

The Recognition about Food Wastes Treatment at Yongin Area

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Abstract : We conducted to investigate citizen's attitude to the treatment of food waste in Yongin city. The respondent of 41.81% throws the food waste eliminate from home and store less than 1 l in Yongin. When they dump the food waste, they speak out the inconvenience of damaged envelope by animals in case of home and store. This caused troubles for reason of sanitary. So a local autonomous entity must carefully consider of expand use specially designed container as like apartment house. They give an answer that the collecting time of food waste is suitable from dawn till morning. This answer shows the satisfaction of the period time to collect the food waste. They prefer to be appointed the exclusive place to collect food waste. The service interval of collect is suitable 1 time a day. They want to increase the number of washing of the collecting container. This is good method for sanitary condition, but the care of the period time to collect the food waste is more efficient than the care of the number of washing the collecting container. The care of the period time minimizes to incur the enmity of the people and to pollute in environment. The major of respondent handled the food waste after keeping the basket or a kit. This fact shows to us almost citizen doesn't feel the seriousness to remove the moisture of the food waste. Recently, many solutions which can be disposal efficiently are getting magnified and improved owing to increase utilities channel to loss in quantities and dry the food waste. We expect the reduction of food waste is solved getting easily step by step. The results of the awareness about the facility of food waste show citizen prefer recycling facility to the other facilities. If recycle facility and incineration facility are constructed, they were worried about bad smell. When some facility of the food waste is constructed, they have to maintain and to handle not to incur the enmity of the people. The spread rate of specially designed container already increased, the citizen set a high value on the use of specially designed container more than amount-rate vinyl envelope that people have used for several years. In the cost treatment about food waste, the major respondent answered the use cost of specially designed container is suitable price. So we can know the use charge is proper level. The majority of citizen more prefer autonomous plan which voluntary atmosphere creation and public information by mass media than levy system and rising treatment cost which forced plan. The citizens have pretty positive thinking of incineration, so the government needs more efforts for a public notice, which includes the incineration is no more than abandoned thing. Each of local self government has to sort the food waste and make kind of resource system related to collecting and carrying, constructing a suitable facility, proper disposal of the food waste and producing harmless in our surrounding in order to solve the invisible problems. To do above mentioned things, we have to analyze referred several problems till now. Also, to minimize the side effect, the government will have to improve through enforce the system.

Keywords : food waste, Yongin, recognition, NaCl, element analysis

Introduction

A waste matter caused by human activity because

of a population growth, an increase of daily life as customer, a change of life style that brings about the many qualitative changes from quantitative increase, growth of economy, the rapid development of science, diverse social organizations and so on.

Also, according to an income level, life style, difference of localities, and change of season,

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there are various features of the waste in life. Among them, the proper management about organic waste as like food waste was under consideration one of most important environment contamination as a international issue. We have different culture pattern to another country, especially culture of food and receiving guests. Too many amount of food garbage lead to a waste of resources. Also, when a food waste contained much salt and moisture destroy by incineration, at that time it makes plenty of ground water having high concentration. This ground water causes the second environmental pollution and makes enormous loss to own nation^{1,2)}.

The prohibition measurement of directly buried food waste has been described clearly by waste management law for 7 years. Its prohibition measurement will become effective on 2005. Jan. 1st. There aren't many months till taking effect of the law. The waste management law expressed in 1995 but a countermeasure of food waste was devised before 1995. Ten years have passed since then.

For the past 10 years, having done trial and error, we have devised a counter plan. And we have made the foundation system. Now, the prohibition measurement of directly buried food waste is under discussion. Some part of people is concerned about causing a serious disturbance of food waste. Also, People who work at landfill in metropolitan area will do close examination of life waste from October. The people said that if the waste is not separated each item, to take in waste in landfill will banned. And they make plan to a total amount system of taking in waste from 2007.

In comparison with another country, the department of environment, a local autonomous entity and social workers made every effort to solve the problem of food waste. As they do trial and error, still they hard work to improve the matter of waste.

In a local autonomous entity over class of city, even a detached house do sorting waste. The sorted food waste was used as resource in a public or private resource organization. In present state, if the rate of sorting collection increase from 77% to 90-100%, we expected there dose not happen as like sclerosis of the arteries in the step of disposal and the system of making a resource. We think that formal disturbance of waste dose not exist, but

there are various invisible problem. The problems are possible to be indicated as social problems⁷⁾.

Some of local self-government is progress a investigation of a disposal method on a large scale. Because the Final disposal cost increases continuously, also the interest of plan to making recourse is getting increase. Especially we expected considerable economical efficiency about feeding animals, composting and incineration. In order to secure economical efficiency, as the resident and the place of business in each region, the waste must be classified according to each feature and the waste must be disposed by proper treatment method. So then we can expect the economical efficiency and the utility.

Yongin City concentrates their various efforts on correcting mistake related to environment. In case of food waste, Yongin city make consignor to treat garbage. The food was disposed of various methods as like incineration or buried in ground. 4 collecting companies and 3 consignor companies handle the waste as method of commission in many town house area as like Gu-seong, Gi-hueng, Su-ji. But, in real circumstance Yongin city, the city directly collect the waste using the collection vinyl envelope for food waste in a detached house and store area. Yongin city is city with the population of 610,000 at present dated 2004, June and Yongin city is not anymore small-scale city. Yongin city is rapidly growth as a big city. So, to search the proper method to treat waste must be settled without delay.

The amount of food waste in city is on the increase and the most outstanding matter is to find a solution to dispose of food waste. Therefore, in this study, As being under consideration these regional special qualities of Yongin city that coexists city and farm village as the same time, we will use the basic data on presentation of a proper method and a consideration subject as compared the point of similarity with the point of difference about treatment of food waste. And, in subject of citizen of a detached house and store area, the several matters of food waste as following examples (for example, the amount of discharge waste, inconvenience thing when they throw the waste, the cost of envelope using throw the waste, collecting time and interval, the people's recognition related to disposal method of the waste, attitude and consciousness as resident to reduce the waste, the

level of recognition of facilities for recycling, the satisfaction of cleanness about collection device designed specially using exclusively, the proper policy in order to reduce food waste and so on) through a survey, we analyze the result and we grasp the problems of food waste. So we will offer this result of survey as administrative and academic data for solution of food waste.

