Institute for Global Environmental Strategies

"Lesson Learns from Japanese Practices for Urban Waste Utilization"

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Workshop on Capacity Building on Accounting and Utilizing GHG Emission Reduction Measures for Local Waste Management Actors in Developing Asian Countries, Vientiane, Laos, 4-6 October 2011.

1. Objects and Contents of the Presentation

Objects

- To learn the utilization of waste in urban sectors by seeing the Japanese practices
- To consider what can be to energy/materials from urban sectors in Laos?

Contents

2. Urban Area and Biomass Utilization

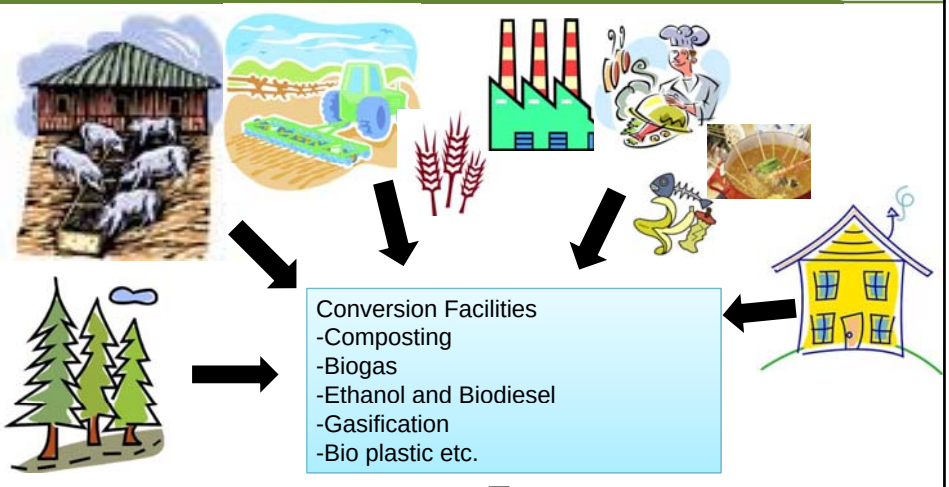
◆Urban area is the engine for the development and produces wastes from its activities.

◆There are several cases the wastes from urban can be utilized for material and energy use by doing both urban waste management and GHG reduction.

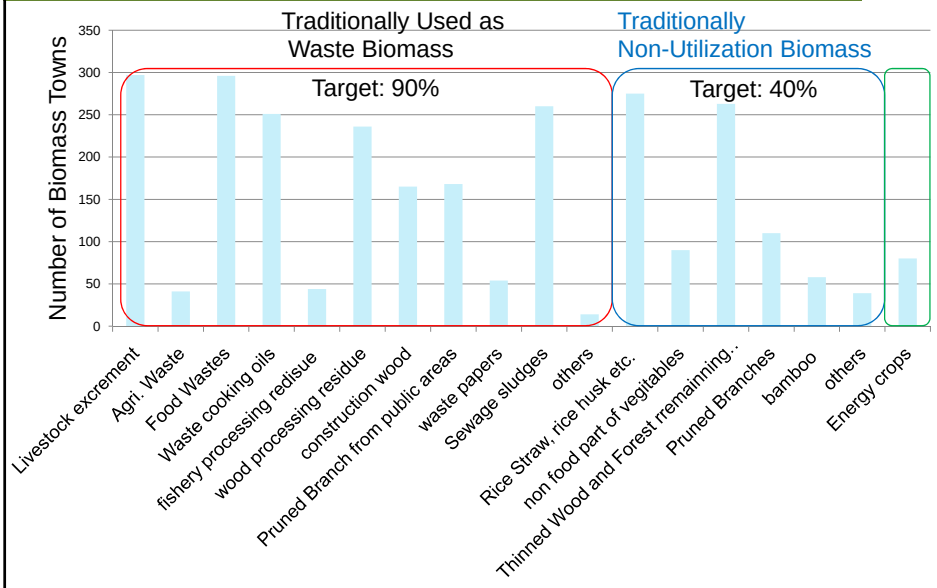
◆Japanese Practice: Biomass Town
a community which utilizes biomass with strong ties among a community and local stakeholders.
318 town (2011. July)

◆Biomass, as renewable energy source, is biological materials from living, or recently living organisms. This biomass is included waste from urban activities and can be included agro waste.

