TERRA URBANA

Umlandentwicklungs GmbH

Seminar Composting

PRO Arkades

KompostierungsGmbH & Co.KG

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Introduction of a compost und substrate production in Laos integrating environmental and product processing aspects

organisation by:	**LITSE** Lao State International Trade and Services Enterprise, Vientiane / Laos and **Pro Arkades** Kompostierungsgesellschaft mbH & Co.KG Berlin / Deutschland
local partner:	Ourworld rural development Co. Ltd. Vientiane / Laos Neo Siam Biz, Bangkok / Thailand TERRA URBANA Umlandentwicklungsgesellschaft mbH Premnitz / Deutschland IBP – Ingenieurbüro Dr. Frank Panning Berlin / Deutschland

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structure of presentation

Introduction of a compost und substrate production in Laos integrating environmental and product processing aspects

I. composting principles

factors in composting:

- aeration
- water content
- temperature
- pore volume
- pH-value
- C/N-relation

II. techniques

1. source material
2. process
3. biology
4. hygiene
5. emissions
6. vermicomposting

III. operating procedure

1. acceptance
2. interim storage and treatment
3. intensiv rotting
4. refinement
5. pre-rotting/ storage
6. marketing / substrate production / soil conditioning
7. vermicomposting

IV. compost

1. characteristics
2. advantages
3. Basis for substrates

COMPOSTING …

…means biological decomposition and alteration of organic waste and residue under aerobic conditions (with atmospheric oxygen).

The result of this process is compost, which is used for soil improvement and as fertilizer.

Factors in Composting

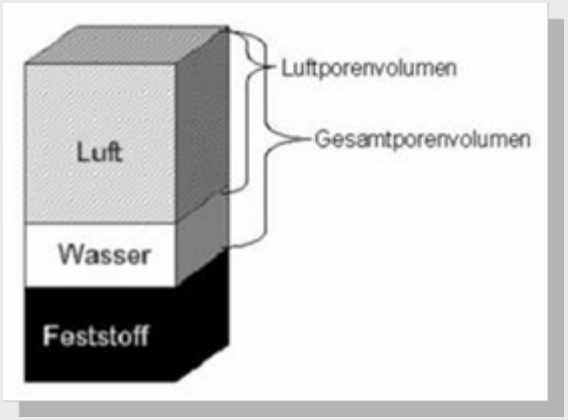
1. **Aeration**
2. **Water content**
3. **Temperature**
4. **pH-value**
5. **C:N-ratio**

Functions of aeration:

- **Supply of oxygen to microorganisms**
- **Expulsion of water for drying of rotting materials**
- **Prevention of heat build-up**
- **Limitation of nitrogen discharge**
- **Discharge of CO_2**

Attainment of optimal areation conditions through:

- **High air void volume**
- optimal between 30 – 50 %
  appropriate water content (fist test)



- **Shape of compost heap**
  high surface area for gas exchange
- **Admixing of structuring material**
  i.e. green and wood cuttings

- **regular turning**

  prevention of compression

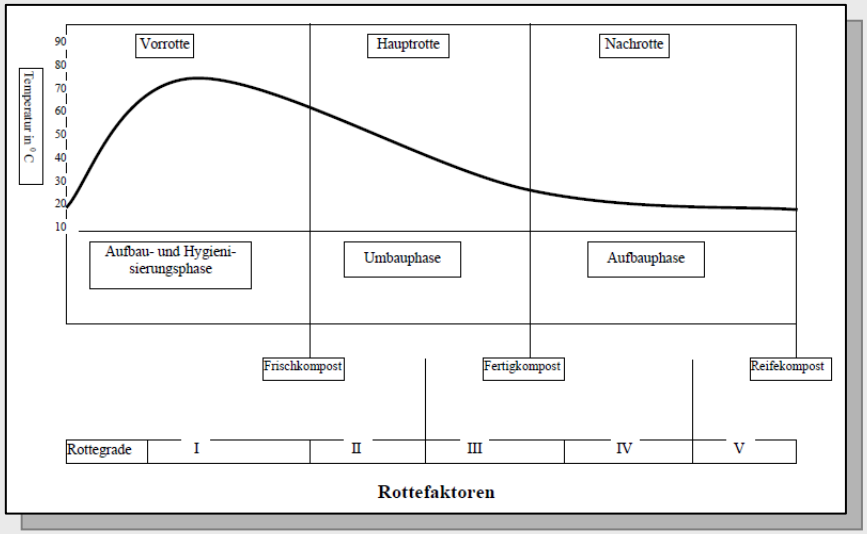
- **control through measurement**
  i.e. via compost testing probe
  measurement of oxygen contents in feed and exhaust air