Materials and Methods

Analysis of Characteristics to the Food Waste

Materials

The sample data is gathered from 6 places which are separated as general home and shop in Wonsam-myeon (farm village area), Samga-dong (cityarea), Yangji-myeon (having both form of farm and city). The food waste of general home was gathered from the location which people did good job to sort waste. The food waste of shop without any classification by business was collected it as visiting directly. The number of collection to the food wastes were 2 times of summer, fall. The amount of 1 times was over 3 kg.

Analysis Methods

In order to research of characteristics, we analyzed about 4 items as following table. Basically, It analyzed contained quantity in each weight of composition and tree properties as general item. Also It analyze the contained quantity of NaCl, which have to be considered, when recycle food waste as feeding animals and composting. Also It studied element analysis and the caloric value. These are most basic things when operate and design to incinerator.

Table 1. The multifarious source and sampling point of food wastes

Area	Source of Food Waste		Point
Samga-dong	I Region	House	5
		Restaurant	5
Yangji-myeon	II Region	House	5
		Restaurant	5
Wonsam-myeon	III Region	House	5
		Restaurant	5
Total			30

Table 2. The list of various characteristics and properties for food waste

	Item
Weight of composition	Grains, vegetables, Fruits, Meats, Foreign matters
Basic three matters	Water, Ash, Volatile solid
NaCl composition	NaCl
Chemical Composition and Caloric Value	C, H, O, N, S and Ho

Each Weight of Composition

To grasp the contained quantity of each component is very important thing in order to plan the management, and set-up the disposal method, choose the equipment. For maintaining of typical form, we avoid the rainy day on purpose. Also special regarding of the change of contained quantity of moisture, when we gather the sample data, we tried to analyze it as quickly as possible.

In this study, the food waste was classified according to grain, vegetable, fruit, meat, fish and a foreign matter.

Three Properties Analysis

After we smashed very minutely a sample data that gathered each component, we measured the contained quantity of moisture using the dry oven. The evaporation plate was dried for one hour at $105 \pm 5^\circ\text{C}$ in advance and then the plate was cool in desiccate until maintaining weight regularly. We weighted the evaporated plate of regularly maintained weight (W1). We also weighted evaporated both plate and sample precisely (W2). After moisture was almost vaporized in cold bathe and was dried for 4 hours in dry oven, put in the sulfuric acid desiccate and cool, we measured the weigh of regularly maintained weight (W3).

$$\text{Water content (\%)} = \frac{(W2 - W3)}{(W2 - W1)} \times 100$$

After the pot and the cover were heated at for 30 minutes at $600 \pm 25^\circ\text{C}$ in electric furnace, cooled in desiccate. Then the content of ash was measured as the weight of pot and cover (W1). We took the proper amount of sample in pot and then we take a measurement of weigh of pot and cover (W2). We add the ammonium nitric acid solution of 25% in

here and we soaked sample in the ammonium nitric acid solution of 25%. We put it in electronic heater for 30 minutes at $600 \pm 25^\circ\text{C}$ in electric furnace and then cool in the sulfuric acid desiccator. We measured the weight of it very precisely (W_3).

$$\text{Ash content (\%)} = \frac{(W_2 - W_3)}{(W_2 - W_1)} \times 100$$

NaCl Content

Solution of potassium chromate : 7.5 g of a special potassium chromate (K_2CrO_4) is soluble in water. So it becomes solution of 1 N. For emphasize the change of color after reaction, normally an indicator using a precipitation titration is used in great quantities. The proper amount of 1 time is good about 1 ml.

Silver nitrate of 0.1 N : About 17.5 g of a special silver nitrate (AgNO_3) is weighed accurately in the balance. And then is dissolved in water of 1 l. Calculate the factor and keep the brown bottle.

Determination law about Factor of 0.1 N- AgNO_3 : A special KCl is heated and dried at $100\text{--}120^\circ\text{C}$ for two hours. At the next step, it cool in desiccators and 149 mg of it were weighed accurately in the balance. Put in a triangle flask it and dissolve in water of 20 ml.

Put in the K_2CrO_4 indicator of 1ml and titrate little by little AgNO_3 which is in the burette. When magnetic stirrer operates slowly, in the first time, a white precipitation is made and the precipitation of reddish brown color is made, finally the color of precipitation was disappeared. When the speed disappeared of the reddish brown color is getting slow, drop AgNO_3 drop by drop for 15 seconds. We set the end point which is not disappeared colors.

$$A = \frac{\text{KCl(g)} \times 1000}{\text{gram equivalent of KCl (74.55 g)} \times \text{Titration volum of AgNO}_3 \text{ (ml)}}$$

$$\text{Factor of 0.1N-AgNO}_3 = \frac{A}{0.1}$$

Caloric Value and Element Analysis

Caloric value is the basic data when incinerator is designed or is operated. After dry work, using the crusher, the powdered sample is used for analysis of the chemical components. At that time, the sample

is dried and is cooled again using dry oven or desiccator, before the sample is analyzed. The appropriate components are 6 components of carbon (C), hydrogen (H), oxygen (O), nitrogen (N), sulfur (S) and chlorine (Cl). When we analyzed the components of C, H, N, S, we used elemental analyzer (ELEMENTAL ANALYZER, Fisons, ITALY). The analysis of the component 'Cl' is used ASTM (D2361-85, Standard Test Method for Chlorine in Coal) and the Standard Method of USA (4500-Cl-B. Argentometric Method).

Investigation of Citizen's Attitude

Subject of Investigation and Methods

This study of survey is carried out to grasp the problems which citizen feel about the food waste from 1st. July. 2004 to 30th. August. 2004 for 2 month.

To complete the questionnaire, we discussed with expert of statistics about a questionnaire and then we carried out the preliminary test for 5 times. Finally we accomplished to make the questionnaire. Yong-in city was divided according to the standard of 0.5% number of households and then the question is perfumed as following Fig. For accuracy of this test, the person who carries out research is student or graduate student in university majored in environmental health. Or they have suitable ability to research this test.

