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Sustainable Waste Management through Trash Bank in Ragajaya Village, Bogor Regency, West Java Province, Indonesia

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***Abstract*— Sustainable waste management can be effectively and efficiently solved by participation through trash bank. It is a matter that the participation of the trash bank sometimes is not sustainable, so it does not shown the results of the maximum waste management. Therefore, this study aims to analyze the factors related to the participation of housewife in sustainable waste management in West Java Province. The study used survey design, which is located at Ragajaya Village, Bogor Regency of West Java Province. The respondents are housewife who selected simple random (266 people) consist of five groups trash bank in the research area. The sample size of 73 people determined using the solving formula. Sample data were analyzed using descriptive and inferential (Rank Spearman) analysis. The results show that there is a relationship between level of participation with sustainability of waste management through trash bank. This means that sustainable waste management through trash bank can solve waste problems if housewife participate actively in trash bank activity. On the other hand, the participation of housewife can increase if the intensity of non-formal education and the level of assistance are improved.**

***Keywords*— Participation of Housewife; Trash Bank; Waste Management**

I. INTRODUCTION

Waste problem is a global issue that it is very worrying. Thus, it needs serious handling from various circles to be completed properly, effectively, and efficiently. Indonesian Regulation 18/2008 on waste management explains that the new paradigm of waste management is currently done by upstream to downstream, using the concept of Reduce, Reuse, Recycle (3R) in order to not to damage the environment. The new paradigm views waste as a resource that has economic value and can be utilized for energy, compost and industrial raw materials.

The 3R concept is a systematic, comprehensive and continuous waste management activity, which includes waste reduction and handling. The principle of 3R is a solution to manage waste from the original "waste disposal" to "manage waste", in terms of sorting waste to be reused, so that it can reducing waste generation (Dwiyanto, 2011)[1]. One of the problem solving activities of waste, that has been running and experiencing an increase in Indonesia, is the trash bank program. The Ministry of Environment noted an increase of 1,221 trash banks in just 4 years from 2011 to 2015 (KLH, 2015)[2].

The trash bank according to the Regulation of the Minister of Environment 13/2012 is a place for recycling and/ or reusable waste collection that has an economic value. The working mechanism of the trash bank includes waste sorting, delivery of waste to trash bank, waste weighing, recording,

waste disposal, which is submitted to the savings book and sharing of waste revenue between savers and the implementer.

This is in line with Suwerda (2012) [3] whom explains that the working mechanism of trash bank starts from the community as the customer sorting the waste in each house according to its type and the customer bring the waste to the trash bank for savings. The trash bank officer weighed and recorded the waste into a customer's savings book. The trash bank officers come from the surrounding community, who have more desire to participate in the management of trash banks. Then, the waste collected will be purchased by the collectors to be managed and sold again to larger collectors. The money from the sale is kept by the board that also can be taken by the customer at least 3 months.

The types of waste that can be saved in the trash bank are grouped into: (1) paper, which includes paper, magazines, cardboard, duplexes, (2) plastics, including clear plastic, plastic bottles, and other paper plastics, and (3) iron, aluminum, and tin. In addition, other types of waste can be received from consumers as long as they have economic value and can be purchased by collectors in cooperation with trash banks (Permen LH, 2012) [4]. The amount of waste managed in trash bank for 4 years (2011-2015) increased from 2,347.8 tons / month to 5,551 tons / month with total transaction value from Rp 15 billion / month to Rp 34.3 billion per month (KLH, 2015) [2].

This is appropriate with a research conducted by Pratama and Ihsan (2017) [5] which explains that Malang trash bank in East Java could be reducing the volume of garbage as much as 663,720 kg / year. On the other hand, the volume of waste every year in Indonesia continues to increase from only about 64 million tons in 2014 to 65.8 million tons / year by 2017. The volume of waste is projected to increase to 67.1 million tons / year by 2019 (KLH, 2015; INDII, 2017) [2 ; 6].

This provides an illustration that the benefits of waste management through trash banks have not been able to fully solve the waste problem. In contrast, Indonesia became the second highest country after China threw the most waste plastic into the sea as much as 3.5 million tons per year (Jambeck et al., 2015) [7]. Yet in terms of population, Indonesia ranks fourth after the United States (CIA, 2017) [8]. This is an indication that there are still many Indonesian people who think that waste is a valuable item so lazy to manage it even if just throwing waste in place. Society has the assumption that the behavior of littering is not wrong and innocent (Wibisono and Dewi, 2014) [9]. Therefore, there is a need to make an effort of various parties to mobilize community participation in a sustainable way to manage waste through trash banks in various regions. It is a strategic step to achieve success in handling waste, optimally.

