



Bocashi Making

**Presented to the Participants of the
SHEP Training of Trainers(ToT) in
Jimma**



Practical Solutions

- Organic returning is one solution of nutrient deficiency
- How to improve soil fertility using on the ground materials
- How to use fermentation of organic materials
- The effects of organic usage
- Cost estimation

How to cure Nutrient Deficiency?

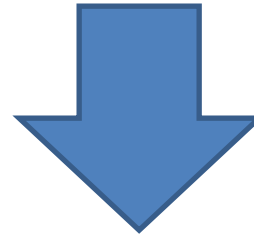
- Use organic fertilizer continuously
- Use green manure every year
- Proper Crop Rotation
- Not too much use chemical fertilizers
- Keeping soil fertility



How to keep sustainability

The keys of sustainable crop production are;

1. Returning Organic materials with proper manners (Use fermented organic fertilizer)
2. Less usage of chemicals (stop only chemical fertilization)
3. Crop rotation
4. Green manure usage



- ***Decrease anti-direction of plant succession***
- ***Improving soil microflora***

Use Fermented Organic fertilizers (Bokashi)

- Why the western countries still stick on returning organic??
 - Quality improvement
 - Keeping soil fertility (stop desertification, erosion)
 - Recycling by-products
 - Pest/disease management
 - Market demand = healthy



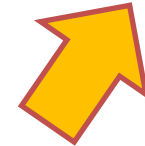
Organic vs Chemical

Organic

vs

Chemical

Productivity (short term)



**Biodiversity and Productivity
(long term)**



Sustainability



Soil degradation



Continuous usage

*Increase Productivity
and soil fertility*

*Decrease Productivity
and soil fertility*

N, P, K sources on the ground

- N: Brans, Bloods, chicken droppings, oil cakes, urine (any)
- P: Brans, Chicken droppings, Egg shells, oil cakes
- K: Brans, oil cake, plant ash, cattle dungs*, plant residues

(Livestock feed usually
can be used as
organic fertilizer material)



Why better to use “Fermentation”

- Fermentation is safe degradation method using familiar food processing microbes
- Forced degradation for easy absorbing nutrients for plants
- Easy to control (microbes, materials, duration)
- Anti-disease microbe effects
- By-productive vitamins, amino acids directly working on plant growth

