Total
Fee50	.00	Count	346	21	367
		% within WASTEAMOUNT	96.1%	77.8%	94.8%
	1.00	Count	14	6	20
		% within WASTEAMOUNT	3.9%	22.2%	5.2%
Total		Count	360	27	387
		% within WASTEAMOUNT	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	17.225[a]	1	.000		
Continuity Correction[b]	13.687	1	.000		
Likelihood Ratio	10.486	1	.001		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	17.181	1	.000		
N of Valid Cases	387				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.40.

b. Computed only for a 2x2 table

Figure C17 Chi-Square Testing of Option no.1 and Waste Generation

Crosstab

			INCOME3			
			0-5000	5001-7000	7001 ขึ้นไป	Total
Fee50	.00	Count	129	180	60	369
		% within INCOME3	98.5%	93.8%	88.2%	94.4%
	1.00	Count	2	12	8	22
		% within INCOME3	1.5%	6.2%	11.8%	5.6%
Total		Count	131	192	68	391
		% within INCOME3	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.112[a]	2	.011
Likelihood Ratio	9.621	2	.008
Linear-by-Linear Association	9.062	1	.003
N of Valid Cases	391		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.83.

Figure C18 Chi-Square Testing of Option no.1 and Income Level

Crosstab

			ช่างสมาชิก			
			1-4	5-8	9-12	Total
Fee50	.00	Count	194	157	18	369
		% within ช่างสมาชิก	98.0%	91.3%	85.7%	94.4%
	1.00	Count	4	15	3	22
		% within ช่างสมาชิก	2.0%	8.7%	14.3%	5.6%
Total		Count	198	172	21	391
		% within ช่างสมาชิก	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.916[a]	2	.004
Likelihood Ratio	11.161	2	.004
Linear-by-Linear Association	10.857	1	.001
N of Valid Cases	391		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.18.

Figure C19 Chi-Square Testing of Option no.1 and Size of Household

Crosstab

			ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่		
			ไม่ใช่	ใช่	Total
Fee50	.00	Count	43	326	369
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	81.1%	96.4%	94.4%
	1.00	Count	10	12	22
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	18.9%	3.6%	5.6%
Total		Count	53	338	391
		% within ในปัจจุบันบ้านท่านแยกขยะขายหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	20.244[a]	1	.000		
Continuity Correction[b]	17.462	1	.000		
Likelihood Ratio	14.335	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	20.193	1	.000		
N of Valid Cases	391				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.98.

b. Computed only for a 2x2 table

Figure C20 Chi-Square Testing of Option no.1 and Waste Management at Source (Selling Recyclables)

Crosstab

			ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่		
			ไม่ใช่	ใช่	Total
Fee50	.00	Count	32	337	369
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	88.9%	94.9%	94.4%
	1.00	Count	4	18	22
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	11.1%	5.1%	5.6%
Total		Count	36	355	391
		% within ท่านเก็บเศษอาหารให้สัตว์กินหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.246[a]	1	.134		
Continuity Correction[b]	1.253	1	.263		
Likelihood Ratio	1.825	1	.177		
Fisher's Exact Test				.133	.133
Linear-by-Linear Association	2.240	1	.134		
N of Valid Cases	391				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.03.

b. Computed only for a 2x2 table

Figure C21 Chi-Square Testing of Option no.1 and Waste Management at Source (Using Food Waste as Animal Feeds)

Crosstab

			ท่านเผาเศษขยะที่บ้านหรือไม่		
			ไม่ใช่	ใช่	Total
Fee50	.00	Count	170	199	369
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	96.0%	93.0%	94.4%
	1.00	Count	7	15	22
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	4.0%	7.0%	5.6%
Total		Count	177	214	391
		% within ท่านเผาเศษขยะที่บ้านหรือไม่	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.702[a]	1	.192		
Continuity Correction[b]	1.176	1	.278		
Likelihood Ratio	1.752	1	.186		
Fisher's Exact Test				.270	.139
Linear-by-Linear Association	1.698	1	.193		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.96.

b. Computed only for a 2x2 table

Figure C22 Chi-Square Testing of Option no.1 and Behavior of Burning in Backyard

Crosstab

			InfoAuthority		
			.00	1.00	Total
KnowAllPositive	.00	Count	16	24	40
		% within KnowAllPositive	40.0%	60.0%	100.0%
		% within InfoAuthority	18.8%	7.8%	10.2%
	1.00	Count	69	282	351
		% within KnowAllPositive	19.7%	80.3%	100.0%
		% within InfoAuthority	81.2%	92.2%	89.8%
Total		Count	85	306	391
		% within KnowAllPositive	21.7%	78.3%	100.0%
		% within InfoAuthority	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.733[a]	1	.003		
Continuity Correction[b]	7.579	1	.006		
Likelihood Ratio	7.674	1	.006		
Fisher's Exact Test				.007	.004
Linear-by-Linear Association	8.711	1	.003		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.70.

b. Computed only for a 2x2 table

Figure C23 Chi-Square Testing of Positive Information and Source of Authority

Crosstab

			InfoMedia		
			.00	1.00	Total
KnowAllPositive	.00	Count	20	20	40
		% within KnowAllPositive	50.0%	50.0%	100.0%
		% within InfoMedia	10.2%	10.3%	10.2%
	1.00	Count	176	175	351
		% within KnowAllPositive	50.1%	49.9%	100.0%
		% within InfoMedia	89.8%	89.7%	89.8%
Total		Count	196	195	391
		% within KnowAllPositive	50.1%	49.9%	100.0%
		% within InfoMedia	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000[a]	1	.986		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.000	1	.986		
Fisher's Exact Test				1.000	.559
Linear-by-Linear Association	.000	1	.986		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 19.95.