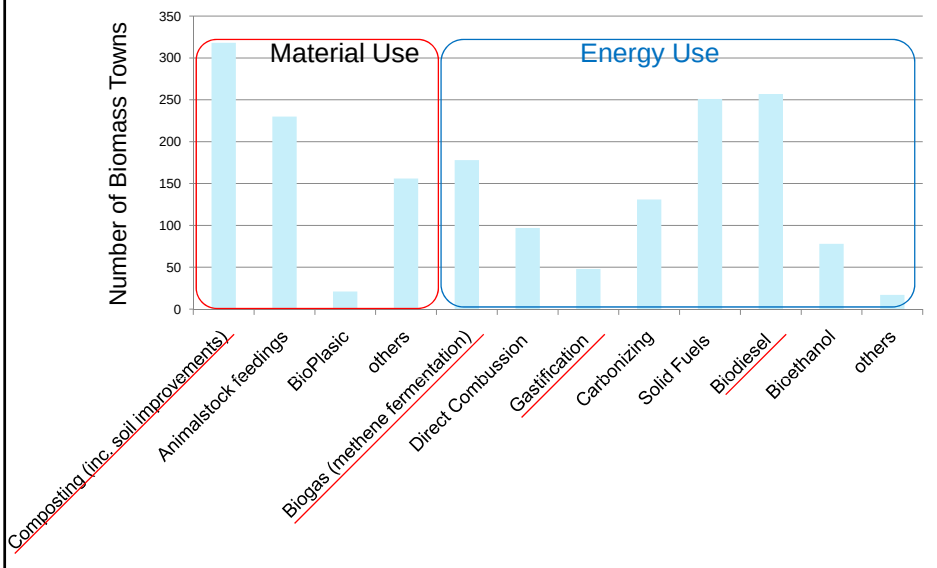
3. Biomass town



3. Biomass town (Biomass Source)

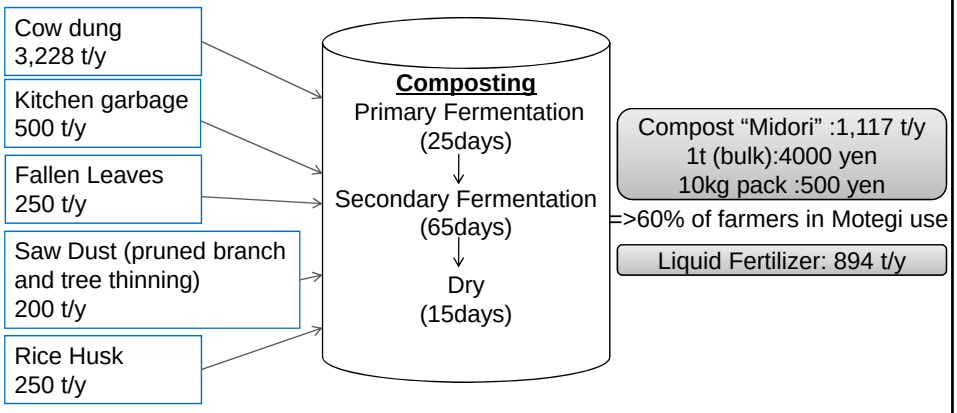


3. Biomass town (Transforming Tech.)



4. A Case of Composts from Organic Wastes

Motegi Town, Tochigi Prefecture (Population : 16,400, Area: 172 km2)



