

**MAKING SOLID URBAN HOUSEHOLD WASTE MANAGEMENT BY
COMMUNITY FINANCIALLY FEASIBLE THROUGH PUBLIC POLICY
SUPPORT: A CASE STUDY FROM THE CITY OF BOGOR**

***(Membuat Pengelolaan Sampah Padat Rumah Tangga Perkotaan Berbasis
Komunitas Layak Secara Finansial Melalui Dukungan Kebijakan Publik:
Suatu Studi Kasus dari Kota Bogor)***

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Abstract

This study aims at evaluating financial feasibility of the business of household solid waste management by cooperative as a communal-based organization and to formulate a set of public policy required to support this business. The study was carried in the communities of *RW 8* and *RW 13* of the Bubulak Sub-district of Bogor City. The study reveals that this business is financially feasible to implement. However, its financial feasibility is largely dependent on the government's support delivered through a variety of public policies. They include: (a) provision of special credit scheme to provide a free-interest rate loan to finance initial investment required to establish a community-based household solid waste management through cooperative (b) provision of cost subsidization policy for the processing of organic solid waste into fertilizing compost products (c) replacement of the existing policy that provide subsidy for use of manufactured fertilizers for rice production with policy that provide subsidy for use of fertilizing compost products to encourage development of market for compost products in Java.

Key words: fertilizing compost, externalities, household solid waste, cooperative, policy, credit

Abstrak

Studi ini bertujuan untuk mengevaluasi kelayakan finansial dari usaha pengelolaan sampah padat rumah tangga perkotaan oleh koperasi yang berbasis komunitas dan merumuskan kebijakan public yang dibutuhkan untuk mendukung pelaksanaan bisnis tersebut. Studi dilaksanakan di RW 8 dan RW 13 Kelurahan Bubulak, Kota Bogor. Studi menunjukkan bahwa usaha pengelolaan sampah padat berbasis masyarakat secara finansial layak untuk dilaksanakan. Namun, kelayakan ini sangat tergantung pada dukungan pemerintah melalui berbagai kebijakan publik. Kebijakan yang dibutuhkan untuk mendukung kelayakan finansial usaha berbasis masyarakat ini adalah (a) kebijakan skim kredit yang menyediakan pinjaman lunak bebas bunga untuk membiayai investasi awal yang dibutuhkan untuk membangun suatu bisnis pengelolaan sampah berbasis komunitas melalui koperasi, (b) kebijakan subsidi biaya pengolahan sampah padat organik menjadi pupuk kompos, (c) mengganti kebijakan subsidi penggunaan pupuk pabrik oleh petani padi dengan kebijakan subsidi penggunaan pupuk kompos untuk mendorong pengembangan pasar pupuk kompos di Jawa.

Kata kunci: pupuk kompos, eksternalitas, sampah padat rumah tangga, koperasi, kebijakan, kredit

INTRODUCTION

Underlying Problem

As increasingly crowded with people and industries, urban areas of Java become confronting increasingly a serious problem of waste management. As in other parts of Indonesia, city governments in this island have assumed the responsibility to handle this growing problem using the conventional approach of removing the waste from the city's area into neighbouring area where the waste will be decayed by nature. It has then become evident that the use of the conventional approach has failed to handle the waste management problem, even though its implementation has imposed a great cost to the city governments. It becomes, therefore, desirable to develop an alternative approach to handle urban waste management problem.

Handling urban solid waste needs not be exclusive by the city government and impose financial burden on public expenditure. The community can organize their members to make the task of processing of household solid waste to become community business. This activity will presumably require a substantial amount of labour service so that it could be a good source of income for unemployed poor people whose population has currently become very significant in Indonesia.

A community-based business for helping community members to improve their income is not uncommon in developing countries. The common form of this type of business organization is cooperative. The emerging question is the management of solid household waste by a community-based business organization of cooperative financially feasible? Moreover, what public policies are required to make the developed cooperative able to work effectively?

The Study Objectives

This study has two objectives. One is to evaluate financial feasibility of the business of household solid waste management by

cooperative as a communal-based organization. The other objective is to formulate a set of public policies required to support the business of communal conversion of urban solid waste into fertilizing compost by the cooperative.

Scope of the Study

This study concerns only with household solid waste produced by the studied community. The fact that more than 70 per cent of the solid household waste is organic type makes it sensible for the community-based cooperative to focus on the business of conversion of organic solid waste into fertilizing compost. Consequently, it is assumed the cooperative will not conduct the conversion of inorganic solid household waste into other forms of product before marketing. Instead, the cooperative will simply sort out the collected inorganic waste to meet the standard applied in the trade and then sell the sorted products to middlemen whose business activity locates not far from the studied community complex.

