Composting using Indigenous Microorganism (IMO)

Philippines

Composting is the natural process of decomposition of organic matter by microorganisms under controlled conditions.

Composting is the decomposition of grass and weeds as fertilizer with the aid of indigenous microorganisms (IMO).This technology is practiced to produce compost used in the farm. Compost is a rich source of organic matter which improves soil tilth. Its decomposition slowly release available nutrients for plant uptake.Material used in the production are weeds and bio waste available in the farm which include Agetarum houstonianum, Dentella repens, Setaria palmifolia, Ipomea aquatica, Echinochloa crusgali, Helianthus annuus and Digitaria ciliaris. The compost is applied in the organic vegetable production of the farm. Vegetables planted include lettuce, herbs, kale and others that are used for garden salads.
The purpose of composting is to produce compost that are utilized as fertilizer for the soil. It is done to reduce the input cost of using chemical fertilizer and to avoid lasting harms to the soils and the environment (e.g. formation of impermeable layer "hardpan", affection of micro-organisms, and upsetting of pH).
The initial step in making compost is gathering of raw materials such as weeds and grasses available in the farm. Then, these are shredded and sprayed with IMO to hasten the decomposition. IMO is produced by mixing one tablespoon of forest soil and one tablespoon of sugar/molasses in one liter of water. A portion of the mixture (250ml) is extracted and diluted in a 16 liter knapsack sprayer. The diluted mixture is sprayed to the shredded grasses/weeds and left to decompose for 14 days. For a 1 ton of shredded grass and weeds, 16L of diluted mixture is needed.
Master's Garden of Mr. Ambrocio Acosta is located at Barangay Puguis, La Trinidad, Benguet. The province is classified under Type I climate by the Coronas System of classification with distinct wet and dry seasons with an average annual rainfall of 3,879 mm. The dry season is from November to April while the wet season is from May to October. The farm has an elevation of 1,342 meters above sea level with less than 40% slope. The farm was manually terraced with UV treated plastic shed. The production system is manually managed and cultivated by Mr. Acosta and his two farm laborers.

left: Compost chamber
right: Fully decomposed organic matter (compost) after 14 days

Location: La Trinidad, Benguet
Technology area: < 0.1 km2 (10 ha)
Conservation measure: agronomic
Stage of intervention: mitigation / reduction of land degradation
Origin: Developed through land user`s initiative, 10-50 years ago
Land use type:
Cropland: Annual cropping
Cropland: Perennial (non-woody) cropping
Land use:
Grazing land: Extensive grazing land (before), Cropland: Annual cropping (after)
Climate: humid, tropics
WOCAT database reference: T_PHI063en
Related approach:
Compiled by: Philippine Overview of Conservation Approaches and Technologies, Bureau of Soils and Water Management
Date: 2013-09-15
Contact person: Ambrocio Acosta, The Master's Garden, Barangay Puguis, La Trinidad, Benguet, 09179258499

Classification

Land use problems:

- Since the farm has steep slope, soil erosion was prevalent resulting to low fertility of the soil (expert's point of view)
Soil erosion caused by rainfall leaving them nothing but an exposed subsoil layer. (land user's point of view)

Land use

Annual cropping
Perennial (non-woody) cropping
Grazing land: Extensive grazing land (before)
Cropland: Annual cropping (after)
full irrigation

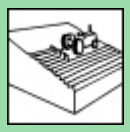
Climate

humid

Degradation

Soil erosion by water: loss of topsoil / surface erosion,
Chemical soil deterioration: fertility decline and reduced organic matter content

Conservation measure



Agronomic: Organic matter / soil fertility

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land users initiative: 10-50 years ago
- Experiments / Research: 10-50 years ago
- Externally introduced

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:
Direct causes - Natural: Heavy / extreme rainfall (intensity/amounts), other natural causes, extreme topography(steep slope >40%

Main technical functions:
- increase in organic matter
- increase in nutrient availability (supply, recycling,...)

Secondary technical functions:
- improvement of topsoil structure (compaction)
- increase of infiltration

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: low
Ground water table: 5 - 50 m
Availability of surface water: good
Water quality: for agricultural use only
Biodiversity: high

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: floods
If sensitive, what modifications were made / are possible: The pile of shredded grass and weeds that will be decomposed into compost were housed under a shed protected from rain and exposure from heat of the sun.