Permanasari and Damanhuri (2012) [10] explain that community participation in waste management through trash bank in Bandung, West Java Province shows the success of waste reduction of 0.417 kg/person/day. The same thing was revealed by Dwiyanto (2011) [1] who say that community-based housewife waste management in Semarang, Central Java Province succeeded in reducing the volume of waste disposed to 70 percent. In addition, Shentika (2016) [11] explains that community participation in waste management through garbage bank in Probolinggo East Java Province can reduce waste generation in their environment.

Community participation in waste management is expected to continue to grow and sustainable in order to solve the existing waste. However, preliminary study at Yayasan Bunga Melati Indonesia (YBMI) were initiated and established more than 120 trash banks in various regions and found that amongst the number of trash bank built, there are not active or stopped from routine activities.

Tanjung et al. (2017) [12] states that the level of participation is related to the level of sustainability of forest management. Abadi (2013) [13] also found that unsustainable waste management activities resulted from low levels of community participation. The low level of participation is inseparable from external factors and factors in individual waste management through waste bank. Therefore, the purpose of this research is to analyze the sustainability of waste management through trash bank in Bogor Regency, West Java Province, Indonesia.

II. METHODOLOGY

This study uses survey design with quantitative approach, which also supported by qualitative data. The location of this study is in five groups of trash bank of Melati Bersih built by Yayasan Bunga Melati Indonesia Foundation (YBMI), which spreads in Ragajaya Village Bojonggede District Bogor Regency, West Java Province. The five groups are Atsiri trash bank, Lembah Griya trash bank, Anggrek trash bank, Bukit Pesanggrahan Indah trash bank, and trash bank Satria Jingga. The total population is 266 people so that the number of samples taken as many as 73 people using the Slovin formula at margin error of 10 percent. The sample data was processed using descriptive analysis and inferential analysis using Rank Spearman correlation with the help of Statistical Package for the Social Sciences (SPSS 21) program for windows.

Figure 1. Reseach location in Bogor Regency, West Java, Indonesia

III. Result And Discussion

A. *Characteristics of Responden*

Respondents in this study were all housewife aged between 28 and 61 years old. The number of family dependents range from 1 to 7 people with an average income level of about 500,000 to 4,600,000 rupiah per month. The level of formal education of respondents is moderate by completing education between 7 to 12 years or equivalent between junior high and high school. In addition, 66 percent of respondents have attended non formal education activities in the last two years, related to waste management. Such non-formal education as an elucidation of organic and non-organic waste separation, training to make financial report from garuda food, organic waste processing training to compost, trade skill training, handicraft training from newspaper, coffee wrapper for flower vase, tissue box, glass cover and etc.

Nevertheless, the intensity of non-formal education is still relatively low because most (97.3 percent) of respondents only follow less than 11 times the activity. If converted in the number of hours, then the non-formal education activities is = only about 53 hours or equivalent to 2 days. The low intensity of non-formal education is very unfortunate because it becomes a constraint of waste management that has not been maximized. On the other hand, the high non formal education can increase the level of knowledge of housewife. If non formal education is high then the level of knowledge will be high so it can increase the involvement of housewife in sustainable waste management.

B. *Waste Management in Trash Bank*

Waste management through trash bank in the study location started since 2013 in Atsiri Permai housing. The program was initiated by non-governmental organizations (Yayasan Bunga Melati Indonesia) and runned by housewife, who care about solving waste problems. The success of this first trash bank became the source of the establishment of other waste banks scattered in Ragajaya Village, among others: Lembah Griya trash bank, which was established on May 22, 2014, Anggrek trash bank was established on September 19, 2014, Bukit Pesanggrahan Indah trash bank was established on 24 May 2015 and Satria Jingga trash bank was established on January 9, 2016 in Satria Jingga housing. The name of the trash bank is in accordance with the name of the area, where the trash bank is located.

The main focus of the activities undertaken in the trash bank is to provide an understanding to the community so that they have a clean and healthy lifestyle (behavior) by managing waste from its source. The activities of the trash bank started from housewife as customers sorting the waste according to their type in each house, the customer brought the waste to the trash bank, the trash bank administrator did the waste weighing as well as record the scales to the passbook, the customer received the savings book, and last waste collected is sold to waste collectors to be processed into useful goods. Money savings can be taken by customers at least 3 months or donated to other communities in need.