We give kitchen towel a piece of paper to the respondent who makes up the question sheet. The rate of detached house and store is 50% to 50%. The question sheets which missed an answer or content or can not verify were excluded. So in the total 500 copies of question sheets, 476 copies of question sheets which were written a full and particularly of each contents was used by data analysis. The rate about a recovery of question sheet was almost 95.2%.

In the rate of each men and women who take part in the survey, the number of women have majority of 73.52%. The people in thirties and forties also have majority as 67.43% than any other age group. In form of respondent, the restaurants have 79.24% in case of stores form. The detached houses have 41.18%, next apartments have 31.93%, and lastly store houses have 2.94% in case of resident place form.

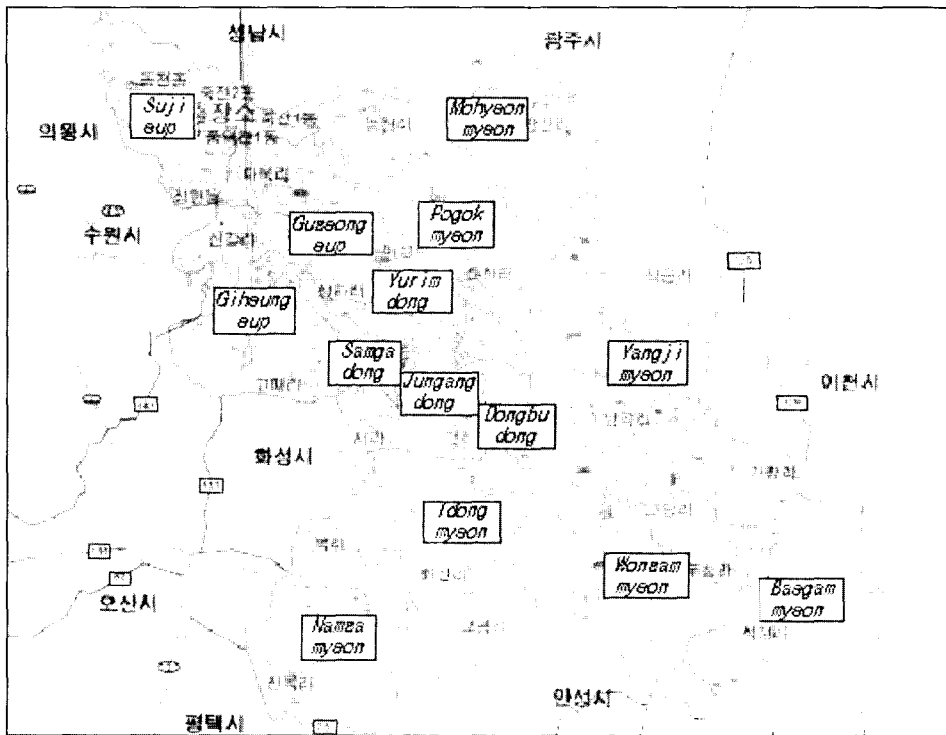


Fig. 1. Area map of questionnaire investigation in Yongin City.

Range of Question Investigation

The contents of questions were as follows.

- 1) Total volume and inconvenience to using waste pack
- 2) The understanding of food waste collection
- 3) The efforts to reducing the volume of food waste
- 4) The understanding of method to treatment of food waste
- 5) The understanding of specially designed plastic pack and containers
- 6) The reasonable policy of the reduction in food waste

Results and Discussion

Analysis of Characteristics to the Food Waste Each Weight Composition

The each weight composition of food waste of the Yong-in city was as the above Table 3. Through dividing food waste into grain, vegetables, fruits, fish and meat and other matters. Selected food

wastes were measured weigh of matters. The each weight composition of food waste of the Yongin city was as the below Fig. 2.

The Analysis of Three Properties of Food Wastes

According to physical quality of food waste, three properties of food waste were used in planning on the disposal method of composition of food waste and assuming the caloric value. Three properties of food waste of the Yongin city was as the above Table 4.

Moisture content, ash content and volatile solid content of food waste were 76.34%, 7.085% and 16.576% respectively.

It was similar to research result of Sun-cheon City ; moisture content, ash content and volatile solid content of food waste were 73.6%, 16.0% and 10.4%⁸⁾. Three properties of food waste of the Yongin city was as the below Fig. 3.

NaCl Content

NaCl content of food waste of the Yongin city

Table 3. Each weight composition of analysis of characteristics to the food waste in Yongin city
(unit : % by weight)

Source of Food Waste			Component (%)					Total
			Grains	Vegetables	Fruits	Meat	Foreign matters	
First Analysis (Summer)	I Region	House	10.526	29.123	48.070	10.175	2.105	100.0
		Restaurant	7.398	25.255	41.327	22.959	3.061	100.0
	II Region	House	37.037	33.862	11.640	16.402	1.058	100.0
		Restaurant	27.604	42.188	2.604	27.604	0.000	100.0
	III Region	House	14.074	18.519	42.222	23.333	1.852	100.0
		Restaurant	31.481	44.444	2.222	19.630	2.222	100.0
Average (%)		House	20.546	27.168	33.978	16.637	1.672	100.0
		Restaurant	22.161	37.296	15.384	23.398	1.761	100.0
Second Analysis (Autumn)	I Region	House	14.623	57.075	23.113	4.245	0.943	100.0
		Restaurant	32.723	56.751	0.915	8.467	1.144	100.0
	II Region	House	40.789	19.298	24.123	15.789	0.000	100.0
		Restaurant	57.674	32.093	0.000	10.233	0.000	100.0
	III Region	House	44.882	13.386	3.150	35.433	3.150	100.0
		Restaurant	36.271	44.068	0.000	17.627	2.034	100.0
Average (%)		House	33.431	29.92	16.795	18.489	1.364	100.0
		Restaurant	42.223	44.304	0.305	12.109	1.059	100.0
Total Average (%)			29.59	34.672	16.616	17.658	1.464	100.0

