

# How to prepare and use compost for sustainable agriculture + Topics on Green Manure

## Part 5: Green manure and compost

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# Green-manure in agriculture

# Beneficial Effects of Green manure

- Increase soil fertility
- Suppress the problems associated with continuous cropping
- Improve soil physical properties (permeability, water holding capacity)
- Increase arbuscular mycorrhizal fungi.
- Increase root nodule bacteria/ Rhizobium.
- Kill nematodes
- Absorb excess nutrients
- Absorb toxic elements

# Concept of Green manure utilization

- Use of solar energy
- Conversion of CO<sub>2</sub> to organic carbon
- Soil improvement by plant
- Increase of soil fertility by symbiotic microbes
-  Use of natural rehabilitation process in agriculture

# Contrasting Concept of Compost Utilization

- Recycle organic wastes as resources
- Conversion of raw OM to stable OM
- Soil improvement by humified organic matter
- Increase of soil fertility by nutrient release from decomposing OM



- Use of humification process in agriculture

# Experiment plot for green manure (June 27, 2004)





Plowing in the oats grown after harvesting  
wheat

August 09, 2004,

Onion field in Kami-Yubetsu, Kamikawa, Hokkaido

Rye will be grown after harvesting





August 11, 2004,

Chiebun

Sun flower field in Chiebun  
Contribution to tourism



*Brassica juncea* (L.) Czern. et Coss.  
Application to phytoremediation



# White mustard (*Sinapis alba*, *Brassica alba*)



# Angeria

Prevent the disease of leek



# Crimson Clover

## Prevent cyst-nematodes of soy-bean



# Hay-oats (Wild oats)

Prevent root nodule nematodes



# Milk vetch

used for paddy field



# Various green manures recommended in Hokkaido



Sunflower



Hairy vetch



Sinapis alba



# Use of harvest residue of ear-corn for green manure



Now  
studying



To increase forage  
production in Japan

# Green manure and compost comparison

## 1) Increase soil fertility

Green manure (G) = Compost (C)

- Nutrients in green manure will be released on decomposition.

## 2) Improve soil physical properties.     G = C

- Increase soil pore space by organic matter application.

# Green manure and compost comparison

3) Increase water permeability in soil

$$G > C$$

Root of green manure is long and strong.  
It penetrates through a hard sub-layer soil.  
Therefore, it improves water drainage.

# Green manure and compost comparison

4) Suppress the problems associated with  
continuous cropping.  $G \geq C$

Suppress plant pathogenic microbes

$$G \geq C$$

Suppress the activity of nematodes

$$> C$$

G

Increase the activity of soil microbes

$$G = C$$

# Green manure and compost comparison

5) Increase arbuscular mycorrhizal fungi.

$G > C$

6) Increase root nodule bacteria/ Rhizobium.

$G > C$

# Green manure and compost comparison

8) Contribution to environmental conservation

$G > C$

a. Soil erosion is suppressed by cover crop.

$G > C$

b. Growing green manure absorbs excess nutrients in soil. Fix mineral nitrogen temporarily into decomposing organic matter. only G

# Green manure and compost comparison

- 8) Contribution to environmental conservation  
G > C
- c. Absorb heavy metals (contribute to phyto-remediation) only G
- d. Contribute to the beautiful scenery of rural area. only G
- e. Fix CO<sub>2</sub> in air. No emission of harmful gasses. only G

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# Merits of green manure

- 1) Green manure can be applied uniformly to large area.  $G > C$
- 2) Quality of organic matter applied to the field is uniform.  $G > C$
- 3) Labor may be less compared with compost application. No transportation cost is necessary.  $G > C$

# Demerits of green manure

1) Adverse effects

$$G = C$$

- Stunt due to insufficient decomposition
- Nitrogen starvation due to high C/N
- Transfer disease and worm hazards due to improper combination of green manure and following crop

2) Need fallow period for growing green manure

$$G < C$$

# Demerits of green manure

- 3) Effect of green manure may differ by each species of green manure,
  - Therefore, almighty effects are not expected.

# Demerits of green manure

- 4) Combination between green manure and following crop should be considered.
- 5) Green manure sometimes increases nematodes by mixing into soil.

# Demerits of green manure

- 6) Seeds of may be expensive, but pure and good seed is necessary.
- 7) Green manure may turn to weed or wild grass on improper management.