2. Water content

- **Function of water:** nutrient supply of microorganism
- during rotting process water is outcoming as a decomposition product
- optimal water content: **40 – 60 %**
- at a water content **< 20 %** the rotting process is disrupting
- at a water content **> 70 %** anoxia
- simple determination by fist test
- warranty of uniform humidification by periodical tramming of the heap

- **release of decomposition heat by microorganism**
  → self heating of rotting material

- **temperature-phased classification of the composting process**



1) initialic phase
→ decomposition of easy available material by fungi and microorganism
→ increase of temperature to 50°C

2) thermophilic phase
→ heat-resistant types of bacteria and fungi
→ increase of temperature up to 80°C

3) phase of conversion
→ conversion process is continued by thermophilic microflora by relativly high temperatures (30 – 70°C)

4) build-up phase
→ decomposition of persistent material by mesophilic bacteria, fungi and macroflora
→ decreasing, low temperatures

pH-value

- in the course of rotting process pH-value is changing
- optimal pH-value: among 7 and 9

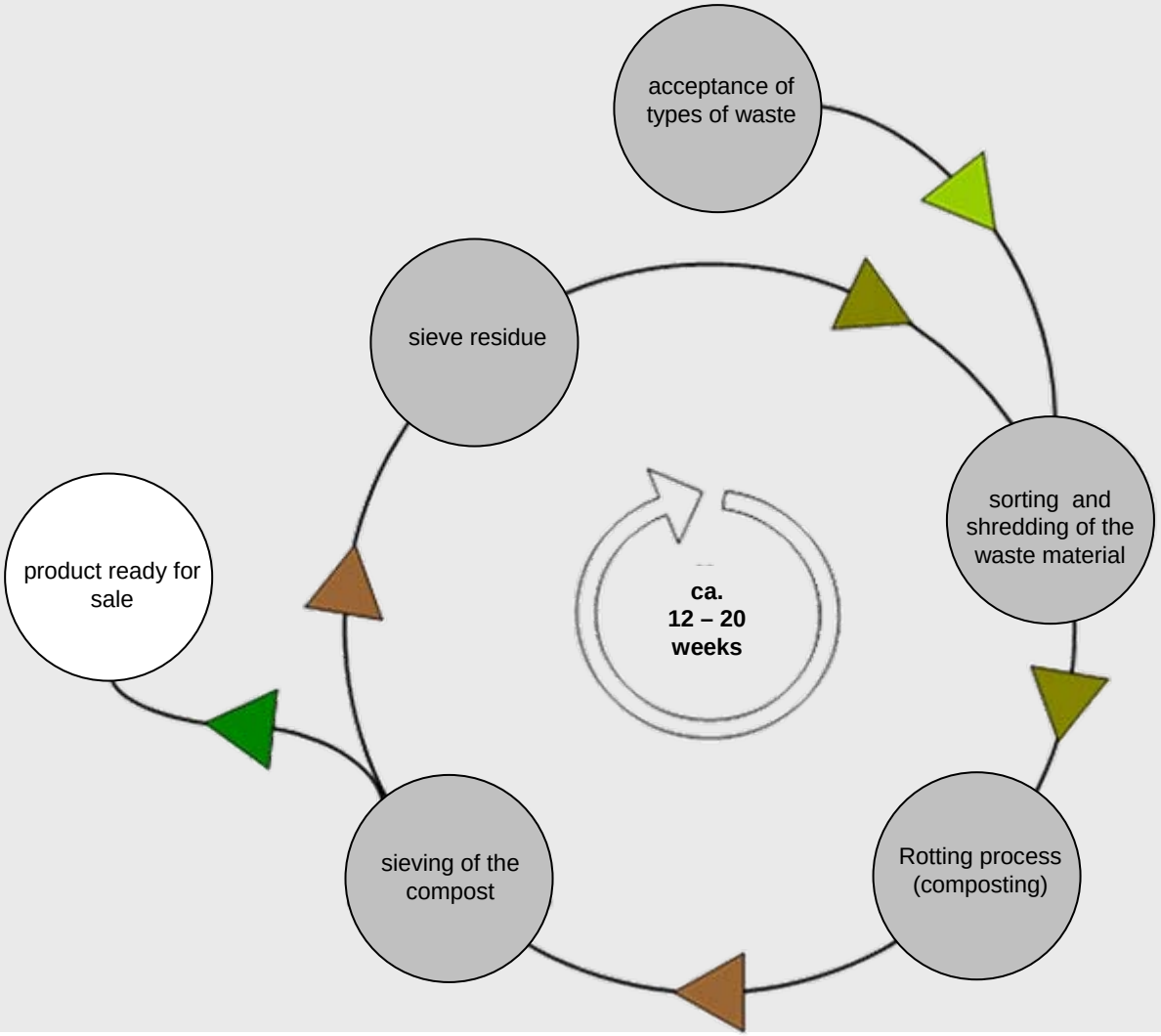
C/N-ratio

- is determining the decomposition rate
- optimal C/N-ratio: 35 – 40:1
- to high carbon (C) –content inhibits decomposition rate
- to much nitrogen (N) leads to formation of ammonia

1. **Raw materials**
2. **Process**
3. **Biology**
4. **Hygiene**
5. **Emissions**
6. **Vermicomposting**

Raw materials are all solid organics that can be decomposed and converted by microorganism, soil-born organism (e.g. worms) or enzymes

