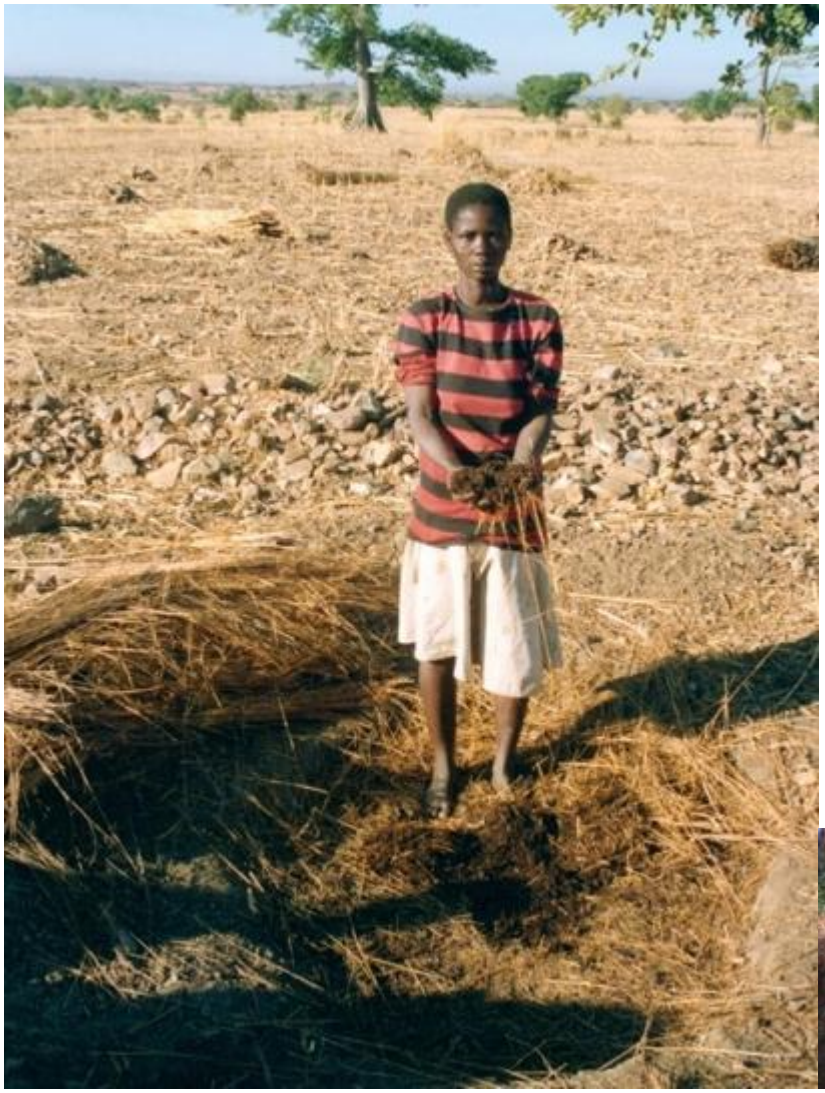


# Composting associated with planting pits

**Burkina Faso - Zai avec apport de compost (french)**

## Compost production, and its application in planting pits (zai) by farmers on fields near their homes.

Compost is produced in shallow pits, approximately 20 cm deep and 1.5 m by 3 m wide. During November and December layers of chopped crop residues, animal dung and ash are heaped, as they become available, up to 1.5 m high and watered. The pile is covered with straw and left to heat up and decompose. After around 15-20 days the compost is turned over into a second pile and watered again. This is repeated up to three times - as long as water is available. Compost heaps are usually located close to the homestead. Alternatively, compost can be produced in pits which are up to one metre deep. Organic material is filled to ground level. The pit captures rain water, which makes this method of composting a valuable option in dry areas. The compost is either applied immediately to irrigated gardens, or kept in a dry shaded place for the next sorghum seeding. In the latter case one handful of compost is mixed with loose soil in each planting pit (zai). These pits are dug 60 cm by 60 cm apart. Three to four grains of sorghum are planted in each pit. Compost in the pits both conserves water and supplies nutrients. This enables the sorghum plants to establish better, grow faster and reach maturity before the rains finish. As compost is applied locally to the crop, not only is the positive effect maximised, but also the weeds between the pits do not benefit. The water retaining capacity of the compost (absorbing several times its own weight) makes the difference. This is much more important than the additional nutrients, which only become available in subsequent years, and do not anyway completely replace all the nutrients extracted by the crops. The planting pits also help by harvesting runoff water from the microcatchments between them. Boulgou experiences erratic and variable rainfall with frequent droughts. The poor soils are often crusted and have a low water-retention capacity. Due to a high and increasing population, the land has become exhausted, and fallow periods are no longer sufficient as a consequence. Fertility and yields have declined. Sorghum without compost is more vulnerable to drought and crop failure. During the dry season, after harvest, fields are grazed by cattle of the nomadic pastoral Peuhl, who also herd the agriculturalists' livestock. Interestingly, the Peuhl have started to systematically collect the manure for sale, since the increased demand (for composting) has led to doubling of the price. Composting has been applied in Boulgou Province of Burkina Faso since 1988.