THEORETICAL FOUNDATION

New Perspective on the Way of Managing Solid Urban Household Waste

Urban waste could be considered as 'public bad', as Todaro (2000) has made this term for pollution. Individual persons or firms have no incentives to handle the public bad (Todaro, 2000). In such a situation where private sector was failed to respond to provide the service that people needs, the government had to perform its provision for the public (Stiglitz, 2000). Therefore, it was rationally justified if city governments take a sole responsibility for the management of solid urban waste produced by its citizens.

This view was correct only if urban waste could not be transformed into private valuable goods. However, most of solid urban waste could be transformed into various marketable products, such as fertilizing compost (Sakti, 2006; Suriadi, 2006). The transformation activity also uses labour very intensively (Suriadi, 2006).

This implies that the management of solid urban waste could be developed as a community business to help solving unemployment and poverty as well as to improve environmental quality of the community.

Cooperative as a Form of Community-Base Business Organization to Transform Solid Urban Household Waste into Marketable Materials

There are some good reasons as to why cooperative is chosen as a form of business organisation for managing solid urban household waste. First of all, our intension is to make management of solid urban household waste as community business. Handling solid urban household waste will be much more effective and efficient if the sorting of waste is done at the household level where it is produced by the family members, rather than doing it other ways. Households as producers of the waste will be likely to make a strong commitment to carry such crucial task of waste management if they are the owner of the business that generates profit from marketing waste that they sorted out.

However, it is unlikely rational for an individual to make the processing of its own household as a personal commercial business. Since, according to Suriadi (2006), this business involves relatively large scale economies to make it become financially rewarding. This implies that generally an individual household could not make the sorting of their own household solid waste and its processing into marketable products as a personally profitable business. In addition, making their environment clean from household solid waste will need a solid collective action from all members of their community. This can be expected to prevail when every members of the community are united in a business organization that gives them an incentive for doing such action. In short, members of the community cannot work individually, but collectively through a cooperative, in managing their household solid waste as a commercial business.

Negative Externalities, Pigovian Taxation and City Government's Role in Managing Urban Solid Waste

When one disposes off some solid waste into environment his action will cause negative externality to other people. One way to control this negative externality is by imposing a Pigovian tax to those ones whose action that create it. This will force the polluters to internalize the external cost of their action to other people so that they become self restrained in doing such asocial action (Stiglitz, 2000).

But, if the imposition of a Pigovian pollution tax will be an effective way to restrain polluters from polluting environment, the relevant question is why the government did adopt this method to handle the existing growing problem of urban solid waste. Implementing this method involves cost of transaction costs, such as cost of overseeing citizens and catching polluters, collecting tax penalty from them and administration of the collected tax penalty. However, when the involved cost of transaction is so substantial such an activity of collecting tax penalty becomes simply not feasible to carry on (Stiglitz, 2000).

It appears the existence of such a prohibitive size of transaction cost that make city government in most developing countries, including Indonesia, not trying to implement the Pigovian pollution tax to control the growing solid waste problem in their administration. This is especially true of Indonesia, where euphoria of political reformation that emerged after the collapse of the Suharto government in 1998 has led to the rapid weakening of people's attitude toward law obedience. A direct consequence of this situation is city governments in Indonesia have to assume exclusive responsibility to clean up their city from solid waste that their citizens have produced. However, as previously explained, the city governments have failed to solve this problem even though they have spent substantial amount of budget to manage it.

Positive Externalities of Communal Composting and Public Policy Support for Development of Community-Based Waste Management

The conversion of solid waste into fertilising compost is essentially the conversion of negative externality into positive externality. In Indonesia massive conversion of urban solid waste into fertilizing compost by communities will generate a variety of positive externality to the society. First of all, its development will provide a real solution for urban solid waste problem. This new approach to waste management in urban crowded cities will not invite any public protest as happened in the case of the conventional one. Since the new approach would not move solid urban waste from the city area into landfill areas which, generally, locate out side of the city's boundary, but converting the waste into valuable material, fertilizing compost.

Second, the communal conversion of urban solid waste into compost makes members of the community that produces the solid waste become collectively responsible for the management of its own solid waste. This will, in turn, have not only a direct effect on the reduction of financial burden that the city government used in handling solid urban waste, but also an indirect effect on improvement of extent of economic welfare of the society which is currently struggling to cope with severe magnitude of unemployment and poverty. The saved budget will enable city government to design and implement better development programs to foster economic growth to provide more jobs and income for its citizens.

