

PROJECT “*ISTEAC*”

*Integration of solid waste management tools into specific settings of
European and Asian Communities*

**Common Applied Research
Under the ASEAN-EU University Network Programme**

Project Documentation

Related to

Activity 9: Planning of composting schemes for small and/or rural communities

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INTRODUCTION

According to the work plan concluded for the common applied research project ISTEAC, the Department of Chemical Engineering, Hanoi University of Science conducted an overview about the implementation of Activity 9: Planning of composting schemes for small and/or rural communities.

This activity should be completed after six months, from July to December of the first year project. However, we should give report every three month. Therefore, our report can be seen as the first step of activity No. 9.

This report was taken place upon basically survey of a location, it is Gia Lam. Gia Lam was a sub-urban district and is being district since beginning of this year. This location meets therefore the suitable address which is proximity to urban areas as mentioned in this activity.

The other community, which was taken in consideration, is Phung. Phung is located near the boundary of Hanoi and Ha Tay. The both chosen sites intended to serve for composting schemes are half agricultural communities that produce large amounts of organic waste.

CONTENT

I. Selected communities

1.1 Gia Lam community

Gia Lam is situated in the south east of Hanoi. This site is located between the southern bank of the Duong River and the route No.1. The surroundings are the factories, houses, railway and agricultural fields. The future land use plan shows that this site is developed as industrial zone and amusement parks.

Gia Lam district with an area of 174.32 km², has the population of 353 000 persons. The population density is 2 027 pers/km².

Administratively, Gia Lam district was sub-urban district of Hanoi whereas Duc Giang was its main town. In Duc Giang area there are 367 farming lots and 7 ponds [1]. However, on the way of development this site has been becoming a new urban district.

The projection of future waste generation and collection quantity in Gia Lam district was presented in table 1 [1]. Beside them a result of the investigation about solid waste composition ratio was gathered in table 2.

Since the waste management of this area has been not yet served completely by the Urban Environmental Company (URENCO) there are only some streets are using rickshaw for collecting. The collected waste are transited to dump-truck and transported to the Kieu Ky landfill. This landfill site is located at the south east end of Gia Lam district and it is completely full. Waste materials are heaped up some where such as sandbank, edge of fields, even sewer and gutter (figure 1 - 3). The waste of Gia Lam district therefore needs to be transported to Nam Son in the future. A feasible plan is to construct the second transfer station in Duc Giang before such time as Gia Lam waste would be transported by URENCO to Nam Son, which may occur in 2005 according to URENCO. There is therefore a significant potential for composting activity with a direct market for application in this area.

**Table 1. Projection of future waste generation and collection quantity
In Gia Lam district**

Year	Gia Lam district		
	Generation (t/d)	Collection (t/d)	Coverage (%)
Annual Growth Rate			
1998	5.04%	As projected by Gia Lam District	
1999 - 2005	5.04%		
2006	4.86%		
2007 - 2010	4.86%		
2011 - 2020	3.65%		
Year			
1998	96	48	50%
1999	100	56	56%
2000	105	66	62%
2001	111	74	67%
2002	116	80	68%
2003	122	84	69%
2004	128	96	74%
2005	135	109	81%
2006	142	118	84%
2007	149	127	86%
2008	156	137	88%
2009	163	146	89%
2010	171	158	92%
2011	180	171	95%
2012	186	177	95%
2013	195	185	95%
2014	205	194	95%
2015	215	204	95%
2016	225	214	95%
2017	236	224	95%
2018	247	235	95%
2019	260	247	95%
2020	272	259	95%

Table 2. Solid Waste Composition Ratio on Wet Base

Types o Waste	M1	M2	M3	Ave.
Bulk Density in Car [kg/m ³]	-	-	-	-
Bulk Density [kg/m ³]	380.0	368.0	378.0	375.3
Kitchen waste	39.50	30.60	37.70	36.45
Paper	3.20	4.10	2.40	3.25
Plastics, rubbers	6.70	9.60	4.10	6.90
Bricks, stones	14.60	7.30	5.20	9.36
Timber, rags	1.30	1.20	2.10	1.58
Bones, shells	1.10	1.50	2.10	1.58
Metal, tin cans	1.10	0.60	0.60	0.79
Glass	1.90	4.8	0.30	2.07
Sand and Dust	30.60	40.30	45.50	38.03
Moisture content	38.8%	34.9%	36.9%	36.9%

Notes:

1. Collection amounts are projected assuming the maximum coverage will be 95%.
2. Collection amounts in Gia Lam district during 1998 - 2010 were given by Gia Lam district. Collection amounts after 2010 are estimated so that the maximum coverage will be 95%.

