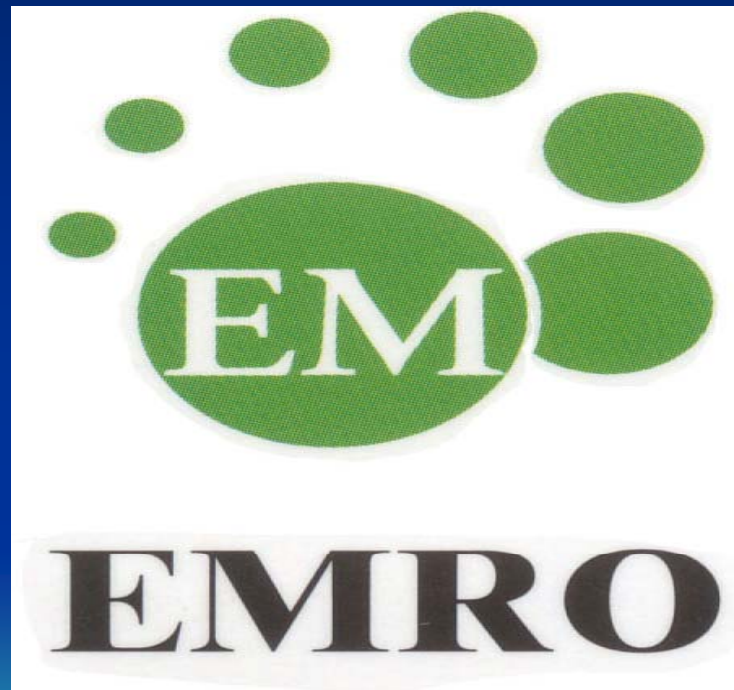


# EM Technology



Presentation by Gedion Shone for the  
National Mushroom Conference. May 2008

Effective Microorganism (EM)

# What is EM?



EM is a combination of various beneficial, naturally occurring microorganisms mostly used for or found in foods.

### **These effective microorganisms**

- secrete beneficial substances such as vitamins, organic acids, chelated minerals and antioxidants when in contact with organic matter.
- this process increases the humus content of the soil and is capable of sustaining high-quality plant production.
- create a favorable environment for other beneficial microbes and insects.
- utilizes the hydrogen from ammonia and hydrogen sulfide eliminating foul odor.