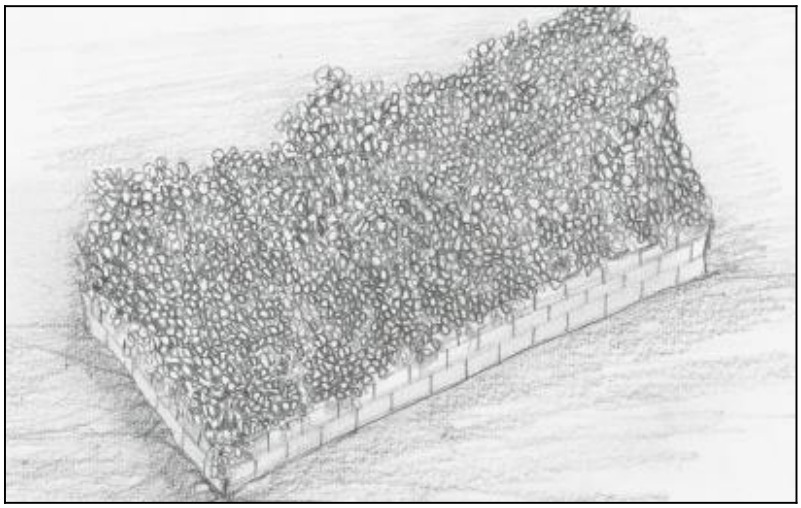
Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, medium scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 3% - 4%
Land ownership: individual, titled
Land use rights: individual
Relative level of wealth: average, which represents 100% of the land users; 100% of the total area is owned by average land users

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: moderate: health, financial services; high: education, technical assistance, employment (eg off-farm), market, energy, roads & transport, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)



Technical drawing

Compost piled in a cemented box. (Patricio A. Yambot)

Implementation activities, inputs and costs

Establishment activities

- Procurement of sprayer, shredder, seedling pots and trays
- Establishment of composite chamber (shed)

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Equipment		
- Sprayer	22.22	100%
- Shredder	2222.22	100%
Other		
- Compost chamber (shed)	155.56	100%
- Seedling trays	55.56	100%
- Seedling pots	2.22	100%
TOTAL	**2457.78**	**100.00%**

Maintenance/recurrent activities

- Hauling of grass and weeds available in the farm
- Shredding of grass and weeds
- Spraying the shredded grass and weeds with indigenous microorganisms (IMO)
- Leave for 14 days to decompose
- Application of Compost

Maintenance/recurrent inputs and costs per unit per year

Inputs	Costs (US$)	% met by land user
Labour	55.57	100%
TOTAL	**55.57**	**100.00%**

Remarks:
The determinate factor affecting the cost is the cost of mechanical shredder. This machine is considered as important investment to those who is serious in engaging and practicing organic farming in a sizable farm like Mr. Ambrocio Acosta. The calculation is based on the initial establishment cost (e.g. machine and tools) spend by Mr. Acosta on 2003.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ increased crop yield	
++ reduced expenses on agricultural inputs	
+ increased farm income	

Socio-cultural benefits	Socio-cultural disadvantages
+++ increased recreational opportunities	
+++ improved health	

Ecological benefits	Ecological disadvantages
++ increased biomass above ground C	
++ reduced soil compaction	

Off-site benefits	Off-site disadvantages

Contribution to human well-being / livelihoods

++ Composting is the decomposition of organic matter into compost which is the alternate for chemical/inorganic fertilizer as source of nutrients for crops. The use of compost prevents the farmers from exposure to harmful effects of chemical fertilizer and protects the consumer on the adverse effects of chemicals on the farm produce. Increased awareness and market demands including premium price for organic crops makes the Organic Farming an impressive source of livelihood and business.

Benefits /costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance / recurrent	very positive	very positive

Acceptance / adoption:

100% of land user families (1 families; 100% of area) have implemented the technology voluntary. Voluntary adoption of the technology was observed since the land owner, Mr. Ambrosio Acosta , was a member and a previous officer of a small group of organic farmers, the La Trinidad Organic Producers (LATOP) and was also an accredited resource speaker/ trainer for Organic Agriculture-related events/forum.
There is moderate trend towards (growing) spontaneous adoption of the technology. It was observed that there is an increased awareness on the harmful effects of chemical inputs on the soil and its negative impact on human health. There is also an increase in demand for organically grown vegetables in the local market.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Application of compost increases soil organic matter that promotes soil aggregation and improves soil condition. →	High initial investment cost in the purchase of equipment, tools and other supplies to start the technology. → Equipment and materials purchased are used for long term.
Decomposition of the compost slowy releases nutrients like N, P and K that were readily available to plants. →	
It reduces farm production cost. →	
Compost increases the organic matter of the soil thus improving soil tilth. Also, it contributes to prevent incidence of plant pathogens,and insect diseases, infestation. →	
Compost as fertilizer provides nutrients to the crops →	