Source:
Mogi Town Biomass Plan

4. A Case of Composts from Organic Wastes (cont.) :Simple CO2/CH4 emission reduction

Kitchen garbage 500 t/y
Fallen Leaves 250 t/y
Saw Dust 200 t/y
Rice Husk 250 t/y

Avoid Incineration => CO2 reduction:
=Waste Amount [t/y]* (1- water %[-])* Carbon% [t-C/t]*44/12[t-CO2/t-C]
=[Kitchen garbage]+[Fallen Leaves]+[Saw Dust]+[Rice husk]
=([500* (1-0.90)*0.442]+ [250*(1-0.80)*0.409]+[200*(1-0.57)*0.518]+[250*(1-0.30)*0.409])*44/12
= **581.8 [t-CO2/y]**

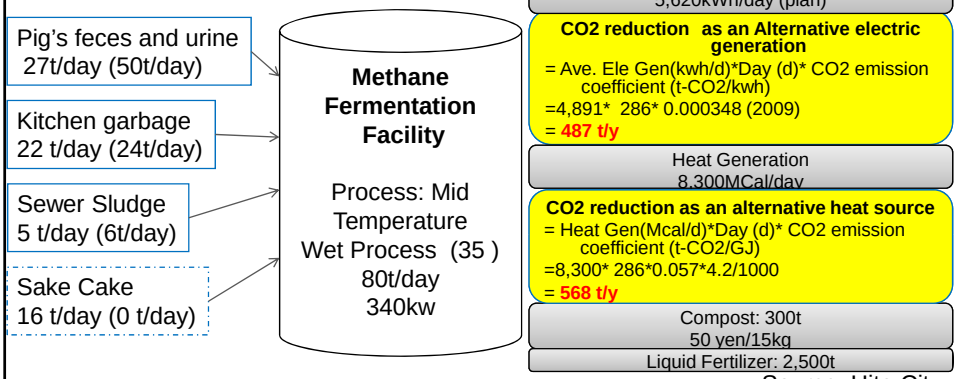
Cow dung 3,228 t/y

Avoid improper methane fermentation => CH4 reduction:
= [a case of compost]-[a case of pile in field]
= waste amount [t/y]*(coefficient(pile) [t-CH4/t]-coefficient(compost) [t-CH4/t])
= 3,228(0.038-0.00044)
= **121[t-CH4/y]**

If you are interested, please see this. **AM0025: Avoided emissions from organic waste through alternative waste treatment processes --- Version 12.0**

5. A Case of Biogas from Organic Wastes

Hita city, Oita Prefecture (Population: 72,000, Area: 666 km2 (82.8 %forest))
1.Waste issues on incineration and landfill
2.Global Warming,
3.Environmental Issues of stockbreeding

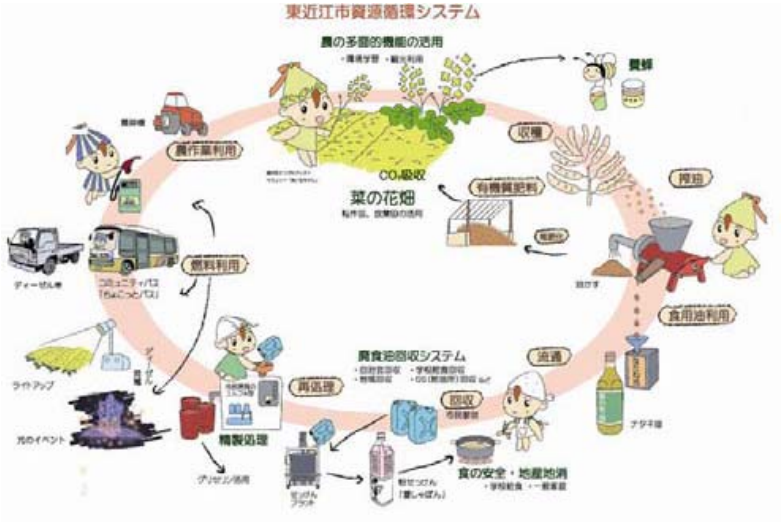


Source: Hita City

AM0025: Avoided emissions from organic waste through alternative waste treatment processes --- Version 12.0