The benefits of the trash bank activities are not only felt by the individual concerned, but also by the surrounding environment, including the government. On the one hand, individuals earn money from the saving of waste which can help solve the waste problem, and on the other hand the government can be more quickly to reach the waste settlement program. In addition, the local government also began to be known by other regions due to the trash bank program was successfully won 2nd national level. Therefore, this trash bank program becomes a social movement to help government programs solve waste and environmental problems.

C. *The Activities of Housewife in Trash Bank*

The waste management activities through trash banks that consisted of sorting garbage in their homes, saving waste to trash banks, making handicrafts from non-organic waste, processing organic waste into compost, teaching families to be able to manage waste and protect the environment, inviting others to join and / or establish a trash bank, and inviting others together to maintain the environment. In addition to these activities, there are also inter trash bank competition held by the government and companies. The competition activity is aimed to improve the creativity of housewife who joined in the trash bank.

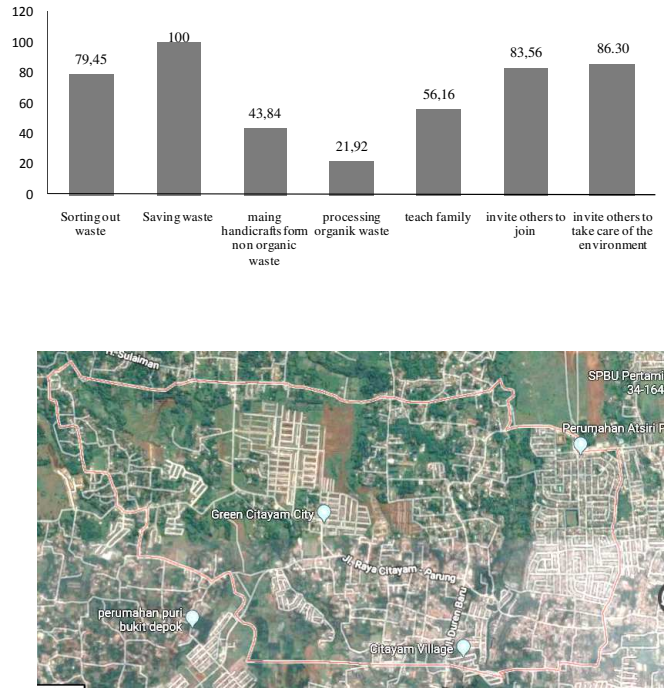

Figure 2. Activities Conducted by Housewife in Trash Bank

Figure 2 shows that all respondents have been registered to customers of Melati Bersih trash bank by engaging in the activity of saving waste to trash bank. However, there is a small (21 percent) of respondents who save without first sorting trash at home. The reason for sorting waste is considered as a troublesome activity that takes more time than when saving without first sorting. Although there are differences in the price of waste between the disaggregated and cleaned first with those who do not, but in fact respondents do not care about it. A small percentage of housewife prefer the efficiency of waste storage at home and the practicality when carrying waste to a trash bank.

In addition, most (> 55 percent) of the activities that have been done by the respondents in the trash bank exceeded four activities consisting of sorting waste according to their type, saving the waste to the trash bank, teaching the family to manage the waste and the environment, inviting others to join the trash bank and others jointly safeguard the environment. Low activity (<50 percent) on the activities of making handicrafts from non-organic waste and processing organic waste into compost. This is because they do not have organic waste processing equipment into compost, including the lack of outside training that teaches the respondents in processing the waste, directly.

However, it does not mean there is no housewife who has processed organic waste into compost. There is a small part (22 percent) of respondents who process organic waste into compost fertilizer, independently. The same thing is related to the activity of making handicrafts from non-organic waste that almost the average (44 percent) of respondents have made handicrafts, even though the product is still constrained market. This is in line with Muljono et al. (2016) [14], who explains that Posdaya activities in the economic field are weak, but still have an opportunity to be improved.

In addition to these activities, housewife are invited to be participated in training and extension activities related to waste management held by foundations, companies and government. Extension activities aimed to increasing the knowledge of housewife about the dangers of waste, while training activities are devoted to improving the ability of housewife in developing the creativity of processing waste into handicraft products. Another training is to improve the ability of housewife in making reports on the administration of waste bank activities.