all kinds of vegetable waste	all kind of organic waste from household	other organic waste
• entire plants, • stalks, • foliage, • withered gras crop, • hedge- and tree-cuttings • et al.	• flowers, • deposits of fruits and vegetables • coffee and tea grounds, • eggshells, wood ash, • hygienic and crumpled paper, also newsprint in small amounts • et al. **= biowaste**	• litter and manure of keeping small domestic animals, • marc, • straw, • saw dust • et al.


acceptance of types of waste
sieve residue
sorting and shredding of the waste material
product ready for sale
ca. 12 – 20 weeks
sieving of the compost
Rotting process (composting)

Composting is based on the activity of microorganisms

- heterotrophic bacteria
  (using carbon from organics to build-up own body elements)

- actinomycetes

- fungi

- protozoa

- Eradication of pathogenics and weed seeds through self heating **> 55 °C** of the rotting material

- **possible emissions by composting facilities**
  - odor
  - noise
  - germs (bakteria, fungi, virus) and dust
  - liqiud emissions (e.g. press- and process water)
  - gaseous emissions (formation of climate relevant gases: N_2O, CH_4, NO)

- **reduction of emissions through:**
  - structural and procedural measures
  - an operational management in best practise

Accelerated composting of organic waste by microorganisms (bakteria, fungi) and compost worms

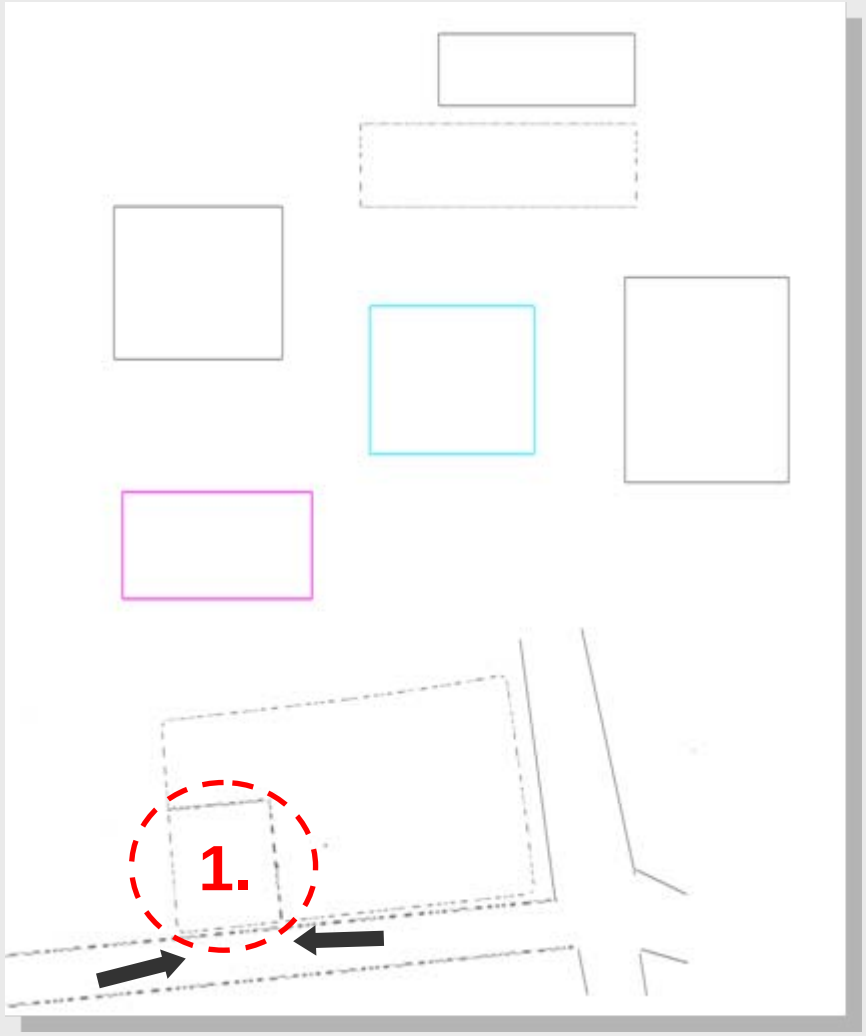
- excrements of worms contain microorganisms (bacteria, fungi) → pre-decomposition of the organics by microorganism
- the pre-decomposed organics in combination with mineral matter is transformed into vermicompost by worms
- cold rotting process = temperatures below than 50°C