**left:** After her training, this young farmer succeeded in compost making. She is seen holding composted material ready for use: next to her is a heap still decomposing, under ist straw cover. (Photo: Reynold Chatelain)
**right:** Compost pits in Bam province with low containing walls: Pit compost requires little or no additional water and is preferable in dry zones. (Photo: William Critchley)

Location: Boulgou Province, Burkina Faso
Technology area: 200 km²
Conservation measure: agronomic
Stage of intervention: mitigation / reduction of land degradation
Origin: Developed externally / introduced through project,
Land use type:
Mixed: Agro-pastoralism
Climate: semi-arid, tropics
WOCAT database reference: T_BRK010en
Related approach: Programme agroecologique de l'association des femmes Pag-La-Yiri de Zabré (AFZ) (BRK10f), Zabré women's agroecological programme (BRK10e)
Compiled by: Not registered
Date: 2002-08-01
Contact person: Elisée Ouedraogo, Ingénieur agronome, c/o CEAS, 2 rue de la Côte, 2000 Neuchâtel, Switzerland; oelisee@hotmail.com
www.ceas.ch

## Classification

### Land use problems:

- Population increase has led to cultivation of all the available arable land, thus shortening or eliminating fallow periods. Organic matter in the soil is reduced, the water holding capacity of the soil has diminished and consequently yields have fallen. This has been compounded by the droughts of the 1970s and 1980s. Thirty years ago farmers harvested 800 kg/ha each year, but by the 1980s yields had fallen to merely 400 kg/ha on average. (expert's point of view)

**Land use**

Agro-pastoralism
rainfed

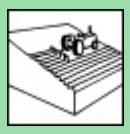
**Climate**

semi-arid

**Degradation**

Soil erosion by water: loss of topsoil / surface erosion, Chemical soil deterioration: fertility decline and reduced organic matter content, Physical soil deterioration: compaction, sealing and crusting, Water degradation: aridification

**Conservation measure**



Agronomic

**Stage of intervention**

- Prevention
- Mitigation / Reduction
- Rehabilitation

**Origin**

- Land users initiative
- Experiments / Research
- Externally introduced

**Level of technical knowledge**

- Agricultural advisor
- Land user

**Main causes of land degradation:**
Direct causes - Human induced: over-exploitation of vegetation for domestic use, other human induced causes, causes agricoles: Suppression des jachères; surpâturage
Direct causes - Natural: other natural causes, Secheresse du sol due à la destruction de l'humus plus qu'aumanque de pluie.
Indirect causes: Expansion démographique, manque de connaissances

**Main technical functions:**

- increase / maintain water stored in soil

**Secondary technical functions:**

- increase in organic matter
- increase of infiltration
- increase in soil fertility
- improvement of soil structure

## 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

**Growing season(s):** 180 days(May - Oct)
**Soil texture:** fine / heavy (clay)
**Soil fertility:** low
**Topsoil organic matter:** low (<1%)
**Soil drainage/infiltration:** poor (eg sealing /crusting)

**Soil water storage capacity:** low

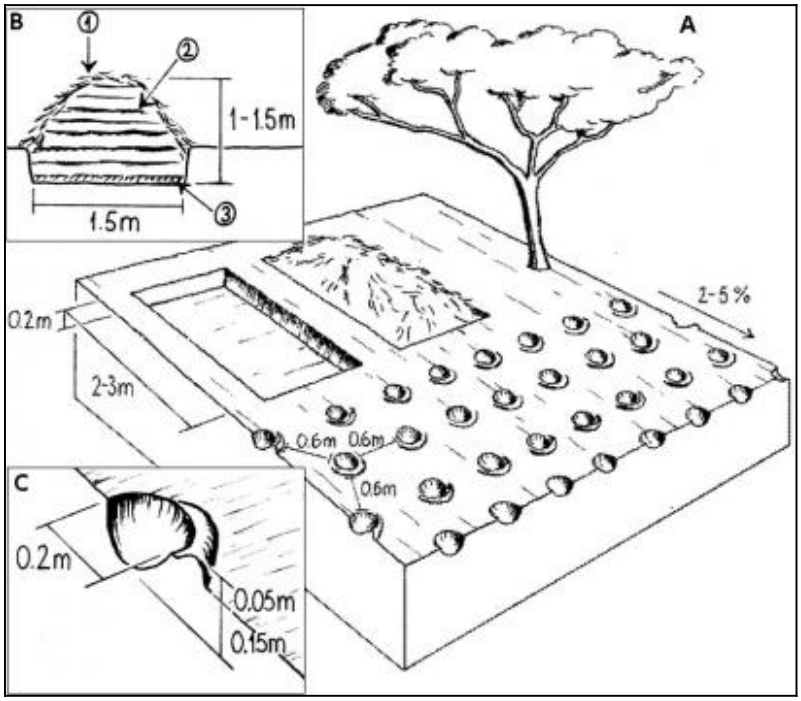
## Human Environment

**Mixed 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 ownership:** communal / village
**Land use rights:** communal (organised)