# The origin of the technology

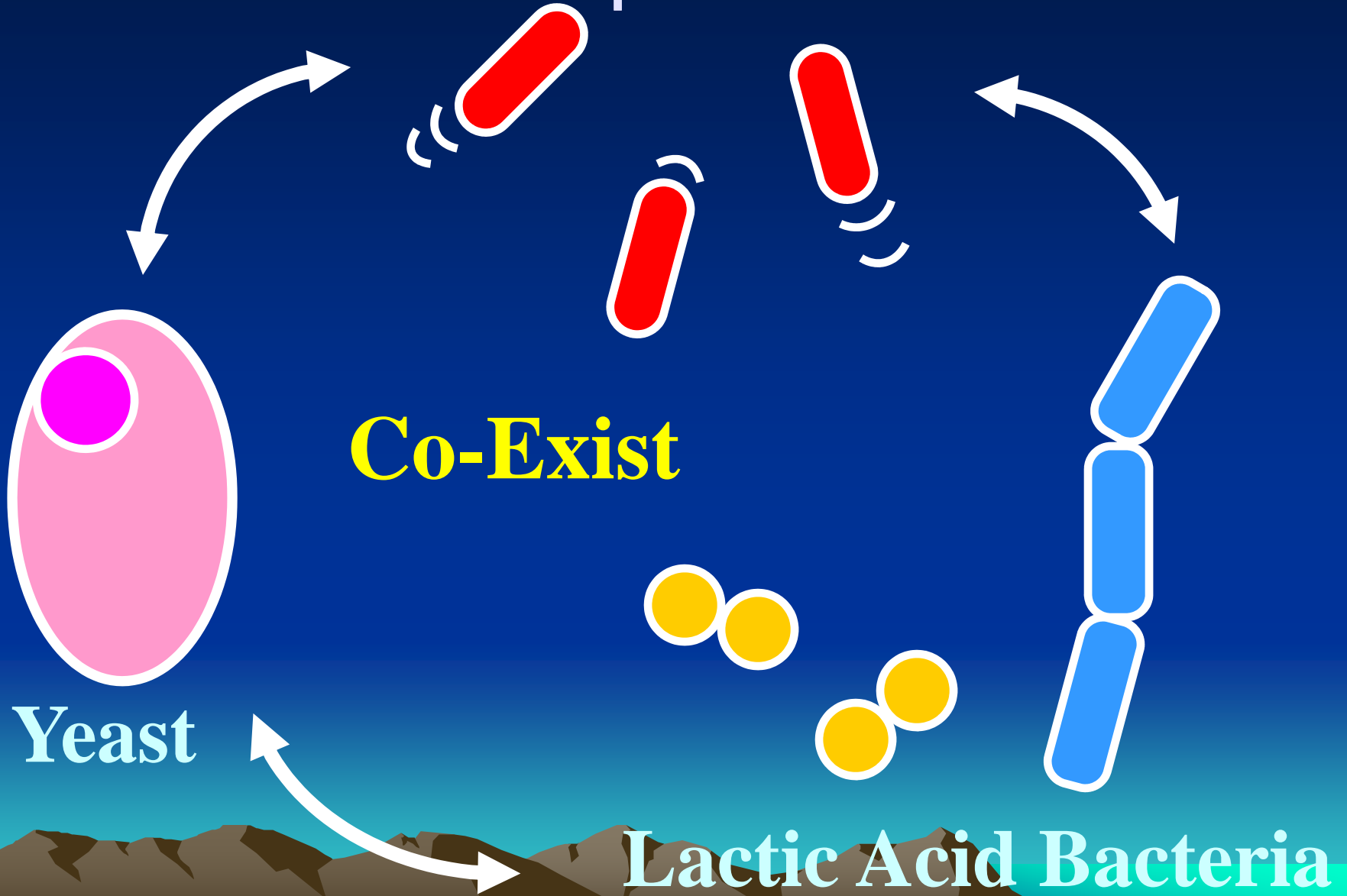
- EM was developed in 1982 in liquid form by Prof. Dr. Teruo Higa of University of the Ryukyus, Okinawa, Japan
- The technology has been spreading gradually.



# EM technology is used all around the world



Phototropic bacteria



Co-Exist

Yeast

Lactic Acid Bacteria

# Phototropic Bacteria

- Self supporting and produce :-
  - amino acids,
  - nucleic acids,
  - bioactive substances and sugars from secretions of roots, organic matter and/or harmful gases
  - utilizes the hydrogen from hydrogen sulfide and ammonia to produce odorless substances.
- Most of these substances are absorbed directly and promote plant growth using sunlight and heat from the soil



# Lactic Acid Bacteria

- produce lactic acid from sugars and carbohydrates
- Lactic acid suppresses harmful microbes and enhances decomposition of organic matter