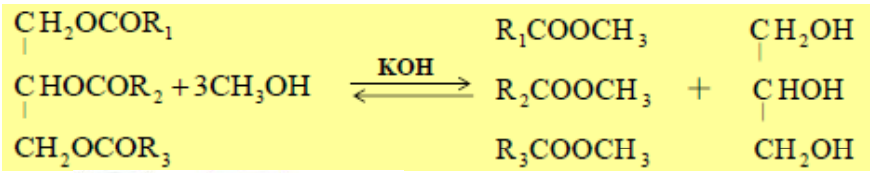
6. A Case of Biodiesel from Waste Cooking Oils

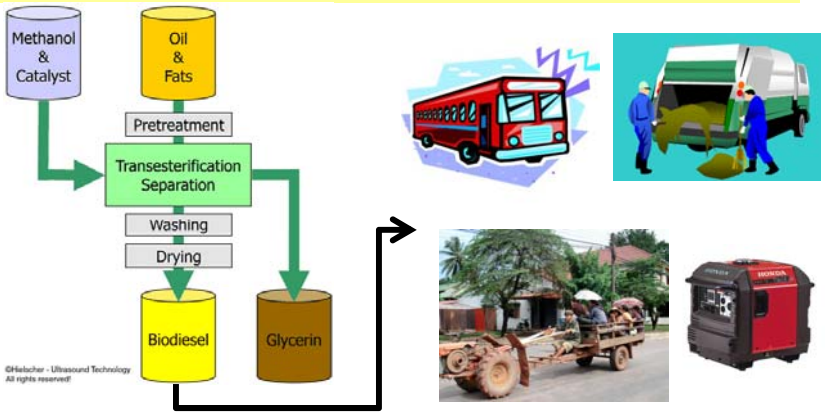
Higashi Omi city, Shiga Prefecture (Population : 116,797, Area: 388.58 km2)



Source: Higashi Omi City

6. A Case of Biodiesel from Waste Cooking Oils (cont.)





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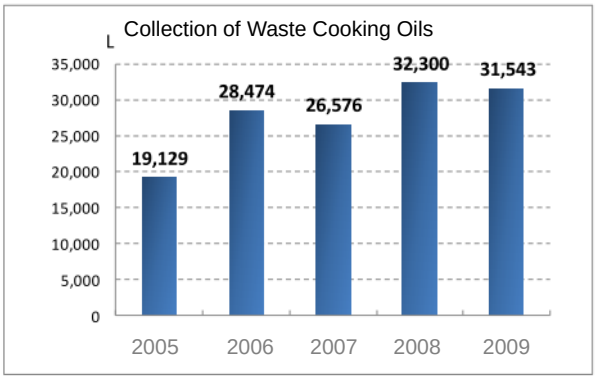
6. A Case of Biodiesel from Waste Cooking Oils (cont.)



Source:
Higashi Omi City

CO2 reduction as Diesel Alternative,
= Biodiesel Production * coefficient of CO2 emission of diesel use
= 25,000 [L/y] * 0.000705 [t-C/L]* 44/12 (g-CO2/g-C)
= **64.6 [t-CO2/y]**

Approved Methodology: ACM0017 “production of biodiesel for use as fuel”

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7. waste in Laos

What can be to energy from urban sectors in Laos?

- Kitchen Garbage
- Animals' feces and urine
- Waste cooking oils
- Rice husk and Straw
- Bagasse,
- Sludge etc.
- Coconuts shell
- etc.

How can we use the biomass?

- Existing facility
- Compost plant
- Biogas refinery
- Gasification facility
- etc.

8. A potential of gasification from rice husk in Laos

Year (1000ton)	1996	1997	1998	1999	2000
Rice	1,413	1,660	1,675	2,103	2,155
Corn	77	78	110	96	77
Sweet Potato	92	94	108	81	52
Vegetables	117	132	150	269	288
Sugar Cane	87	95	170	174	174
Coffee	10	12	17	18	23

Source: FAO

- Percentage of Rice production in Laos is high.
- Rice Production is increasing.
- 22% of processing amount will be rice husk

2,000,000 t/y*0.22 => Rice husk production: 440,000t/y.