vermicompost …

- **is high in microorganism, enzymes and nutritions**
- **has an optimal nutrient supply linked in clay-humus-complexes**
- **is good plant available**

1. Acceptance
2. Interim storage and treatment
3. Intensive rotting
4. Refinement
5. Pre-rotting / storage
6. Marketing / substrate production / soil conditioning
7. Vermicomposting

- Raw material acceptance in special areas
- Different waste materials are registered and stored seperately
- Accepted waste is documented in a concerning kind, amount (approximation of volume) and origin in an operation diary
- Organoleptic inspection of incoming materials (assesment of scent, appearence, color)
- Removal of impurities (gathering of inappropriate material from composting matter)



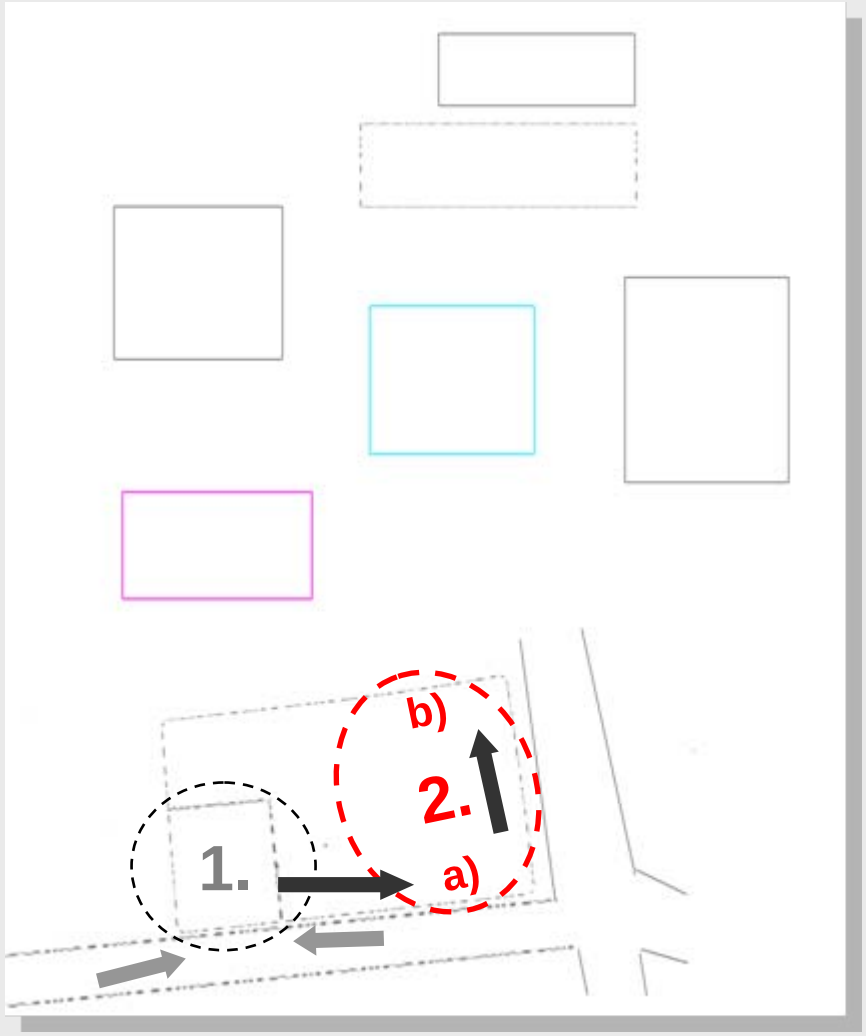
a) Interim storage

- Storage of material until further processing

b) Treatment

- Shredding of big woody raw materials

- Mixing of raw materials for homogenization (via manpower and/or small device)

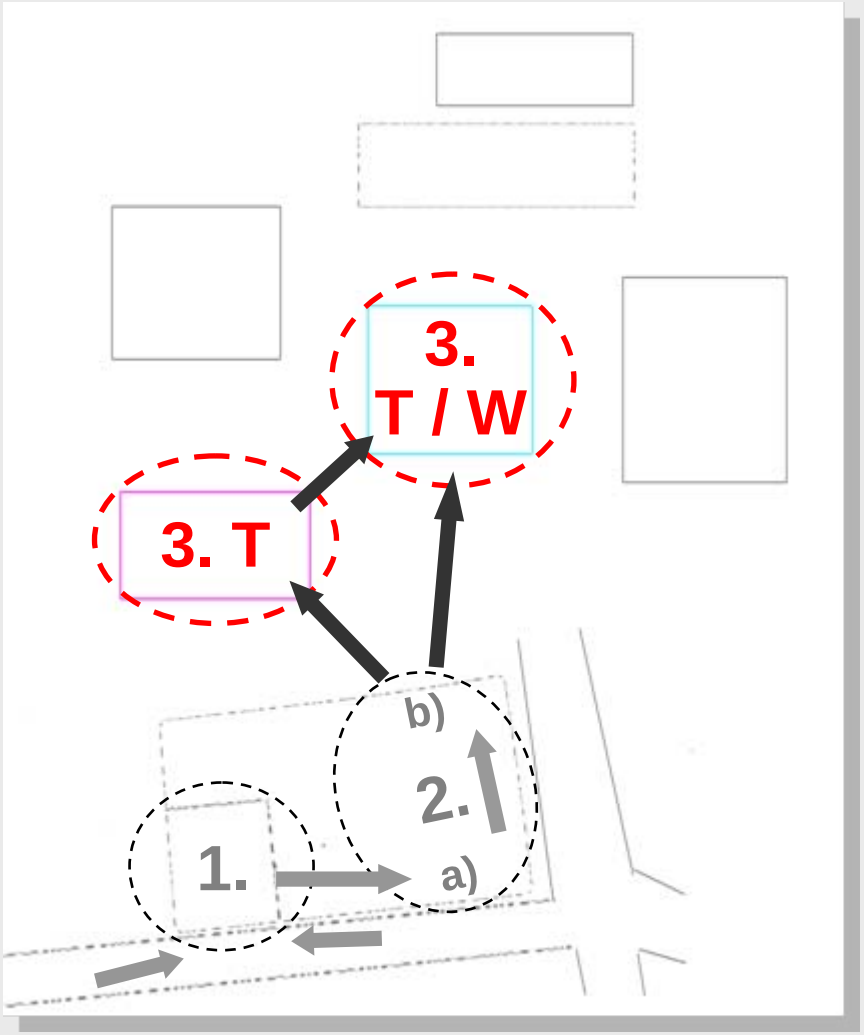


Construction of open trapezoidal compost heap (T)

- Turning after 4 weeks
- Subsequent turning intervals concerning to rotting stage and temperature progress