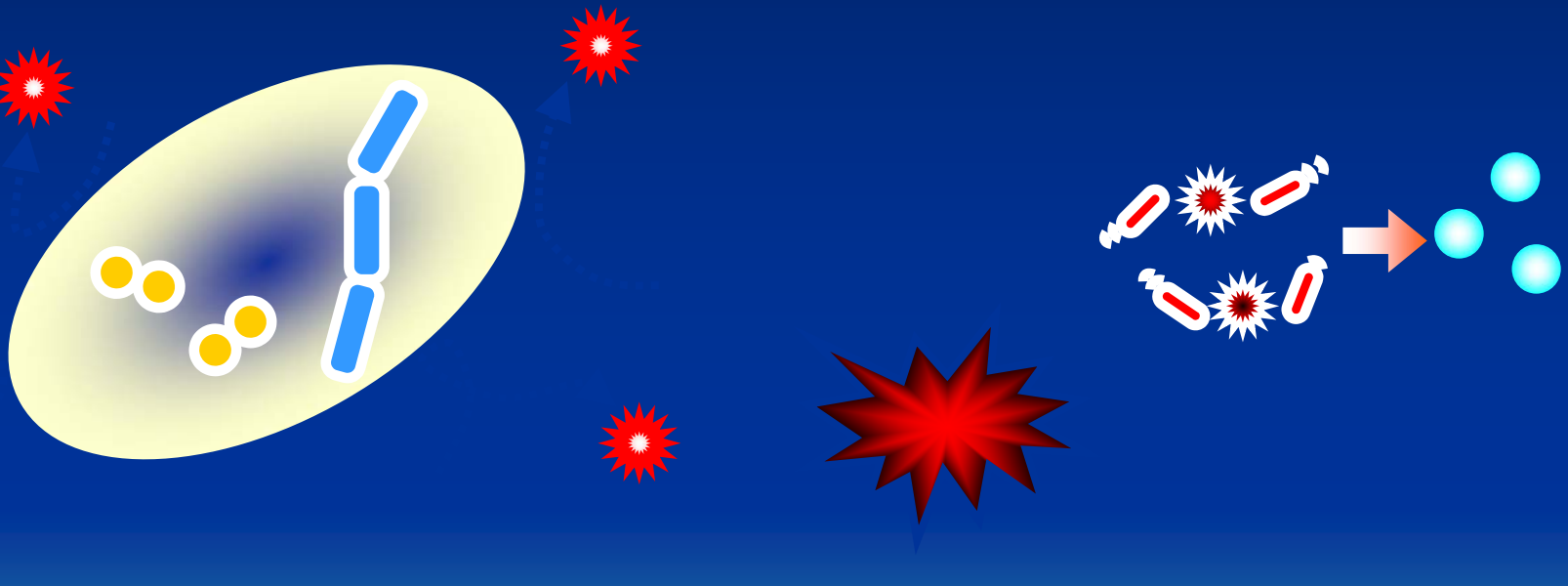
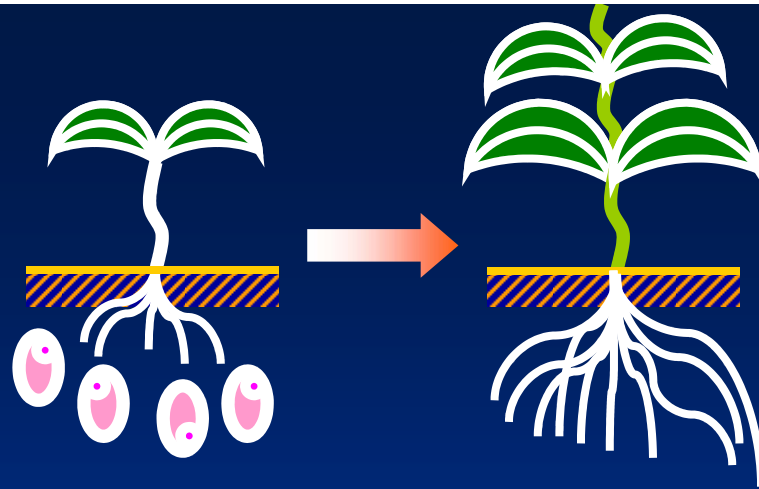




# Yeast

- synthesize antimicrobials as well as hormones & enzymes required for plant growth, from amino acids and sugars secreted by photosynthetic and lactic acid bacteria, organic matter and plant roots





Lactic Acid Bacteria + Phototropic Bacteria + Yeast  
This ensemble can produce **EM**

**POWER!!**

Woljeejii

=

mutually supportive



# Micro-Flora in Natural environment

(80-90 %)