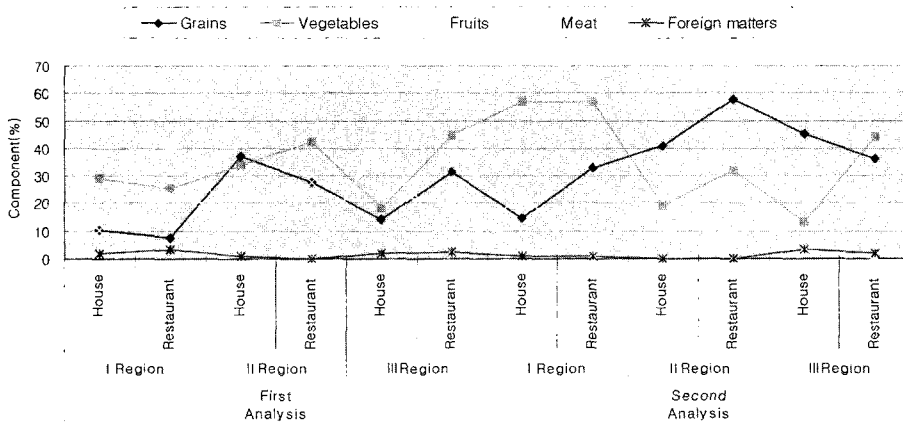


Fig. 2. Each weight composition of analysis of characteristics to the food wastes in Yongin city.

was as the below Fig. 4.

Caloric Value and Element Analysis

Caloric value was a basic data in design of incinerator or operation. Chemical composition and caloric value of food waste of the Yongin city is as

the above Table 6. The range of the seasonal higher heating value of food waste was found out to be 4671.648 kcal/kg. It was show higher result than research result of Sun-cheon City. ; the range of the seasonal higher heating value of food waste was found out to be 3,284-4,206 kcal/kg, that of

Table 4. Three properties of analysis of characteristics to the food waste in Yongin city

Source of Food Waste			Three properties (%)		
			Moisture	Ash	Volatile solid
First Analysis (Summer)	I Region	House	73.797	7.577	18.626
		Restaurant	79.771	3.546	16.683
	II Region	House	74.764	6.109	19.127
		Restaurant	70.250	8.425	21.325
	III Region	House	72.288	5.959	21.753
		Restaurant	77.170	8.172	14.658
Average(%)		House	73.616	6.548	19.835
		Restaurant	75.73	6.714	17.555
Second Analysis (Autumn)	I Region	House	80.618	5.595	13.787
		Restaurant	80.836	5.322	13.842
	II Region	House	77.617	6.228	16.155
		Restaurant	76.153	7.729	16.118
	III Region	House	75.701	12.411	11.888
		Restaurant	77.109	7.944	14.947
Average (%)		House	77.979	8.078	13.943
		Restaurant	78.033	6.998	14.969
Total Average (%)			76.34	7.085	16.576

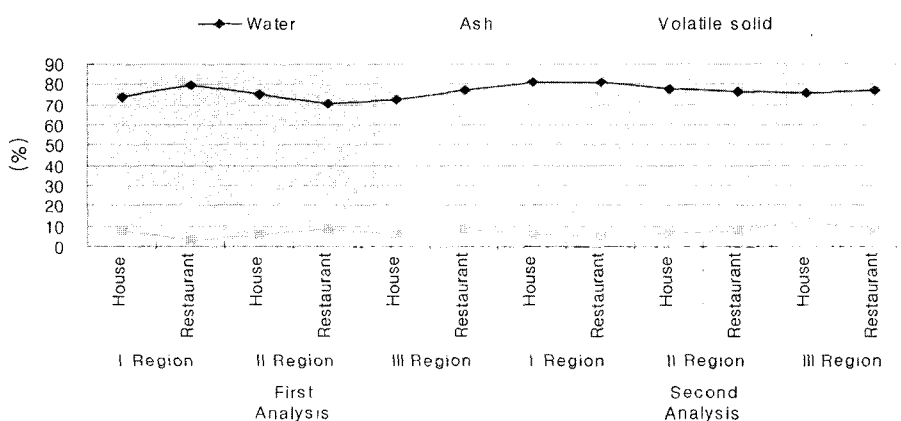


Fig. 3. Three properties of analysis of characteristics to the food waste in Yongin city.

lower heating value of food waste was found out to be 203-352 kcal/kg. When we considerate to the 1000 kcal/kg range of low heating value in order to incineration, the low heating value of food waste in Yongin city indicate with comparative highly.

We can confirm the caloric value of food waste

according to a season and a local in Yongin city as shown in the Fig. 5.

If we examine the chemical composition, we can make discovery that the components of C, O have a majority and then H, N is next order but there are no an element of S. According to a season and a local in Yong-In, we indicated the result of each

Table 5. NaCl content of analysis of characteristics to the food waste in Yongin city

		Source of Food Waste		Factor	NaCl(%)
First Analysis (Summer)	I Region	House		0.989	1.158
		Restaurant			1.158
	II Region	House			1.736
		Restaurant			1.736
	III Region	House			1.736
		Restaurant			2.894
Average (%)		House		1.543	
		Restaurant		1.929	
Second Analysis (Autumn)	I Region	House		0.980	2.867
		Restaurant			1.720
	II Region	House			1.147
		Restaurant			1.720
	III Region	House			1.147
		Restaurant			1.720
Average (%)		House		1.72	
		Restaurant		1.72	
Total Average (%)					1.728

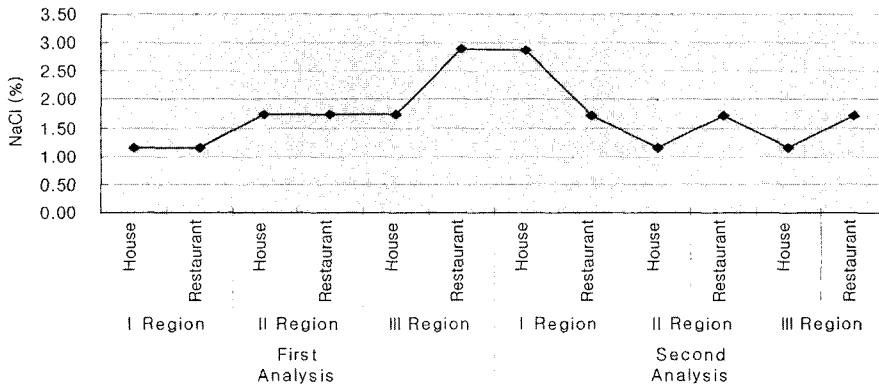


Fig. 4. NaCl Content of analysis of characteristics to the food waste in Yongin city.