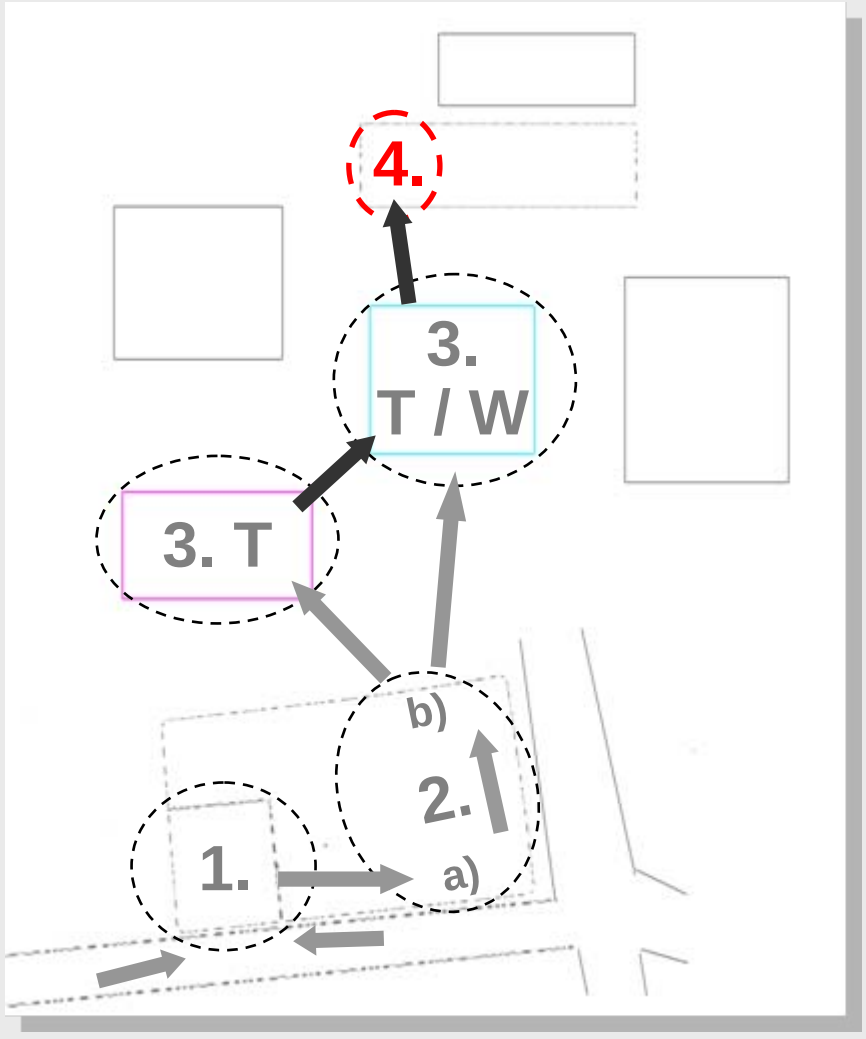
Erection of vermicomposting (W)

Control and monitoring of temperature and water content in compost heap



Sieving of composting product

- Removal of impurities
- Fine- and coarse grain sieves (12-25 mm)
- Interim storage and refinement of fresh compost in bags
- Usage of sieving residuals as structuring material for renewed composting

