

How Waste Recycling Can Restore Soil Fertility

Executive Summary

This Project Proposal recommends win/win solutions for Indonesian issues of national importance by recycling and composting the organic waste that has the potential to:

- 1. Drastically reduces waste volume by recycling 90% of the waste**
Incinerators are no alternative due to high risks and a negative energy balance ^{5), 6)}
- 2. Restores depleted soil and thus assists food security**
50% of Indonesia's agricultural land is depleted and compost is needed to restore it ¹⁾
- 3. Reduces greenhouse gasses**
Organic waste generates 11 % of Indonesia's greenhouse gasses

To achieve these goals, equal opportunities must be created: Compost must get same subsidies as overused chemical fertilizers (or no subsidies for both).

Project objective

The proposal grew out of the Gianyar Waste Recovery Project in Temesi, Bali, where 50 tons of waste per day are successfully processed since 2008 (www.temesirecycling.com). In 2008 it was selected by the UNEP as No. 1 showcase project of South-East Asia. It was filmed by international TV stations.

Above issues must inevitably be addressed. This proposal hinges on composting or alternatively, the controlled anaerobic decomposition of organic waste. The project has the following three objectives:

1. Reducing landfill waste

The experience of the 50 ton per day Gianyar Project shows that about 85 % of waste in Bali is organic waste that can be turned into organic fertilizer and 7 % is recyclable material. Less than 10 % is residue that must be landfilled. Thus, the demand for landfills is reduced by 90 % or a factor 10.

Controlled decomposition of organic waste needs dedicated facilities. For logistic and practical reasons such facilities should be decentralized. The Gianyar project has shown that one facility per sub-district (Kecamatan) is best, ideally supported by local waste banks.

2. Supporting food security

At a seminar on August 19, 2016 in Sumedang it was revealed that over half of Indonesia's agricultural land is depleted by overuse of chemical fertilizers and pesticides. Healthy soil has an organic content of 10 %. But the Ministry of Agriculture concluded that half of the 8.1 million hectares agricultural land is not fertile with an organic content of less than 2.5 %. To be productive, soil should have an organic content of at least 5 % ¹⁾. This has lawmakers worried about Indonesia's food security ²⁾. Organic fertilizers are important to fix depleted soil ³⁾ and can increase yields by 15 to 20 % ⁴⁾.

Only compost can increase the organic content in soil and thus support the restoration of depleted soil. Indonesia's 8.1 million hectare agricultural land is unhealthy with an organic content of less than 1.5%, while it should be at least 5%³. This low organic content level threatens Indonesia's food security

3. Reducing greenhouse gasses

Indonesia's about 50 million ton of organic waste per year contribute about 11 % to the country's greenhouse gas emissions or even 21 % when peat and forest fires are excluded. Controlled decomposition of organic waste would contribute significantly to the national goal of reducing greenhouse gasses 29 % by 2030, compared to "business as usual".

One way to achieve controlled decomposition of organic waste is basic composting. Viable alternatives are much faster anaerobic processes in closed chambers, where the generated methane is used in a genuine Waste to Energy process to produce electricity ^{7) and 8)}. Such plants can be simplified for Indonesia and have a positive energy balance by producing three times more energy than they use at a relatively low investment. By contrast, because of high moisture in Indonesian waste, incinerators have a negative energy balance ⁶⁾ and are false Waste to Energy solutions.

The World Bank: "the average annual lower calorific value of waste must be at least 7 MJ/kg, and must never fall below 6 MJ/kg in any season." and "If the mandatory criteria are not fulfilled, the project should be terminated" ⁵⁾. Almost all Indonesian waste has much less than 7 MJ/kg ⁶⁾ and ITB.

Attaining sustainability by addressing negative factors

To contribute to the achievement of above three objectives of national importance, the controlled decomposition of organic waste must be made sustainable. This requires addressing the following adverse factors.

1. Today, only chemical or organic fertilizers from state related companies have access to subsidies, which reduce the prices for fertilizer by 70 to 90 %. Compost producers have no access to subsidies. This lack of an equal opportunity excludes compost producers from the large agricultural market. For the Gianyar project, this led to a 3000 tons excess compost inventory from the 100,000 tons organics processed since 2008. Fertilizers are usually tendered on provincial or regency level.

Organic fertilizers must be certified by the Ministry of Agriculture to be eligible for subsidies. For strange reasons organic compost does not qualify. To become eligible for subsidies, compost must be mixed with at least 20 % manure, usually from cows. It thus loses its pathogen-free properties but on the positive side, increases nitrogen.

There is an urgent need to create equal opportunities and to modify the specifications for organic compost and organic fertilizers. Compost must become eligible for subsidies.

2. Compost producers can only survive with equal opportunities. For a limited time, the Gianyar project gets carbon credits for reducing greenhouse gases under the Clean Development Mechanism (CDM) of the UNFCCC's Kyoto protocol and the Gold Standard (GS). The carbon credits are used to subsidize the project. Once the carbon credits expire in 2023, the Gianyar model for large scale composting will have to shut down, unless it gets subsidies.
3. Waste separation contributes to 42 % of the production cost of the Gianyar project. This is a cost factor that can be eliminated in the long term by waste separation at source. Today in Gianyar, less than 10 % waste is separated at home. Efforts must be made to increase this percentage. There are already established models for this in Depok and Padangtegal, Ubud.

Economics and final considerations

The opportunity costs of pursuing any thermic waste treatment are huge (negative energy balance, loss of essential organic matter and pollution). No major economies of scale exist for processing by biological decomposition. On the contrary, increased logistic cost and other reasons call for a far-reaching decentralization of community owned waste/materials management.

This Project Proposal is in the public domain. In view of my advanced age I hope a competent entity based in Jakarta will embrace this Project Proposal and I would be happy to assist.

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David Küper, MSc, MBA
dkuper@indo.net.id
Gianyar Waste Recovery Project
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- 1) Muhammad Syakir, Head agriculture research and development agency, Ministry of Agriculture and Muhrizal Sarwani, Director fertilizer and pesticide agency, Ministry of Agriculture
 - 2) Herman Khaeron, Lawmaker of Commission IV (overseeing this matter), House of Representatives
 - 3) Hidayat Salim, Professor food science and field resource, Padjadjaran University in Sumedang
 - 4) Rahmat Pribadi, Director human resources and general affairs of Petrokimia Gresik, Surabaya
 - 1) to 4) Jakarta Post: "Special treatment to boost farming output" 22. August 2016 and <http://www.mongabay.co.id/2016/08/21/degradasi-lahan-pertanian-ancam-swasembada-pangan-nasional/>
 - 5) World Bank Municipal Solid Waste Incineration, A Decision Maker's Guide' 2000, Chapter 5: Waste as Fuel <http://siteresources.worldbank.org/INTUSWM/Resources/463617-1202332338898/incineration-dmg.pdf>
 - 6) http://ousar.lib.okayama-u.ac.jp/files/public/1/11432/20160527190413295966/012_041_049.pdf , page 44
 - 7) <http://www.herhof.com/en.html>
 - 8) <http://www.eggsmann-recyclingtechnology.com/en/>