Table 6. Chemical compositions and caloric value of analysis of characteristics to the food wastes in Yongin city

		Source of Food Waste	HO (Bomb)	C	H	O	N	S
Analysis	I	House	4611.070	43.057	5.986	49.016	1.941	0.000
		Restaurant	5229.360	55.135	8.592	33.665	2.608	0.000
	II	House	4562.690	45.117	6.924	43.711	4.248	0.000
		Restaurant	4820.080	46.912	6.695	43.386	3.007	0.000
	III	House	4706.260	49.185	6.902	39.774	4.139	0.000
		Restaurant	4100.430	38.165	5.483	52.901	3.451	0.000
Average (%)		House	4626.673	45.786	6.604	44.167	3.443	0.000
		Restaurant	4716.623	46.737	6.923	43.317	3.022	0.000
Total Average (%)			4671.648	46.262	6.764	43.742	3.232	0.000

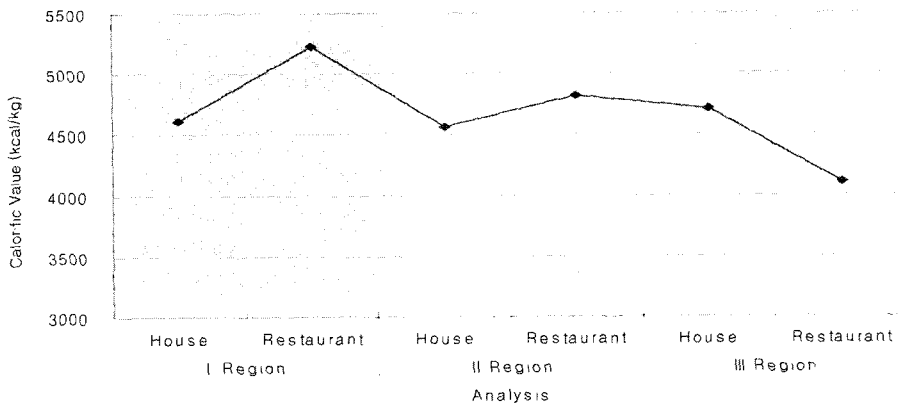


Fig. 5. Caloric value of analysis of characteristics to the food waste in Yongin city.

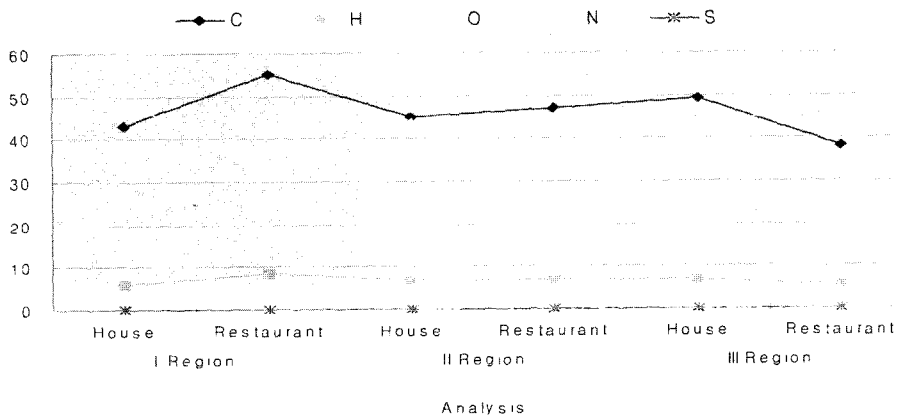


Fig. 6. Chemical composition of analysis of characteristics to the food waste in Yongin city.

elements analysis as following Fig. 6.

Investigation of Citizen's Attitude
Total Volume and Inconvenience to using Waste Vinyl Pack

"How much does each house or store generate food waste in a day?" The responses of the above

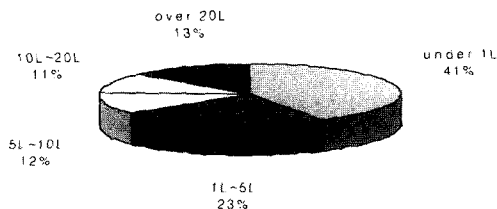


Fig. 7. Total volume of food waste of investigation of citizen's attitude to the food waste in Yongin city.

question were as follows. 41.81% of the respondents eliminate less than 1 l, 22.69% less than 1-5 l, 13.03% more than 20 l, 11.97% less than 5-10 l and 10.50% of the respondents less than 10-20 l.

Fig. 8 shows the research result of the question

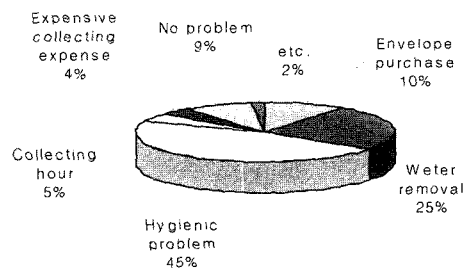


Fig. 8. Inconvenience to using waste pack of investigation of citizen's attitude to the food waste in Yongin city.

about “What is the most inconvenient thing when eliminating food waste?”. According to Fig. 1, 46.11% of the respondents said that insects of collection place, damage by animals and public health problem such as a bad smell are the most inconvenient things, 25.42% said that removing moisture for putting food waste into the exclusive use collection container was troublesome, 9.98% said that purchasing the exclusive use collection container every time was troublesome, 8.63% had no complaints, 4.63% had trouble to adjust the collection time, 3.79% think of collection fees as expensive and 1.68% said other things (etc).