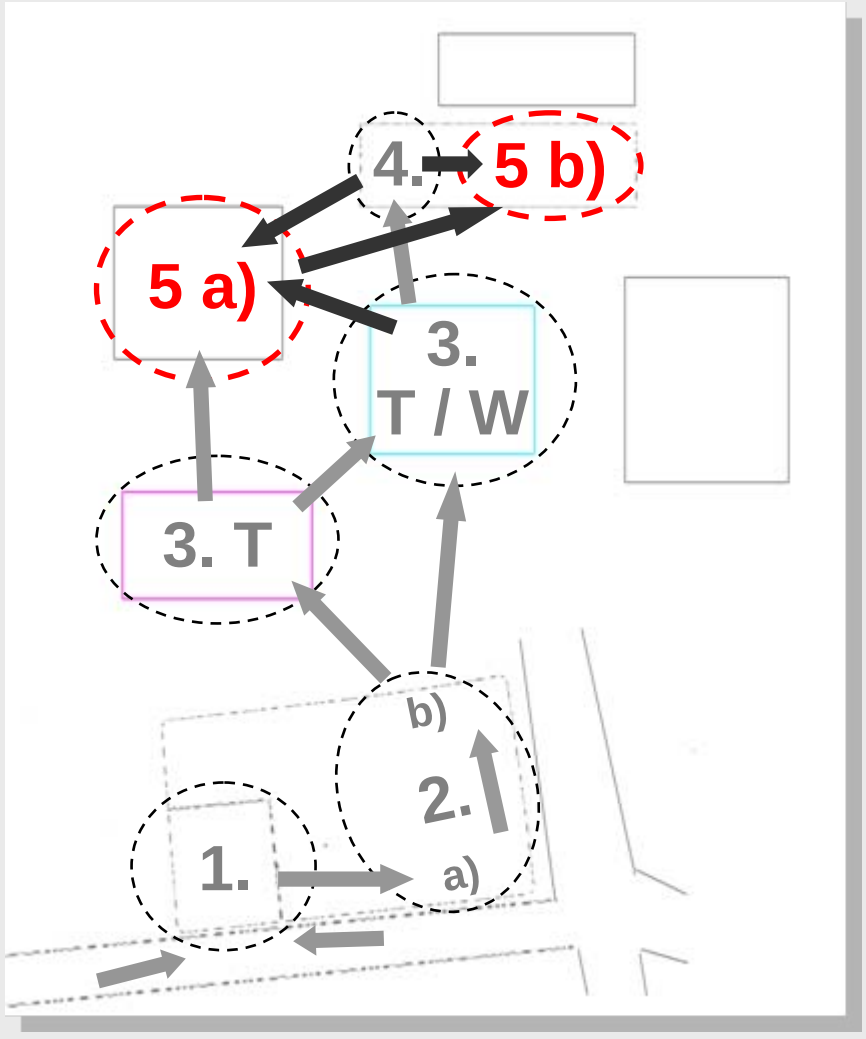


a) post-rotting = maturation phase for biological stabilisation of compost

- Fresh compost develops into mature compost
- Regular monitoring of temperature and water content (visual control and fist test)
- Covering may be required

b) storage

- Protection from rewetting and dehydration
- Regular turning or aeration
- adequate labelling of individual compost batches

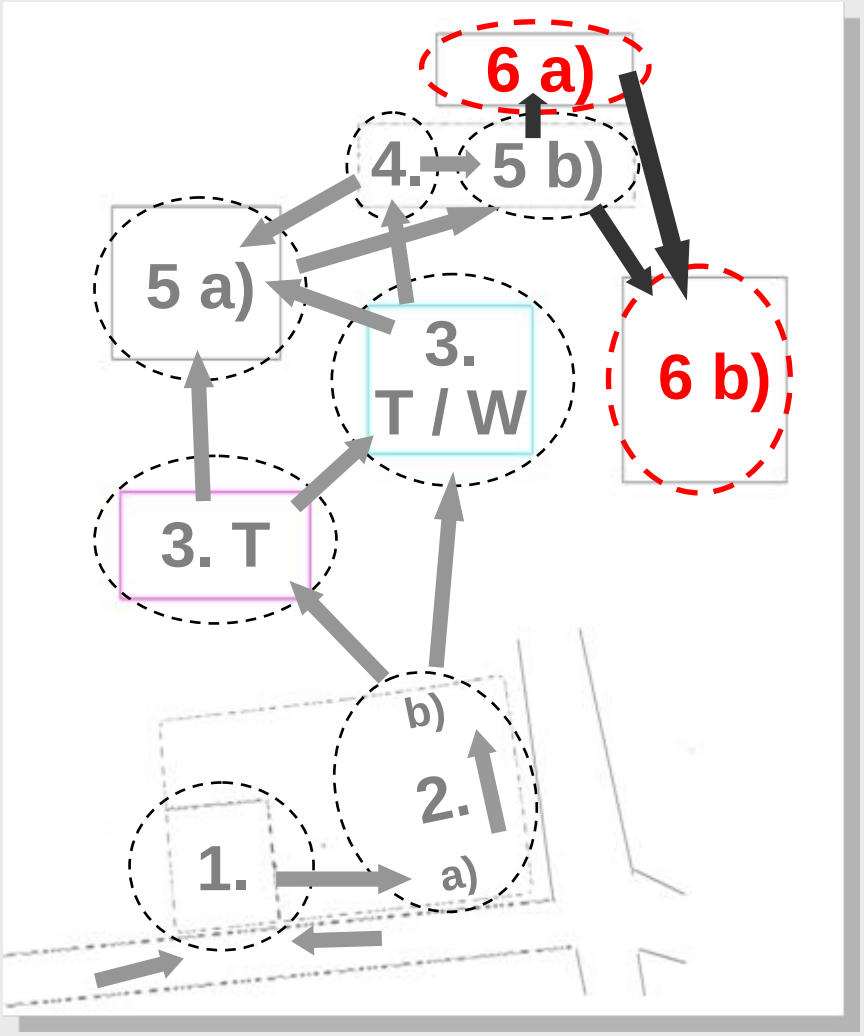


a) Substrate production / soil conditioning

- Pre-comminution
- Adjustment of water content if necessary (in order to preserve a suitable moisture content for further processing and/or storage)
- Addition of aggregates and/or soil for production of substrates
- Documentation for filling and final storage
- Refinement in bags

b) Final storage and marketing

- Protection from rewetting and dehydration
- Regular turning and aeration
- adequate labelling of individual compost batches