b. Computed only for a 2x2 table

Figure C24 Chi-Square Testing of Positive Information and Source of Media

Crosstab

			รับข้อมูลจากเพื่อนบ้าน		
			ไม่ใช่	ใช่	Total
KnowAllPositive	.00	Count	21	19	40
		% within KnowAllPositive	52.5%	47.5%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	11.3%	9.3%	10.2%
	1.00	Count	165	186	351
		% within KnowAllPositive	47.0%	53.0%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	88.7%	90.7%	89.8%
Total		Count	186	205	391
		% within KnowAllPositive	47.6%	52.4%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.733[a]	1	.003		
Continuity Correction[b]	7.579	1	.006		
Likelihood Ratio	7.674	1	.006		
Fisher's Exact Test				.007	.004
Linear-by-Linear Association	8.711	1	.003		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.70.

b. Computed only for a 2x2 table

Figure C25 Chi-Square Testing of Positive Information and Source of Neighborhood

Crosstab

			InfoAuthority		
			.00	1.00	Total
KnowAllNegative	.00	Count	24	62	86
		% within KnowAllNegative	27.9%	72.1%	100.0%
		% within InfoAuthority	28.2%	20.3%	22.0%
	1.00	Count	61	244	305
		% within KnowAllNegative	20.0%	80.0%	100.0%
		% within InfoAuthority	71.8%	79.7%	78.0%
Total		Count	85	306	391
		% within KnowAllNegative	21.7%	78.3%	100.0%
		% within InfoAuthority	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.465[a]	1	.116		
Continuity Correction[b]	2.022	1	.155		
Likelihood Ratio	2.363	1	.124		
Fisher's Exact Test				.138	.079
Linear-by-Linear Association	2.459	1	.117		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.70.

b. Computed only for a 2x2 table

Figure C26 Chi-Square Testing of Negative Information and Source of Authority

Crosstab

			InfoMedia		
			.00	1.00	Total
KnowAllNegative	.00	Count	56	30	86
		% within KnowAllNegative	65.1%	34.9%	100.0%
		% within InfoMedia	28.6%	15.4%	22.0%
	1.00	Count	140	165	305
		% within KnowAllNegative	45.9%	54.1%	100.0%
		% within InfoMedia	71.4%	84.6%	78.0%
Total		Count	196	195	391
		% within KnowAllNegative	50.1%	49.9%	100.0%
		% within InfoMedia	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.907[a]	1	.002		
Continuity Correction[b]	9.153	1	.002		
Likelihood Ratio	10.034	1	.002		
Fisher's Exact Test				.002	.001
Linear-by-Linear Association	9.882	1	.002		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 42.89.

b. Computed only for a 2x2 table

Figure C27 Chi-Square Testing of Negative Information and Source of Media

Crosstab

			รับข้อมูลจากเพื่อนบ้าน		
			ไม่ใช่	ใช่	Total
KnowAllNegative	.00	Count	53	33	86
		% within KnowAllNegative	61.6%	38.4%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	28.5%	16.1%	22.0%
	1.00	Count	133	172	305
		% within KnowAllNegative	43.6%	56.4%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	71.5%	83.9%	78.0%
Total		Count	186	205	391
		% within KnowAllNegative	47.6%	52.4%	100.0%
		% within รับข้อมูลจากเพื่อนบ้าน	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.735[a]	1	.003		
Continuity Correction[b]	8.028	1	.005		
Likelihood Ratio	8.771	1	.003		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	8.713	1	.003		
N of Valid Cases	391				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.91.

b. Computed only for a 2x2 table

Figure C28 Chi-Square Testing of Negative Information and Source of Neighborhood

APPENDIX D

COLLECTED PHOTOS

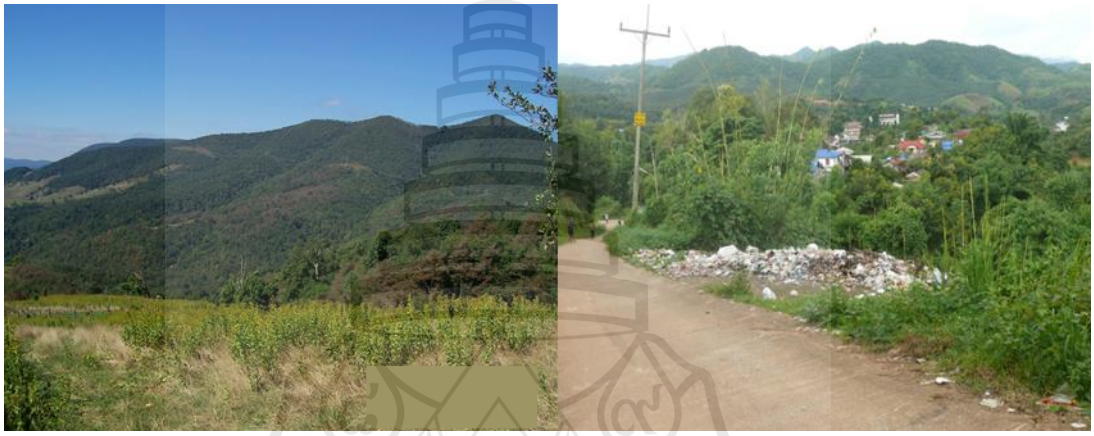

Figure D1 Sample Pictures of Before and After The Waste Management

Figure D2 Data Collecting: Survey Questionnaire, The Leadership Meeting Observation

Figure D3 Waste Problems Occurring in Mae Salong Nai

CURRICULUM VITAE

CURRICULUM VITAE

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