Then, housewife who joined in trash bank follow the activity of inter-bank waste competition organized by company and government by holding the foundation. These activities make the village of Ragajaya known by other regions because it became the 2nd champion at the national level. The growing trash bank activity becomes the place for other private companies (wardah) to provide their CSR funds through extension activities for oxygen handling, such as The implementation of such activities in the form of planting trees to green the surrounding environment. Therefore, the trash bank activity becomes a place for housewife to improve ability in processing waste, managing environment and finance.

The trash bank activities managed by the housewife have been highlighted several times in local and national media coverage, whether from private television such as Metro TV, iNews TV, or from newspapers such as Media Indonesia, Detak Banten, Tangsel News and others. This makes the trash bank activity can be a fairly effective example in household waste management. The news illustrates that trash banks have started to be known and accepted by various circles in various regions. This is in line with study by Permanasari and Damanhuri (2012) [10] which shows positive result that waste management in garbage bank can be accepted well by society.

D. Factors Related to Housewife Participation in Trash Banks

Participation can be seen as the involvement of a person or group of community members in a planning, implementation, evaluation and utilization of the results (Cohen and Up off, 1977; Mardikanto, 2010; Wardojo, 1992) [15-17]. Based on

descriptive analysis, housewife has enough to participate in waste management in trash bank. They actively participate in the implementation and utilization aspects of the results, but participate less in aspects of planning and evaluation. This is in line with the Aref (2011) [18] study which found that people in Iran are less involved in planning and decision-making in development evaluations because the government is less supportive. This is also in line with the study of Amal and Baharuddin (2016) [19] which found that coastal communities are less involved in the planning stage and to the maintenance stage. In addition, an evidence of community participation development in Nigeria also shows the same that community participation is limited only to receive information and some consultations only (Laah et al., 2013) [20].

The level of community participation in an activity is inseparable from the factors that drive it. Based on the result of Rank Spearman analysis (Table 1) shows that there is a positive and significant correlation between the intensity of non-formal education and the level of accompaniment with the level of participation. However, there is no significant correlation between the number of family dependent and income level with the participation level of housewife in waste bank activity. This means that the intensity of non-formal education and the level of assistance can contribute to the involvement of housewife in waste management through trash banks. While the number of family dependents and family income levels do not become the incentive for housewife to be involved in waste management in trash banks.

The number of family dependents and family income levels is not significantly correlated with the participation rate of housewife. This means that the high and low of these two factors cannot be determined significantly in the involvement of housewife in the trash bank. Nevertheless, the number of dependents of the family has a negatively negative relationship with the level of participation. It indicates an opportunity that can explain that the more the number of family dependents will be the lower the participation rate of housewife in waste management. Conversely, the less the number of dependents of the family then the higher the level of participation that will occur. Therefore, the number of dependents of the family is not a strong reason for housewife to be engaged in waste management activities in junk bank. This is expressed by the mother of DRM as the chairman as well as coordinator of the junk bank Melati Bersih Ragajaya village as follows:

> *"... I also used to say to other board cannot attend weighing. but, fitting day H, even canceled weighing. No one wants to hold on, all have to be me. ... I cannot be present because I have to be a child who wants to train for the preparation of the race. It's a shame, if I have to take care of the trash bank but my own son who is not golden period I dampingin"*

Furthermore, the number of family dependents and income levels are not significantly related to the level of participation in line with Budiman (2013) [21], Sawerah (2015) [22], and Ankesa et al. (2016) [23]. However, on the contrary to Yanto (2013) [24], which states that the level of community income is related to their participation in managing forests. The number of family dependents and income level of the respondent's family is not significantly related to participation because their involvement is not based on economic, but social and environmental objectives. They are involved in the trash bank to fill the void or boredom when too tired of doing daily work routines.

Table 1 the value of coefficient correlation between independent variables with the level of participation

Independent variables	Level of Participation in Waste Management through Trash Bank	
	r_s	Sig. (2- tailed)
The number of family dependents	-0.074	0.533
The level of family income	0.058	0.624
The intensity of non formal education	0.720**	0.000
The level of assistance	0.396*	0.001

Information:
*correlation is significant at the 0.01 level (2-tailed).
**Correlation is significant at the 0.05 level (2-tailed).

Table 1 shows that the intensity of non-formal education and the level of assistance are significantly related to the level of participation of housewife in waste management. This explains that respondents who have attended non-formal education have better knowledge of waste thus increasing their participation in waste management. This means that the involvement of housewife in managing waste in trash banks can be runned even increased when housewife are given maximum non-formal education on an ongoing basis. This is one of the first steps before pursuing the achievement of high housing participation.