There were no complaints in the region that food waste are disposed by being feeding and composting, while many complaints about the damage of collection containers were expressed in the region that the exclusive use collection container were used. This fact means that the exclusive use collection container should be used more extensively in the public houses like apartments as soon as possible.

The Understanding of Food Waste Collection

This part is related to the collecting time of the food waste, now the collection time is going on the time of morning and dawn. But we present the question of the collecting time to change as time of night. “When is the best time of collecting food waste?” The response was as follows. 34.45% of the respondents think of 24:00-06:00 (dawn time) as suitable and 28.15% prefer the morning time (06:00-12:00).

The next question is “where is the suitable equipment place of containers?” This may cause trouble in the region of houses and stores in the event of expansive use of the exclusive use collection container. If containers are installed next to the respondents’

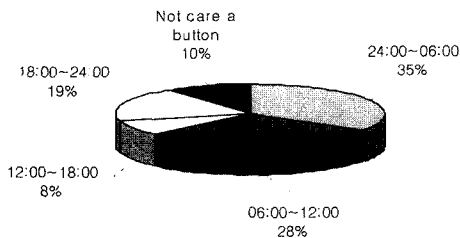


Fig. 9. The service hour of collection of investigation of citizen's attitude to the food waste in Yongin city.

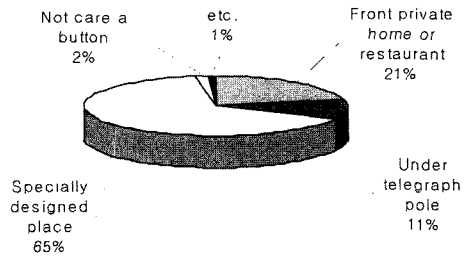


Fig. 10. The positioning of special device for food waste collection of investigation of citizen's attitude to the food waste in Yongin city.

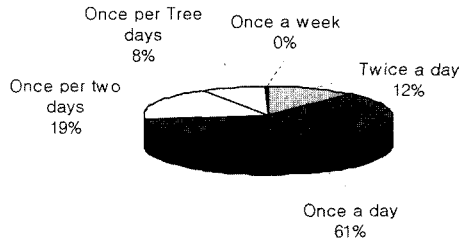


Fig. 11. The service interval of collection of investigation of citizen's attitude to the food waste in Yongin city.

houses, there will be a obvious difference between the refusal and the satisfaction, but, this question is asked to improve the residents’ correlation understanding. “where is the most suitably place of collecting food waste?” The response is as follows. 65.55% of the respondents want a exclusive collection place but 21.22% prefer the place close to their houses or stores.

Relating to the collection period, this question is for verifying the recognition and satisfaction of the present daily collection way. “How often do you think food waste should be collected?” 61.34% of the respondents want daily collection, which shows the satisfaction with the present collection way. 18.53% of the respondents want every second day, 11.58% twice a day, 8.42% every third day and 0.21% once a week.

Fig. 12 is shows the research result of the question about “For the purpose of public health control of the collection containers, Yongin city clean collection containers twice a month in the summer season and once a month in the winter season. How often do you think collection containers should be cleaned?”.

Yongin city wash the container for sanitary

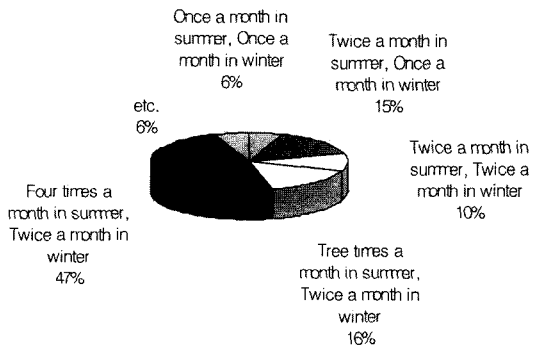


Fig. 12. The hygienic management of special device of investigation of citizen's attitude to the food waste in Yongin city.

treatment reason of the collecting container. This question is about interest and treatment, and this question is shown to us each separated treatment for washing was carried out in summer and winter. The 48.32% of respondent want more time to wash than now. The respondents hope to change the time as 4times a month in summer and twice a month in winter.

The Efforts to Reducing the Volume of Food Waste

Fig. 13 shows the result of survey about the question as like "Please choose the solution which you use now in order to reduce a food waste." To know what kind of effort the respondents do to reduce the food waste, we present easy method on purpose and we induce the respondent to choose all of the method.

Majority of respondents used the methods to remove moisture of food waste and to prepare a

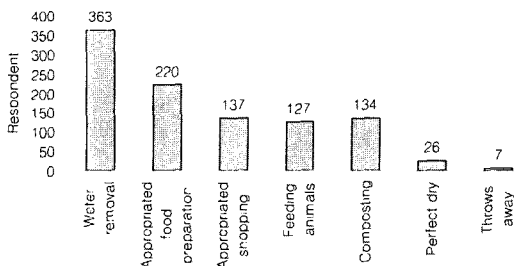


Fig. 13. The efforts to reducing the volume of food waste of investigation of citizen's attitude to the food waste in Yongin city.

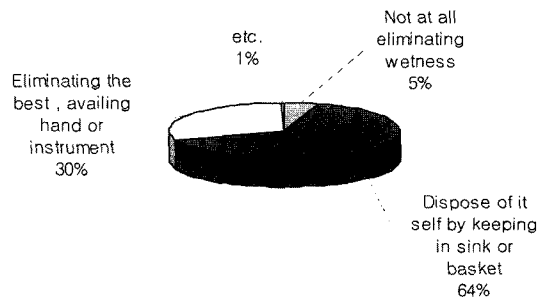


Fig. 14. The efforts to reducing the water of food waste of investigation of citizen's attitude to the food waste in Yongin city.

suitable amount of food. The answer of next order method was to take away the needless part when respondents go shopping. And then they used the food waste as compost and feed animals in their flower garden and farm. The answer of last order is to throw waste in state of perfectly dry. A few of respondent answer they just throw as the food waste is.