Another significant positive externality will come from the use of fertilizing compost by rice farmers in Java. Scholars have criticized a long practice of heavy use of manufactured fertilizers for rice crops, for it has caused a serious environmental degradation in this main producing rice island of Indonesia (Saragih, 2008; Schiller, 1980). Accordingly, it has been recommended for the reduction of its use by substituting it with organic fertilizers (Saragih,

2008). Karama (2005) in Bintoro (2008) has also recommended such a fertilizer substitution for the sake of improving soil fertility of rice field so as to increase rice yield of rice field. His contention stems from his observation about the fact of most rice field in East Java has very low organic content that causes low rice crop productivity. Bintoro (2008) views this fertilizer substitution is also important for the control of flood in Java. The reason is simple. Increasing organic content of soil will increase its water retention significantly, since one kilogram of compost could retain 5 to 10 kilogram of water.

It is now clear that communal composting of urban solid waste by the community will generate a very remarkable positive externality for the society at various levels. Different from that of negative externality, the presence of positive externality is beneficial for the society so that they want its source to produce it much. Since members of the society do not pay for benefit from enjoying positive externality, its source will not produce it as much as the society have actually desired. Accordingly, government intervention is required to close the existing gap. The government needs to pay the source of positive externality with sum amount of subsidy to compensate it for the external benefit that the society captured without paying its producer to encourage itself to serve the society's interest (Stiglitz, 2000).

RESEARCH METHODOLOGY

Location of the Study and Sources of Information

The study was carried in the communities of *RW 8* and *RW 13* of the Bubulak Sub-district of Bogor City. The primary source of information for this study was 40 local residents who selected randomly from their respected population. The obtained information from these respondents were complement with the information obtained through in-dept interviews and focus group discussions with local leaders,

waste management experts and government officers of relevant offices. Relevant secondary data were also used to sharpen the discussion.

Data Analysis

The collected data were analyzed using a variety of relevant tools. They include cross-tabulation, and project benefit-cost analysis. Relevant computer programs will be utilized to assist in data processing and analysis.

The following criteria are used to measure financial feasibility of the proposed community-based solid waste management:

(a) Net Present Value of Benefit of the Project (NPV)

NPV is the total net benefit that will be accrued from the project during the whole economic life time of it. NPV is measured by using the following formula (Gittinger, 1986):

$$NPV = \sum_{t=0}^{t=n} \frac{Bt - Ct}{(1+i)^t}$$

Where Bt = Benefit at year t, Ct = Cost at year t, t = year, and i = interest rate

The project is financially feasible to implement if NPV > 0, and financially is infeasible to implement if NPV < 0.

(b) Net Benefit-Cost Ratio (B/C) of the Project

The B/C ratio reflects the average benefit that the investor that will receive for every unit of currency that he spends (cost) in the project. The B/C ratio is measured by using the following formula (Gittinger, 1986):

Net B/C =

$$\frac{\sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t}}{\sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t}} \quad \text{for } Bt - Ct > 0$$

$$\frac{\sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t}}{\sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t}} \quad \text{for } Bt - Ct < 0$$

Where, Bt = Benefit at year t, Ct = Cost at year t, t = year, i = interest rate

The project is financially feasible to implement if B/C > 1, and financially is infeasible to implement if B/C < 1.

Some Basic Assumptions Used in Analysis of Financial Feasibility

Financial analysis using in this study rests on some crucial assumptions. The assumptions are defined as follows: (a) The project has economic life time of 20 years. (b) Price of compost is fixed at the current level that the *Rumah Kompos* is charged (Rp 1 250 per kg) (c) The government maintains its current policy of subsidizing small scale producers of compost of Rp 350 per kg. (d) Factor conversion of organic to compost is 30 per cent. (e) Discount factor applied for this study is 10 per cent. This figure is average rate of prime interest rate by Bank Indonesia (the central bank of Indonesia) for the period of 1 November 2005 and 5 June 2008 (See www.bi.go.id.htm as for 20 June 2008).