- Building of flat compost heaps
- Application of comminuted and half-way rotten carrier substrate containing 10-15% mineral soil
- Application of ca. 1.000 worms per m² on compost heap
- Regular addition of fodder in spreads every 10 days
- Wurmmiete leicht feucht halten
- Separieren und Umsetzen der Würmer in neu vorbereitete Miete

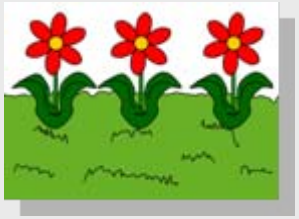
1. **Properties of compost**
2. **Advantages of using compost**
3. **Basis for substrates**

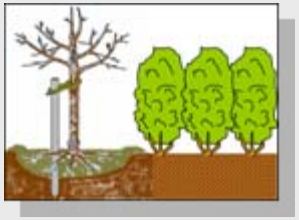
properties

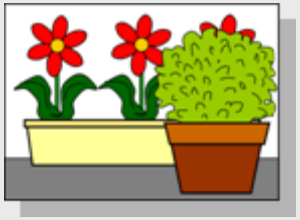
- Increasement of humus contents in soils
- Improvement of soil aeration
- Improvement of water retention capacity of soils
- Continuous nutrient supply of plants
- Activation of soil life
- Variable granulation: fine to coarse grained
- Weed-free

Application areas

- Cultivation of plants
- Conditioning of poor and leached out soils
- in agriculture and horticulture







a) Biological and chemical advantages

- Build-up of humus through additional organic substance
- Fertilizing effect through additional nutrients
- Slow release of nutrients from compost
- Increase of biological activity in soil
- Improvement of nutrient uptake from soil
- Reduction of nutrient eluviation

b) Physical advantages

- Improvement of water and air balance in soil
- Facilitated workability of soil

- **Function of aggregates in substrates:**

  Usage as structural material and for improvement of water and nutrient retention capacity

- **separate storage of compost, prepared soil and aggregates**

- **Individual compilation filling of substrate mixtures adapted to special requirements of soil and plant species**

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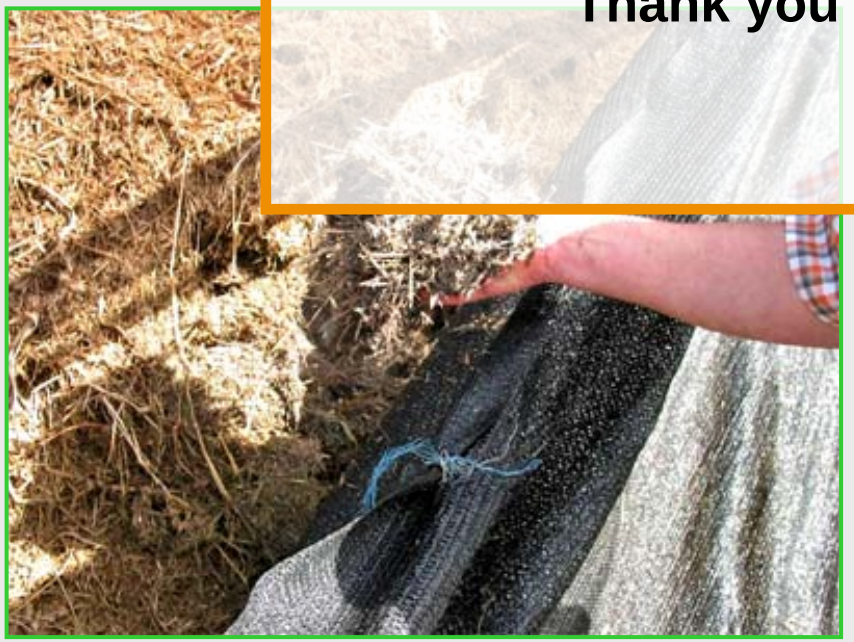
Thank you for attention!



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