8. A potential of gasification from rice husk in Laos

Heat(500- 600 ° C)

(C6H12O6)m → (H2+ CO+CH4+…..+C5H12) :Gas
:Biomass + (H2O+…+ CH3OH+CH3COOH+…) :Liquid
+ C : Char

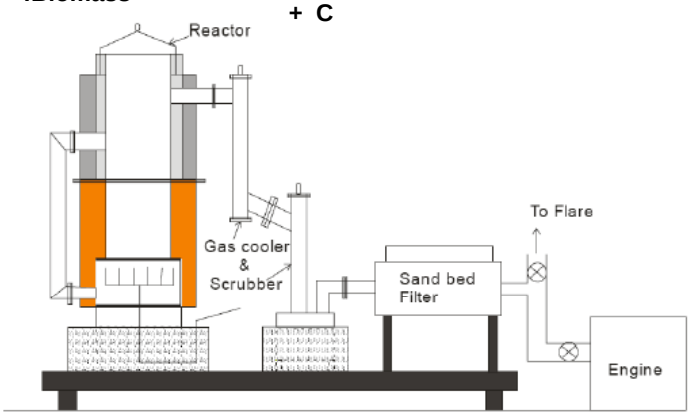


Figure 3 - Schematic representation biomass gasification

Source: www.bioenergy3.org

8. A potential of gasification from rice husk in Laos

Gasifier with rice husk to generate electricity

First Demonstration Biomass with rice husk

Supported by NEDO

Capacity : 200 kW

Implemented by TRI

(Technology Research Institute)

- 200kW gasifier with rice husks reduced 75% diesel consumption (5,500L/month)
- 6kg of Rice husk replaces about 1 liter of diesel. (based on the Calorie)

Source: P.A. Salam et al.(2010)

CO2 reduction from Diesel Replacement with a 200kW gasification system
= diesel reduction* coefficient of CO2 emission of diesel use
= 5,500*12 [L/y] * 0.000705 [t-C/L]* 44/12 [g-CO2/g-C]
= **170 [t-CO2/y]**

8. A potential of gasification from rice husk in Laos

Figure 2 Reed's Woodgas Campstove (left) for sale on the Internet (US$55) and Anderson's Juntos B+ TLUD gasifier (with removable fuel canister) hand-made in Cambodia with GERES (estimated cost under US$20). For cooking, the pot can be placed on top of the unit or (better) be positioned on a simple pot support structure of any size so that the gasifier can be moved for refilling without disturbing the pot. (*photos: Tom Reed, left, Paul Anderson, right*)

Source: http://www.hedon.info

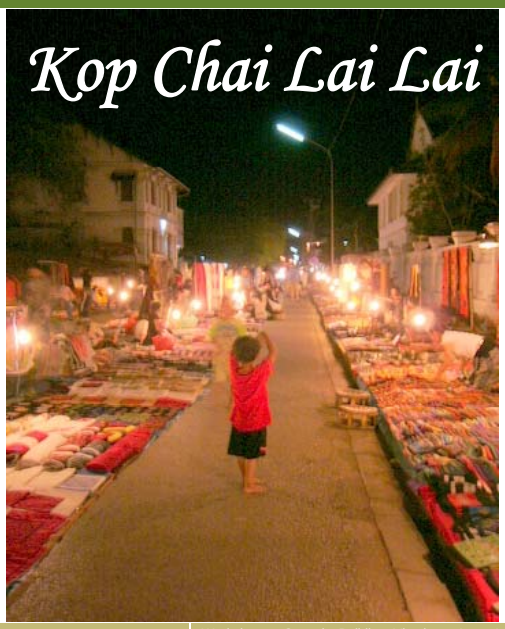
9. Summary and Keys of success

Summary

- There are several waste biomass in Urban area and several technologies can be applied to the existing waste biomass. Thus, the combination of utilization of waste biomass will be varied in countries, cities, and towns.
- Laos has a high potential of the waste biomass utilization for energy generation and material uses.

Keys of the Success

- First priority is proper waste management
- Involvement of Stakeholders
- Utilize existing facilities, technology, human resources, and waste management systems
- Separation at source and efficient collection are keys for success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