M1, M2, M3 were household waste samples collected through the household waste generation survey.

M1 Dong Da district (Governmental house)

M2 Hoan Kiem and Tay Ho (Private house)

M3 Gia Lam district (collected from houses in sub-urban area).



Figure 1: the picture was taken in Land of Duong River



Figure 2: The picture was taken in Trau Quy village



Figure 3: Picture was taken in Duc Giang village

I. 2 Phung community

Phung is a town which belongs to Dan Phuong district of Ha Tay province. Phung adjoins Hanoi in the south west, where would be chosen as a research place. With a total area of 76.6 km² Dan Phuong district has a population of 132 288 persons and the population density is 1 727 pers/km². Main activity of Dan Phuong district is agricultural production.

Near to Phung there is a foodstuff factory which is SANNAM Co., Ltd. SANNAM produces dried fruits from fresh fruits such as pineapple, litchi, mango, banana...Solid waste from production process are skin and unused parts of fresh fruits evaluated at 1 ton/day. This waste source is unmixed and simpler in compared with municipal wastes. Based on above reasons, SANNAM foodstuff factory was selected as the site to implement studies on compost pilot production. Input material for compost pile is therefore available with a low cost of transportation.

In a combination between organic waste due to the agricultural activities of Phung and the large mounts of unused part of fruits in SANNAM we think about an optimal input material for our composting process.

The above communities therefore seem to be the right places for our study.

2. Selection of composting technology

According to the results of laboratory analysis on organic waste characterization presented in the 2nd report for “ISTEAC” of the Hanoi University of Science we intend to apply the roll - up system for composting process.

Figure 4 presented a composting unit which uses for household scale. This unit works under conditions: aeration regulation, leachate recycling, thermal and aeration control, effective micro organism additives, the dimension could be 200 liter.

The following first problems met in our research which is: Input material with the water content changes in a range of 80 - 90% (2nd report for “ISTEAC”) which corresponds with URENCO’s data (85%) [2]. However, the moisture content for composting should be between 50 and 60%. This organic waste therefore needs a pre-treatment. High moisture content (above 65%) will restrict air movement through the pore spaces and result in anaerobic fermentation; A C/N ratio ranging from 25/1 to 35/1 is described as the optimum for composting. However, our research has shown the ratios more than 35/1. Balancing the C/N ratio therefore need to be done, maybe with food waste or kitchen waste.

With above mentioned problems together with the composting unit on the way of construction our research therefore needs to be continued in a deep step.

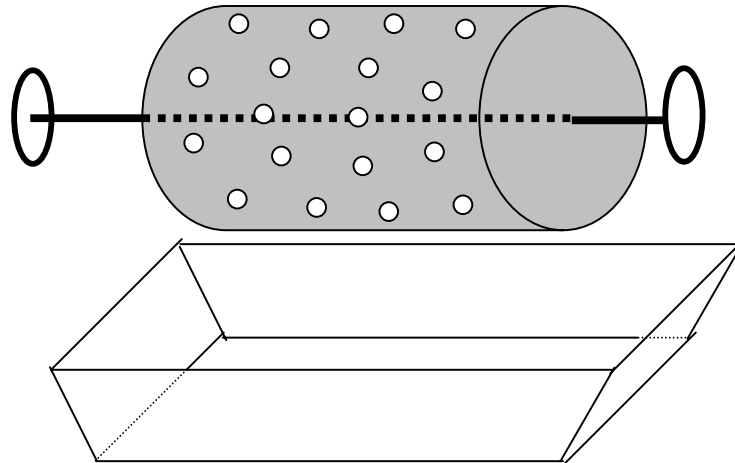


Figure 4: A composting pile household scale

Volume of the reactor: 200 liter

Length: 1.2 m

Diameter: 0.46 m

3. Reference

[1] Japan International Cooperation Agency (JICA), Study on Env. Improvement of Hanoi City, March 1999.

[2] Proceedings, International Workshop "Technology of Municipal Solid Waste Treatment – Experiences and Challenges", Hanoi, March 2003.