Scenarios for Sensitivity Analysis

For sensitivity analysis, 10 scenarios has been envisaged and developed. These scenarios are depicted in the following table (Table 1)

Table 1: Scenarios for Analysis of Financial Feasibility of the Project

No.	Symbols of Scenario	Descriptions of Scenarios
01	S1	All initial investment fully financed by the government, no further government subsidy on output, and no retribution paid by community members
02	S2	Equal share on initial investment between the government, and the community, the community's share was made up by a free-interest rate loan from the government with 10 years instalment after three years of grace period, no further government subsidy on output, and no retribution paid by community members
03	S3	Initial investment fully paid by the community by a free-interest rate loan from the government with 10 years instalment after three years of grace period, no further government subsidy on output, and no retribution paid by community members
04	S4	S1 plus government subsidy on compost Rp 350/kg
05	S5	S2 plus government subsidy on compost Rp 350/kg
06	S6	S3 plus government subsidy on compost Rp 350/kg
07	S7	S1 plus community retribution fee of Rp 5 000 per household per month
08	S8	S2 plus community retribution fee of Rp 5 000 per household per month
09	S9	S3 plus community retribution fee of Rp 5 000 per household per month

Evaluation of the Extent of Project Financial Feasibility

Estimates of criterion of financial feasibility for the developed scenarios are depicted in Table 2 below. Out of the ten proposed scenarios, only five scenarios (S4, S7, S8, S9 and S10) are financially feasible to be implemented.

Before contrasting merits of each of these five scenarios, one may make general comments on the role of each assumption underlying the proposed scenarios. From scenarios S1, S4 and S7, one could learn that even if the government assumes all initial investment for development of community-based solid waste management, it is not sufficient to make this project financially feasible to implement. To make the project financially feasible, the government has to complement it with compost subsidization policy of Rp 350 per kg (S4). Other way is to supplement the provision of initial investment by the government with the imposition of monthly household retribution fee of Rp 5 000 (S7).

Meanwhile scenarios S2, S5 and S8 reveal if the government and the community members make an equal contribution on initial investment, the project will be not feasible financially, even if the government supports it with provision of compost subsidy of Rp 350 per kg. It could be financially feasible only when the investment sharing is complemented with the imposition of monthly household retribution fee of Rp 5 000 (S8).

In scenarios S3, S6 and S9, it assumed that the community is responsible for all the initial investment which is financed through a free-interest loan obtained from the government. Observation of estimate of feasibility criterion of each scenario shows that this investment could be feasible financially to implement only if members of the community are willing to pay a monthly household retribution fee of Rp 5 000 (S9). Without it, the project will not be feasible financially even if the government grants with a compost subsidy of Rp 350 per kg (S6).

Table 2: Estimates of NPV, and Net B/C by Scenarios

No.	Scenario	Criterion	
		NPV (Rp)	Net B/C
01	S1	- 69 974 404.82	0.90
02	S2	- 116 854 673.12	0.90
03	S3	- 181 769 567.67	0.86
04	S4	54 316 814.64	1.10
05	S5	- 10 598 079.92	0.41
06	S6	- 57 478 348.22	0.63
07	S7	178 019 479.23	1.29
08	S8	113 104 584.68	1.23
09	S9	75 680 599.21	1.20
10	S10	45 501 718.54	1.15

From the preceding discussion, one might conclude the following points. First, the imposition of a monthly household retribution fee is a crucial factor in determining financial feasibility of the project. Even if the community assumed all of initial investment, the project is still financially feasible to implement as long as it could charge household retribution fee of Rp5 000 per month from the community members that it served. This finding has a direct implication which could be formulated in the following point. Any supplementary policy support such government policy as the sharing of initial investment between the community and the government, and the provision of compost production subsidy of Rp 350 has the effect on the possibility of reduction in magnitude of monthly household retribution fee.

The question is to what extent this contribution fee could be reduced. The last scenario (S10), which is one out the five identified feasible scenarios, gives the answer to this question. This scenario shows it was possible to reduce the magnitude of monthly household retribution fee to the lowest feasible limit (Rp 2 000) that Sudradjat (2007) has suggested, even if the community has to assume all the required initial investment as long as the government supported the project with compost production subsidy of Rp 350 per kg.

So far the discussion has not touch the issue of selecting a scenario out of the five

identified feasible scenarios (S4, S7, S8, S9 and S10). S4 and S7 share the same condition whereby all the required initial investment has to be made by the government. Implementation of any of these scenarios is conditioned by preparedness of the government to make the required investment whose amount is not small. However, the present condition of government deficit budgeting makes it impossible for the government to support communal processing of organic solid waste to produce compost with the provision of free initial investment. If this budgeting condition was correct, the selection of S8 simply becomes impossible.

Members of the community must shoulder all initial investment that requires for establishment of their project of communal solid waste management. So, now the available choices for them are only S9 and S10. From the community members' perspective, clearly S9 is less preferred than S10. Thus, the option is S10.

PUBLIC POLICIES REQUIRED TO SUPPORT THE PROPOSED COMMUNITY-URBAN SOLID WASTE MANAGEMENT

To make the proposed community based waste management becomes successful in the business of converting urban organic solid waste into compost requires the government to support its development not only with the provision of production subsidization policy.