This is the question to find out the effort and awareness of respondents about moisture of removal which is one of the difficulty for handle the food waste.; "How long do you remove the moisture of the food waste?"; The 64.92% of respondents answered they handled it after keeping the basket or a kit in sink. The 29.83% of respondents answered they remove the moisture of food waste to the full using the hand and kitchen equipment. The 4.62% of respondent answered they have never remove the moisture. The 0.63% was the other things.

Recently, many solutions that can be disposal efficiently are getting magnified and improved owing to increase utilities channel to loss in quantities

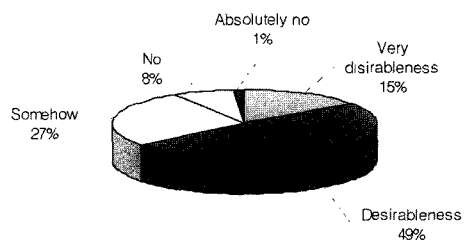


Fig. 15. The generating in the case of using incinerator to the food waste treatment of investigation of citizen's attitude to the food waste in Yongin city.

and dry the food waste. So we expect that the reduction of food waste is solved getting easily step by step⁴⁾.

The Understanding of Method to Treatment of Food Waste

This question was to ask the awareness about disposal the burning up rubbish and to make the respondent to recognize that if we remove the moisture, the food waste would have made a little harmfulness substance. This question was “There is the research result that If the moisture of waste was removed, the substance caused air pollution is create rarely. How do you think about to dispose the food waste as destroy by fire?” The 64.08% of respondents answered it is a desirable solution. The 27.2% of respondent answered it was just so so. The answer of 8.82% is very negative.

Fig. 16 shows about the result of research as following question. “On the assumption that food waste is handled by incinerator, choose the problems which you are worried about.” When food wastes burn up, most big problem is occurred the enmity of the people. Namely, we can catch the main factor causing to provoke the hatred of the people.

The majority of respondents concerned about the bed smell. The next order is the generation of toxic material, the opposition of local citizen in incineration utility area, an increase of handling cost. This result shows at present the level of people’s awareness about environment pollution is getting increased than before. Also we and know if the incineration utility is construct, it can be caused NIMBY (Not In My Backyard) Syndrome.

The disposal of food waste is always the source

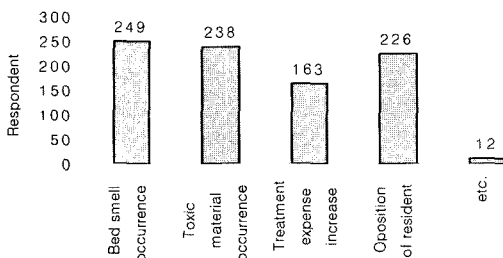


Fig. 16. Concern in the case of using incinerator to the food waste treatment of investigation of citizen’s attitude to the food waste in Yongin city.

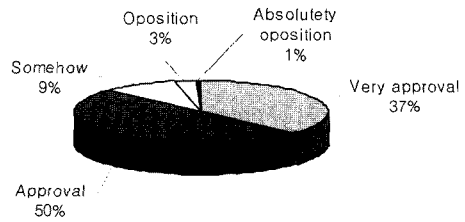


Fig. 17. The understanding of recycling of investigation of citizen’s attitude to the food waste in Yongin city.

of trouble. This question was to ask the possibility of recycling about the food waste as potential resource. And we can notice the refuse range about to construct the recycling utility of food waste in Yongin City. “How do you think about the construction of the recycling utility of food waste as like composting and feeding in Yongin city?” The 87.18% of respondents answered affirmatively. The answer of 9.45% was just so-so. The 3.36% of respondents answered negatively.

Fig. 18 shows about the result of research as following question. “If you are opposite to establishment of recycle facilities, what is the reason?” This question refer to reason that opposite to establishment of recycle facilities. The majority of respondents concerned about the bed smell. The next order is pollution of subsurface water, trash influx of other city, low application, real estate depreciation. It is necessity that establish of recycle facilities in Yongin city. But it is more important that apply health facilities environmentally and residents accept or not accept. This is very sensitive part⁵⁾. If it is no damage to residents in case of recycle which utility food waste, residents would

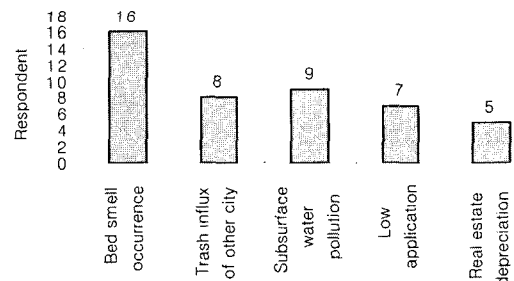


Fig. 18. Opposite reason in case of construct recycling of investigation of citizen’s attitude to the food waste in Yongin city.

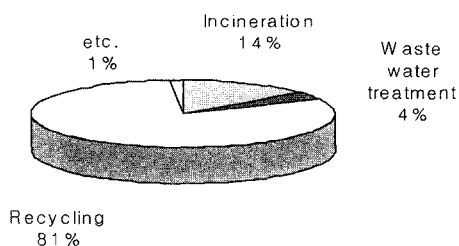


Fig. 19. Treatment method of food wastes of investigation of citizen's attitude to the food waste in Yongin city.

have been favorably to establish of recycle facilities.

Fig. 19 shows the findings on following question. "We can't reclaim the food waste from 2005. What is your best choice to cope with this problem?" This is calling us attention to reclaim prohibition again and finding the best way to clean the food waste. As you see 80.6% of respondents refer to use it as compost or feed for the recycling of food waste. Also, 14.08% of respondents think it is the best way to use an incineration plant.

The Understanding of Specially Designed Plastic Pack and Containers

"How do you think about using specially designated plastic pack and containers?" It is for the question that shows the recognition of using the specially designated plastic pack and containers of residences. Unlike 69.96% of favorer, 3.15% of respondents disagreed with that opinion. It's because of the good experienced result for the residences who used to the specially designated plastic pack and containers.