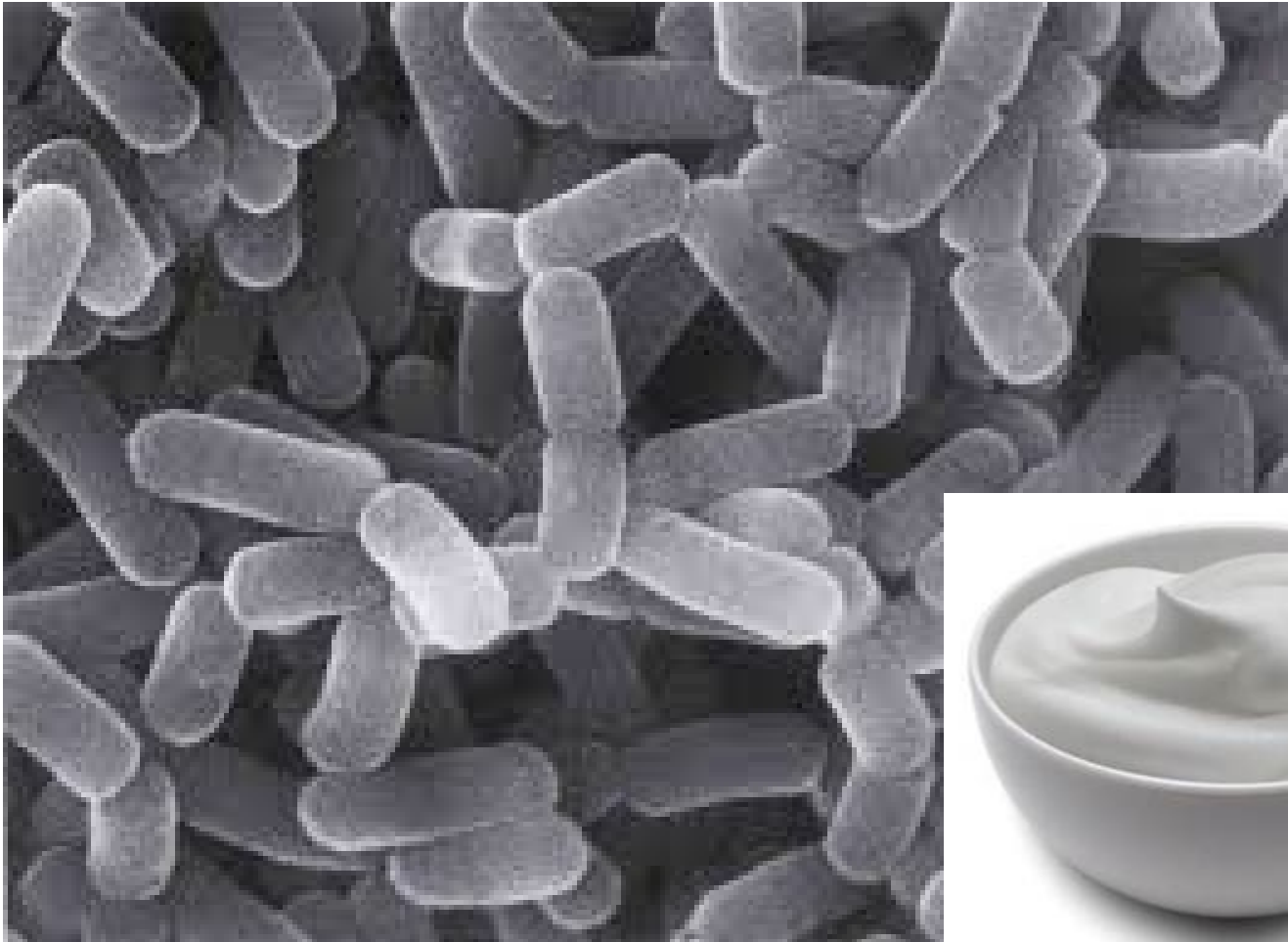
Microbes for fermentation

- Non toxic, non disease type
- Different from other saprophytic soil microbes (not scavenger type)
- Rapid propagation = overcome the speed than saprophytic (degradation) others
- Quick decomposition effects
- Synthesis much useful byproducts (Vitamins, alcohol, organic acids, antibiotics, organic acid etc.)
- Confirmed the safety (used for food processing)
- Long time usage history (w or w/o intentions)