This is in line with research Mujibburahmad and Firmansyah (2014) [25] which shows that the level of non-formal education related to community participation in household waste management. However, on the contrary Ankesa et al. (2016) states that non-formal education is not related to the level of participation of housewife in environmental groups.

Another significant factor related to the participation rate of housewife in waste management, is the level of assistance. This shows that the level of assistance has a real relevance to the level of participation. This means that the high level of assistance can increase the participation of housewife in waste management through trash bank. This illustrates that the higher level of assistance conducted by the NGOs will highly affect the level of participation of housewife. Likewise, when the lower the level of existing assistance, then the lower the participation rate will occur.

Based on the results of field observations, the assistance of Non-Governmental Organizations (YBMI) is not evenly distributed in every trash bank that becomes the target. This makes the mentoring level is quite high (44 percent), but as many as 25 percent fall into the low category while the rest in the medium category. Two of the five trash banks (65%) mostly went to high levels of mentoring, and the level of assistance in the other two trash banks were still low compared to the rest had moderate foundations. This is in accordance with the statement of the foundation which illustrates that the foundation only accompanies the junk bank when they need help:

> "*… the Foundation freed the trash bank management to develop its trash bank. So the foundation will only help the trash bank when they have problems, for example related waste collectors or bookkeeping .... "*

In addition, the foundation is more enthusiastic to accompany the trash bank that looks more compact and active based on subjective judgment. Nevertheless, one of the causes of uneven aid of foundations because the number of active human resources in foundation (3 persons) is not comparable with the number of trash bank built to be managed (> 120 pieces). On the other hand, the trash bank spreads in various areas in Indonesia. As a result, most of the existing solid trash banks are not sustainable or stop in the middle of the road.

Assistance of foundations on a regular basis is very much needed by respondents (trash bank) because the foundation has authority of responsibility and higher knowledge related to waste management in trash bank. In addition, the foundation is the first party to initiate or facilitate the community to establish and manage the garbage bank in the surrounding environment using the name of Melati Bersih. Therefore, accompaniment conducted by the foundation can minimize the saturation of housewife in carrying out routine waste weighing. Based on field observations, housewife became enthusiasm when the foundation held an interbank junk competition by holding a private company (garuda food).

The enthusiasm is evidenced by the ability of trash bank of Melati Bersih to donate the sale of garuda food product, which reaches more than 100 million in 3 months. In addition, the village entrepreneurial race is initiated by the foundation and private company and the other forms of assistance are done by teaching or training housewife to manage the financial and sales administration. The purpose of these activities to grow the entrepreneurial spirit of respondents to know, willing and able to become entrepreneurs as well as reliable manage the resulting finances. The activity is in accordance with the philosophy of extension (Mardikanto, 2010) [17], that is helping the community so that they can help themselves so as to improve their quality of life (to help people, to help themselves through educational means to improve their level living).

The relationship between the rate of assistance with the rate of participation in line with research Asnamawati et al. (2014) [26] who explaining that the level of facilitation by facilitators influences community participation in life-level education activities. The same thing is explained by Muhtadi (2017) [27] who said that assistance by facilitators, educators and technical role in waste management in junk banks jasmine clean is necessary. Inderawati et al. (2016) [28] stating that mentoring has no significant effect on participation.

E. Sustainability of Waste Management through Waste Bank

Waste management that grows and develops in society today is the result of the desire of the people who want to improve the quality of the environment in order to improve the quality of life and social. This can be achieved if the existing participation continues to grow and develop sustainably. Sustainable waste management needs to be placed in equal environmental, social and economic aspects. The equalization of these three aspects is deemed necessary considering that the conventional development paradigm has turned into a sustainable development that considers social and environmental improvements as important as economic growth (Salim, 2010) [29]. The result of Rank Spearman correlation test using SPSS 21 program aid can be seen in Table 2.

Table 2 the value of the correlation coefficient between the level of participation with the level of sustainability of waste management through trash banks

Variables	The level of sustainability of waste management							
	Economics		Environment		Social		Total	
	r_s	Sig.	r_s	Sig.	r_s	Sig.	r_s	Sig.
Planning	.361**	.002	.282*	.016	.384**	.001		
Implementation	.279*	.017	.331**	.004	.414**	.000		
Evaluation	.251*	.032	.178	.131	.338**	.003		
Utilization of Results	.641*	.000	.732**	.000	.707**	.000		
Level of Participation	.457**	.000	.411**	.000	.528**	.000	.544**	.000

Information: *.correlation is significant at the 0.01 level (2-tailed).
**. Correlation is significant at the 0.05 level (2-tailed).