Next one is about how much residences should pay the plastic pack price. They should understand that specially designated plastic pack expense more

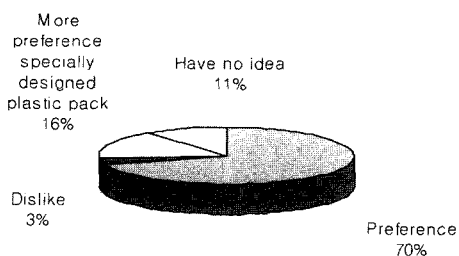


Fig. 20. The using of specially designed container of investigation of citizen's attitude to the food waste in Yongin city.

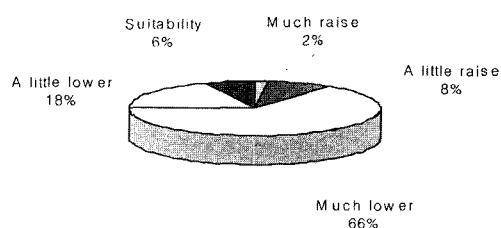


Fig. 21. The cost analysis for the use of special device compare with plastic pack of investigation of citizen's attitude to the food waste in Yongin city.

than containers. Moreover, it is the question of adjusting the actual price, which is 450 won per 20 l pack which is using nowadays in your home. Other cities are using the containers and they pay 900-1200 won per a month and Young-in city receives 600 won per a month. "How do you think about the price?" it has 65.34% of favorer and 24.79% of opponents also 9.87% of respondents want to rise the price. Totally, 75.1% of respondents say the price is suitable, it means the city costs reasonably.

The Reasonable Policy of the Reduction in Food Waste

Fig. 22 shows the findings on question, which is "what is government's best policy of reducing the food garbage?" This question is to know which method is more efficient to reduce the food waste form home and store in order to make citizen understand. The majority of respondents prefer autonomous plan which voluntary atmosphere creation (42%) and public information by mass media (32.63%). The next order is levy system (17.68%) and rising treatment cost (4.42%) which forced plan. This fact means that people more prefer autonomous plan than forced plan.

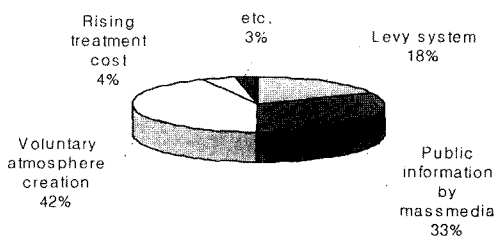


Fig. 22. The policy to reduce food waste of investigation of citizen's attitude to the food waste in Yongin city.

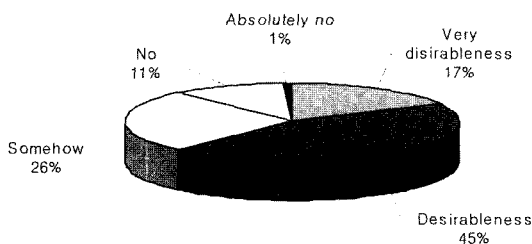


Fig. 23. The assurance for the choice of incineration treatment of investigation of citizen's attitude to the food waste in Yongin city.

Fig. 23 shows the assurance for the choice of treatment of incineration type. question is for double-checking of previous one and making it sure that the treatment of incineration type is the best choice for assurance. "Everybody knows that the assurance is the best choice for the treatment of incineration type. Therefore Youngin city is planning to use this way for the treatment. How do you think about it?" In this question, it has 62.10% of favorer, 26.47% of neutrals, and 11.58% of opponents. It means the citizens have pretty positive thinking of incineration, so the government needs more efforts for a public notice, which includes the incineration is no more than abandoned thing¹⁰⁾.

Conclusions

We conducted to investigate citizen's attitude to the treatment of food waste in Yongin city and we reached a conclusion as follow.

(1) The respondent of 41.81% throws the food waste eliminate from home and store less than 1 l in Yongin City. When they dump the food waste, they speak out the inconvenience of damaged envelope by animals in case of home and store. This caused troubles for reason of sanitary. So a local autonomous entity must carefully consider of expand use specially designed container as like apartment house.

(2) They give an answer that the collecting time of food waste is suitable form dawn till morning. This answer shows the satisfaction of the period time to collect the food waste.

They prefer to be appointed the exclusive place to collect food waste. The service interval of collect is suitable 1 time a day. They want to increase the

number of washing of the collecting container. This is good method for sanitary condition, but the care of the period time to collect the food waste is more efficient than the care of the number of washing the collecting container. The care of the period time minimizes to incur the enmity of the people and to pollute in environment.

(3) The major of respondent handled the food waste after keeping the basket or a kit. This fact shows to us almost citizen doesn't feel the seriousness to remove the moisture of the food waste. Recently, many solutions which can be disposal efficiently are getting magnified and improved owing to increase utilities channel to loss in quantities and dry the food waste. We expect the reduction of food waste is solved getting easily step by step.

(4) The results of the awareness about the facility of food waste show citizen prefer recycling facility to the other facilities. If recycle facility and incineration facility are constructed, they were worried about bed smell. When some facility of the food waste is constructed, they have to maintain and to handle not to incur the enmity of the people.

(5) The spread rate of specially designed container already increased, the citizen set a high value on the use of specially designed container more than amount-rate vinyl envelope that people have used for several years. In the cost treatment about food waste, the major respondent answered the use cost of specially designed container is suitable price. So we can know the use charge is proper level.

(6) The majority of citizen more prefer autonomous plan which voluntary atmosphere creation and public information by mass media than levy system and rising treatment cost which forced plan.

The citizens have pretty positive thinking of incineration, so the government needs more efforts for a public notice, which includes the incineration is no more than abandoned thing.

Each of local self government has to sort the food waste and make kind of resource system related to collecting and carrying, constructing a suitable facility, proper disposal of the food waste and producing harmless in our surrounding in order to solve the invisible problems. To do above mentioned things, we have to analyze referred several problems till now. Also, to minimize the side effect,

the government will have to improve through enforce the system.

Acknowledgement

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