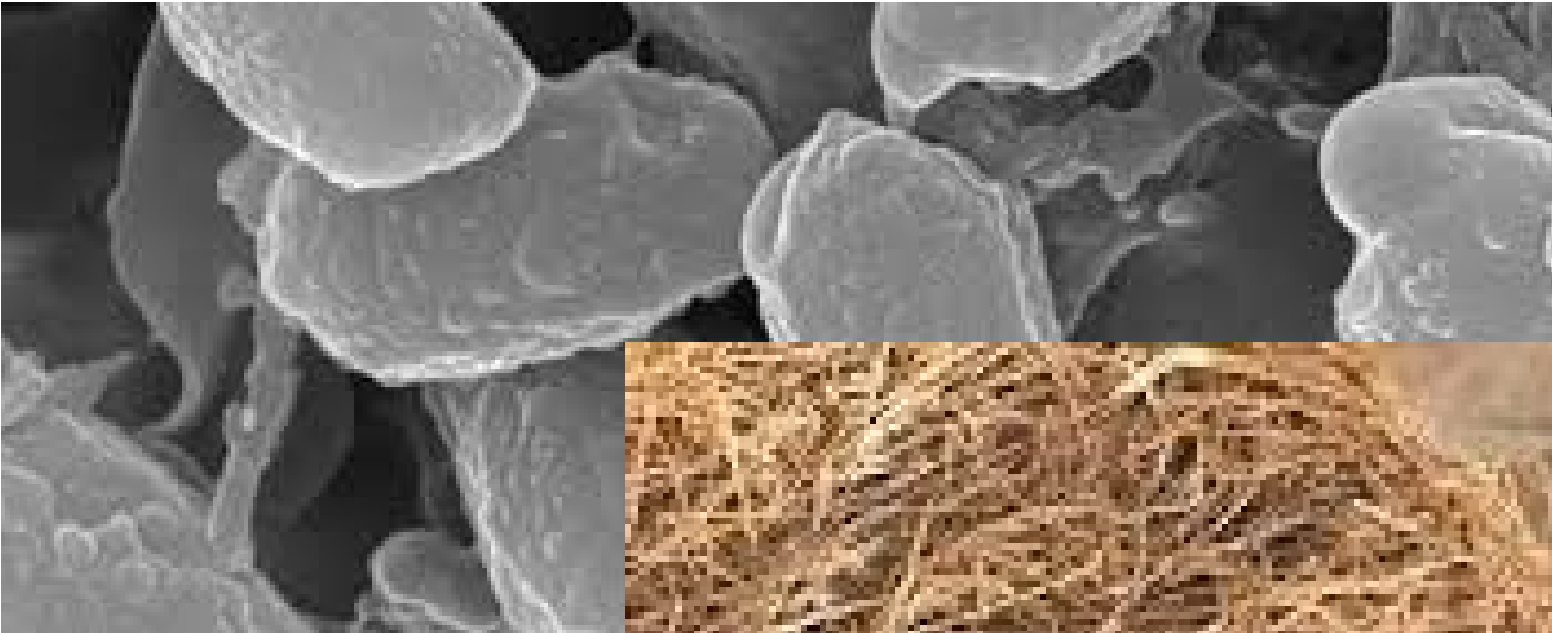
Yeast



Lacto bacillus



Bacillus



Rhizopus



Aspergillus



Available materials for Bokashi

wheat bran(2.5-2-1.5), Rice bran, maize bran, barley bran, oil cake(7-3-2), sericulture residue(10-2-0), brewery residue(12-5-1), chicken droppings(10-10-0), fresh livestock blood, bone meals, leather/hide residues, feather meals, wool residues, waste from mills, legume leaves(2-1.5-1) etc.

Why we recommended to use fermented organic fertilizer??

- ① Organic fertilizer can be used as chemical one but **improve soil fertility** (due to enrichment of soil microflora)
- ② Replaceable by chemical fertilizer but normally **high-efficiency** & **long effective** (due to microbe can hold nutrients in their bodies)
- ③ Environmental friendly and **prevent soil erosion**/degradation (due to living microbes can hold soil physically)

Organic fertilizer(Bokashi) sample recipe

Solid material	weight (kg)	Estimated cost (ETB)	NPK type
Wheat bran	50kg (1 quintal bag)	200	N-P-K
<i>Oil cake (optional)</i>	<i>0-50</i>	<i>300</i>	<i>N-P-K</i>
Seed solution	weight (kg)		Tips
Molasses or Sugar	0.5kg	20	Add salt 1 tea spoon in case of sugar only
Dry yeast	One tea spoon	2	Replaceable by molasses
Yogurt	One table spoon	1	Yogurt ONLY
Over-ripen fruits	50g	2	Banana, papaya, guava etc.
water (60°C after boiling)	1 Bucket (12L)	-	

** Red inoculants can be replaced by seed solution 500ml*

Organic fertilizer(*bokashi*) making flow



Measure materials



Mix solid materials



Prepare water mix



Put paper on the top (humidity adjustment)



Press into barrel or bucket with lid



Mix water part to solid mixture

Cover by plastic sheet with lid (no bugs invading)



Fermentation 1 month at least

If needed, dry & packed for sale



NPS mixed Bokashi (advanced)

Potential Material	Amount (Kg)	Cost (ETB)	N-P-K
Bran/mill residues	50	200	2.5-2-1.5
Green leaves (legume) Legume pots (fresh)	30	-	2-1.5-1
NPS	20	300	20-38-0
Sugar / Molasses	1	20	-
Bokashi (fermented)	2	10	2.5-2-1.5
TOTAL	100 KG*	530 ETB	N 5.9kg P 9.1 kg K 1.1 kg

* Approximately enough amount for one horticultural crop production for 1,316m² field