**Importance of off-farm income:** less than 10% of all income:
**Access to service and infrastructure:**
**Market orientation:** subsistence (self-supply)




**Technical drawing**

A: Overview of compost making and zai planting pits within a field. Tree shade helps to conserve moisture in the compost pits. B: Cross section of compost pit: protective straw (1); successive layers of compost (2), clay layer at the bottom (3). C: Detailed view of zai planting pit. (Mats Gurtner)

## Implementation activities, inputs and costs

### Establishment activities

**Establishment inputs and costs per ha**

| Inputs | Costs (US$) | % met by land user |
|---|---|---|
| Labour | 2.00 | 100% |
| Equipment | | |
| - tools | 10.00 | 100% |
| Construction material | | |
| - clay (m3) | 0.00 | % |
| **TOTAL** | **12.00** | **100.00%** |

## Maintenance/recurrent activities

- Put 20 cm layer of chopped crop residues (cereal straw) into the compost pit (water with one bucket). Add 5 cm layer of animal manure. Add 1 cm layer of ash. Repeat steps 1–3 until the compost pile is 1.0–1.5 m high.
- Dig two compost pits (3 m by 1.5 m and 20 cm deep). Cover the bottom of each pit with 3 cm clay layer.
- Turn compost after 15 days into the 2nd pit, then after another 15 days back into the 1st pit. Water the pile after each turning with 3 buckets of water.
- Store ready compost in dry shady place.
- Cover pile with straw to reduce evaporation, and leave to decompose.

**Maintenance/recurrent inputs and costs per ha per year**

| Inputs | Costs (US$) | % met by land user |
|---|---|---|
| Labour | 20.00 | 100% |
| Equipment | | |
| - Wheelbarrow renting | 6.00 | 100% |
| Construction material | | |
| - Wet straw | 0.00 | % |
| - clay (m3) | 0.00 | % |
| - ash | 0.00 | % |
| Agricultural | | |
| - compost/manure | 2.00 | 100% |
| Other | | |
| - Compost transportation | 2.00 | 100% |
| **TOTAL** | **30.00** | **100.00%** |

**Remarks:**
Duration of establishment: 1 week
Costs relate to production and application of one ton of compost per hectare - which a farmer can make in one year and is the product of one full compost pit. The compost is directly applied to each planting pit: since the pits all in all constitute only around 10-15% of the field surface, compost is effectively applied at a concentration of 7-10 t/ha. This rate is equal to actual rates applied in small irrigated gardens (<0.1 ha). If compost is produced in deep pits, production is cheaper because there is less work involved.

## Assessment

### Impacts of the Technology

**Production and socio-economic benefits**

+++ increased crop yield
+++ increased farm income
++ fodder production/quality increase

**Production and socio-economic disadvantages**

+ increased labour constraints
+ increased input constraints

**Socio-cultural benefits**

+++ community institution strengthening
++ improved conservation / erosion knowledge
++ integration of agriculturalists and pastoralists

**Socio-cultural disadvantages**

**Ecological benefits**

+++ increased soil moisture
++ improved excess water drainage
++ improved soil cover
++ increase in soil fertility

**Ecological disadvantages**

**Off-site benefits**

**Off-site disadvantages**

**Contribution to human well-being / livelihoods**

**Benefits /costs according to land user**

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

**Acceptance / adoption:**

100% of land user families have implemented the technology voluntary.
There is strong trend towards (growing) spontaneous adoption of the technology. Strong trend towards growing spontaneous adoption. Almost everybody wants to imitate neighbors - but not everyone had received adequate training. Demand grew because of the expanded membership of the association. Some pastoralists use it in their gardens.

## Concluding statements

| Strengths and → how to sustain/improve | Weaknesses and → how to overcome |
|---|---|
| All land users, even the poorest, can learn to make and apply compost. No jealousy amongst land users, which is a prerequisite for ist spread/acceptance → Keep going with training and extension. | The modest quantity of compost applied is not enough to replace the nutrients extracted by the crops in the long term → Small amounts of nitrogen and phosphorous fertiliser need to be added and crop rotation practiced. |
| Possibility of doubling cereal yields in normal years: any surplus production can be sold → Produce enough good compost/manure. | The short/medium term local benefits are not associated with a positive overall, long-term ecological impact because there is a net transfer of organic matter (manure) to the fields from the surroundings → Improve management of the vegetation outside the cropland, avoiding overgrazing etc to increase manure production. |
| Ensures yields in dry years, giving security against drought and hunger. → | Needs considerable water and thus also extra labour → Pit composting helps to reduce water requirement in drier areas and at the same time reduces labour input. |
| Gives high income in dry years due to production increase and double prices on the market for the surplus → However the government is attempting to stabilise prices, so this benefit might not endure. | |
| Requires only locally available resources, and knowledge about compost application is 'owned' by the farmers: nobody can take it away from them. → | |

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