Based on the results of the correlation test contained in Table 2, there is a real relationship between the level of participation of housewife to the level of sustainability of waste management through trash banks. This means that the high participation of housewife in the trash bank can determine the sustainability of waste management. The higher the participation will affect the waste management activities in the trash bank which will last longer. Conversely, if the level of participation is low then the level of sustainability of the lower waste management which gradually has the potential of trash bank activities will be stopped or disperse. This is in line with the Abadi study (2013) [13] which found that the level of waste management in Semarang is not sustainable due to lack of community participation.

In addition, the relationship between the level of participation and the level of sustainable waste management is in line with Tanjung et al. (2017) [12] which explains that the level of participation is related to the level of sustainability in forest management. Table 2 also indicates that the level of participation of housewife in all aspects, namely planning, implementation, evaluation, and utilization of results is very significant with the level of social sustainability. Planning aspect relates very real with economic aspect, while implementation aspect and utilization of result relate very real with sustainability in environment aspect. In addition, the four aspects of participation rate are significantly related to the sustainability of waste management in the economic and environmental aspects. Here,the evaluation aspect is the only unrelated to the environmental aspect. This illustrates that the highest aspect of sustainable waste management occurs on the social aspect at all levels of participation.

Based on the observation in the field, the main objective of the respondents follow the trash bank activities not because of economic value but because of environmental and social factors. Respondents assume that the economic value obtained from the waste saving activity in the trash bank is only sufficient for the needs of the kitchen spice. This illustrates that the economic results obtained do not significantly increase family finances. The average amount of income from rubbish deposits in trash banks that have not been taken until the study lasted only about IDR 300,000 only.

The result of the savings is not felt directly by the respondents who have high income because the economic benefits in the trash bank are used for social purposes. In addition, some other respondents have not taken any even to check the results of its trash bank savings. Their focus on trash bank activities takes precedence to take advantage of positive spare time with neighbors by managing the environment to be cleaner, tidier and beautiful. This is as delivered by Mrs. T as a treasurer in garbage bank Satria Jingga as follows:

> *"Yes, let me just socialize, (can) socialize with neighbors. If not (join) so, cannot get out (home). Keep clear, increase knowledge about waste management"*

The disclosed objective is in line with the main objective of establishment of trash bank which is expected by the

foundation that the trash bank is not a place to seek economic advantage, but as a place to move the society into behave clean and healthy life by managing household waste. This in the result of economic value as an added value of social activities. This is also expressed by the foundation of Bunga Melati Indonesia which foster and manage the jasmine bank Clean Melati as follows:

> *"... do not agree if the trash bank makes its customers rich. Until now there is no research that says that the trash bank makes its members rich. Here is the difference between managing waste for the purpose of changing or clean living behaviors by managing waste for businesses? "*

Nevertheless, the economic benefits are very beneficial for respondents who have low family income as in the Anggrek and Jingga trash bank. This makes housewife who is incorporated in the Anggrek trash bank more actively do the trash weighing even until there are specific respondents who scavenged trash on the road. It illustrates that the economic benefits in the trash bank activities can help the household economy so it can buy family needs such as rice, eggs, even clothes and meat when Eid fitri arrived.

Constraints that usually occur in the waste collectors because several times stuttering weighing and payment. Therefore, the trash bank cannot do the waste weighing which customers no longer weigh in the trash bank, but directly sell the waste to the mobile collectors at a higher price.

IV. Conclusions

The activities of Melati Bersih trash bank in Ragajaya village have been running since 2013. The activities consist of sorting waste according to its type, saving waste to trash bank, making handicraft from non-organic waste, processing organic waste into compost, teaching family to manage waste and environment, invite others to join the trash bank, and invite others to maintain the environment.

Housewife simply participate in waste management through trash bank with the driving factor is the intensity of non-formal education with the level of accompaniment of the foundation. The higher the factors, the higher the participation of the housewife will happen.

The high housewife participation will increase the sustainability of waste management through trash bank. Although the trash bank activities have not yet improved the economy significantly but the activity can continue due to high environmental and social benefits.

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