Bokashi Usage

- As Fertilizer: for basal and top dressing with or w/o NPS
- As soil sterilization starter: use with wheat bran for improve soil microflora
- Disease control: Use top dressing and furrow application(antagonistic microbe functions)
- Pest control: sprinkle bokashi from the top of leaves for army worms (young instars) and caterpillars
- Composting enhancer(promoter): use with green manure for better and quick composting in soil

Advantages using Organic materials with chemicals

- Reduced negative environmental impacts than only using chemicals (easy washed-away, excess N etc.)
- Slow-absorbing, longer period working
- Supply balanced NPK together with micro nutrients from organic materials (synergic effects)
- Increase soil fertility slowly
- Keep soil productivity, less surface soil erosion

Estimation: Cost and amount for *Root Rot disease control* (per ha; 10,000m²)

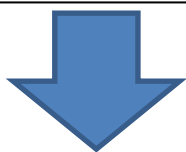
Current application method (N-P-K : 38-75-0)

Fertilizer: Chemical (NPS-B) 200 kg/ha (600 ETB per 50kg)

Fungicide: 60L (6 times, 10L per ha in each) 500 ETB per L

Soil fumigation chemicals for soil sterilization: N/A

Total cost: 32,400 ETB/ha



Cost comparison not including yield loss by disease

Recommended fertilizer using organic 50% (N-P-K : 38-48.2-40)

Fertilizers: Bokashi(Wheat bran@250ETB per 50kg) 760kg, NPS-B 100kg , Ash (0-2-10) 250 kg

Soil sterilization and basal fertilization: Mustard (green manure) 50kg (use from the total as basal: Bokashi 100kg, NPS-B 50kg)

Gelatin solution (200L), Charcoals (500kg)

Total cost: 17,500 ETB/ha

A sample of Garlic cost/profit (ha)

Fertilization	Chemical 100%	Recommended (50% chemical)
Cost (ETB)	32,400	17,500 ↓
Increase % of yield	100%	200% (min) ↑
price@Qt (100kg)	3,000	3,000
Harvest (Qt)	90.96 (CSA)	181.9 ↑
Estimated income	272,880	545,700 ↑
Net profit	240,480	528,200 ↑
Profitability Difference	100%	220%

2017 bokashi utilization records

Crop	Tomato	Green pepper	Garlic	Onion	Potato
Min yield (Qt/ha)	192	86	130.5	151.5	255.4
Max yield (Qt/ha)	540	54	313.5	353.5	481.9
CSA yield (Qt/ha)	62.11	61.55	90.96	89.73	134.5
Difference %	309-869	82-140	143-345	169-394	190-358

Seed solution making

Seed Microbe solution

Materials

1. Water 90% (60C hot water recommended)
2. Molasses 5-10% (or Sugar 5% + 0.5% Salt)
3. Seed solution 1-5% (or 0.1% yogurt, 0.1% yeast, 0.1% fermented bokashi, + over ripen fruits)

Procedure (check sourly smell)

Just mix well and close cap tightly

Release gas every day (2 weeks-3 weeks)

Ready to use after 2 weeks, store up to 3 months

How to make “*Bokashi*” organic fertilizer



Liquid materials: 5% of water
Sugar+Salt (or Molasses)

0.5% yoghurt & yeast (or 5%
seed solution) dissolved in a
bucket



Solid materials (Wheat bran, mill
residues, crashed maize, oil cake
etc.)



Mix well all solid and
liquid materials



Push them into the storage
box, barrel or bucket,
remove excess air



Put newspaper on the top and
covered with plastic and set a
rid then **leave 1 month**
at least (storage up to 1 year).

Gelatin solution making

Gelatin solution for Aphids, mites, thrips, White fly

- Material

Any type of bones from animals (boiling extraction), water, fire place, a big size pot

- Additional material: detergent (enhancer)

- How to work

Suffocation by coating

- How to use

Spray on the pests directly



Flow of making Gelatin Solution

- Procedure

Bones(tail, feet)/skins from animals, fishes



Boil bones more than 3 hours (extraction gelatin)



Remove solid part + detergent (1-3%)



Filtrated by cloth, then Spray

Thank you for your attention

THANK YOU

【Ethio-SHEP Project Office】

- **Address:** 3rd Floor, Building A Horticulture Development & Technology Transfer Directorate (SHHD)
- **E-mail:** ethioshep@gmail.com