The government should back up this project also with public policy that helps the community to meet the required initial investment and with public policy that helps to expand market for compost.

Concession Credit Scheme for the Required Initial Investment

Perceivably, there were two ways through which the government could prevent the proposed community-based solid waste management from failing to exist, due to lack of capacity of its members to meet the required initial investment. One is the government should make the investment available for the community as grant. The fact that this activity will generate remarkable positive externality makes it rewarding for the government to provide such a free investment support. However, the current lack of budgeting capacity makes it impossible for the government to implement such kind of public policy support for development of this project.

Alternative way is the provision of a credit scheme that caters the required initial investment for this project as a refundable loan. A credit package could be effective for development of this project only if its terms are relatively favourable for the borrower. One of these terms is the extent of repayment. The repayment should be made by instalments during the period of 10 years with the first instalment to be made only after three years of grace period. Thus, the repayment will become completed after 13 years from the day of its deliverance (or seven years before the project's completion).

Another characteristic of this credit package is about the extent of interest rate that the government should charge for it. From the stand point of view of a borrower, interest rate is a price of capital that he borrows to run his commercial business. It is true that commercial banks charges commercial interest rate for credit supplied for commercial

business. However, charging commercial interest rate for the loan supplied for the project will make its operator to limit its borrowing to level that maximizes its own profit. This implies the project's production will not reach the level that is socially desirable. To persuade the project's operator to borrow a sufficient amount of capital to enable its operation to reach the production level that is socially optimal, the government should subsidize price of the borrowed capital. The best policy that the government could implement in this area is to make the loan available for the project at zero interest rate.

Public Policy to Alter the Rice Farmers' Preference for the Use of Manufacture Fertilizers to Expand Market for Compost

Simply blaming rice farmers for their practice of heavy use of manufactured fertilizers for their rice field is not fair. Since the beginning of Suharto era, the government has played a crucial role in making rice farmers become addicted for heavy use of manufactured fertilizers through notably provision of heavily subsidized price of manufactured fertilizers for rice farmers in order to propel domestic rice production to make the country become rice self-sufficient country.

It has been thought that heavy subsidy for use of manufactured fertilizer was desirable to encourage rice farmers to use these inputs heavily, for the rice HYVs crops' ability to produce high yield is very much dependent on heavy use of manufactured fertilizers. A direct consequence of such addicted behaviour of rice farmers has made public expenditure on fertilizers' subsidy grows rapidly from time to time. This year of 2008 one the fertilizers subsidy has cost the government budget of sum Rp 15.2 trillion (*Kompas*¹, 28 July 2007, page 17).

Under the current limited budget capacity, it is no more sensible for the government to sustain such costly fertilizer subsidization

¹ *Kompas* is a leading news paper in Indonesia.

policy. It is more reasonable for the government to abandon this policy. More over, even if the government was capable of providing heavy subsidy on the use of manufactured fertilizers on rice production it will be unrealistic if the government continues to implement this policy, given the finding of its adverse consequence on environment and soil productive capacity as discussed above.

Meanwhile, its dramatic impact on environment and physical structure of rice farmland, especially in Java island where more than 60 per cent of the national rice production, has warranted for the government to promote the substitution of compost for manufactured fertilizers used for rice production. This substitution will improve significantly not only production potential of the soil (Karama, 2005), but, also its water retention capacity so as to reduce significantly accidents of water flood in this crowded island (Bintoro, 2008). However, for such a substitution to occur the government was required to alter relative price of manufactured fertilizers and compost. This will mean the government needs, again, to terminate its policy of fertilizer subsidization and replace it with a new policy of compost-use subsidization for rice production.

CONCLUSIONS AND RECOMMENDATIONS

From the discussions in the preceding matters, the following conclusions might be drawn: (a) The business of managing household solid waste of the study community through a community-based cooperative is financially feasible. However, its financial feasibility is largely dependent on the government's support delivered through a variety of public policies. (b) The provision of public policies to support community-based management of household solid waste through cooperative is strongly justified, since this activity will generate remarkable positive externalities to the society as a whole.

Accordingly, it is recommended for the government to implement the following set of

public policies in support for the development of this business: (a) Provision of special credit scheme to provide a free-interest rate loan to finance initial investment required to establish for a community-based household solid waste management through cooperative (b) Provision of cost subsidization policy for the processing of organic solid waste into fertilizing compost products (c) Replacement of the existing policy that provide subsidy for use of manufactured fertilizers for rice production with policy that provide subsidy for use of fertilizing compost products to encourage development of market for compost products.

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