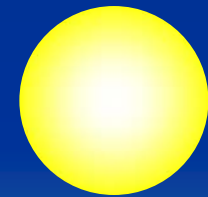
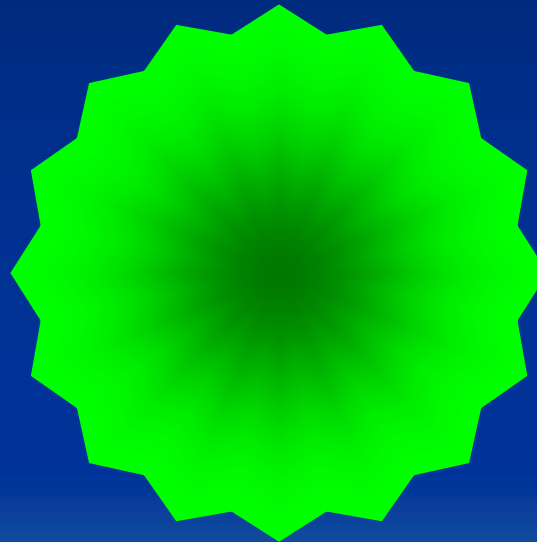
Neutral  
Microbes

(5-10 %)

Beneficial  
Microbes

(5-10 %)

Harmful  
Microbes

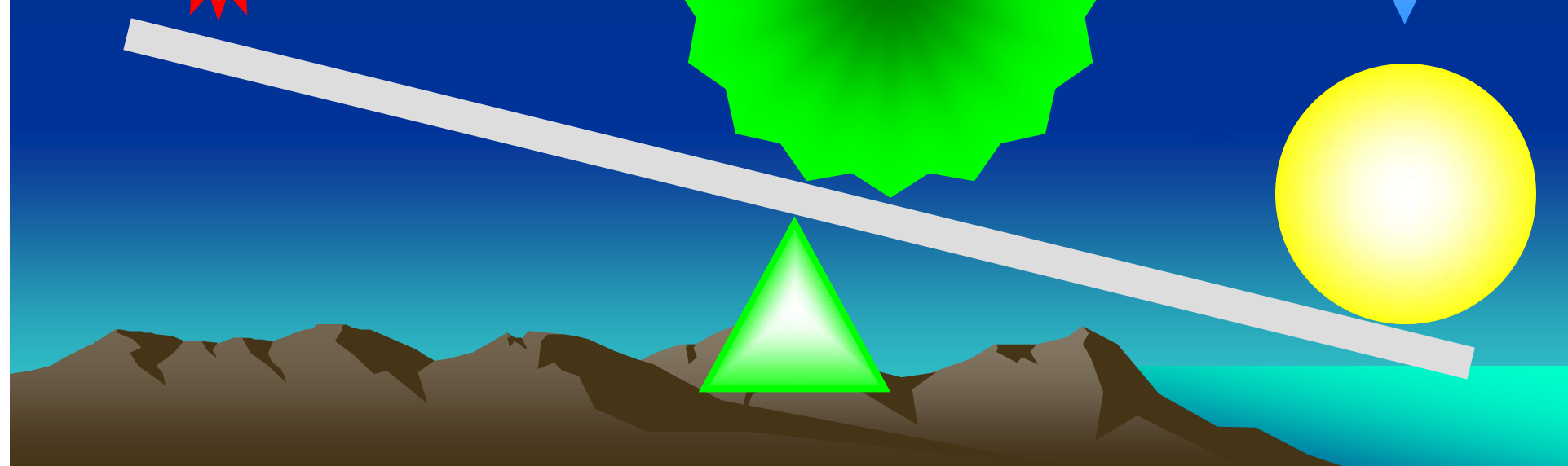
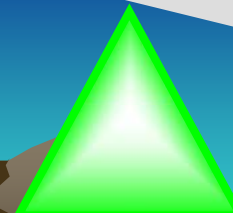
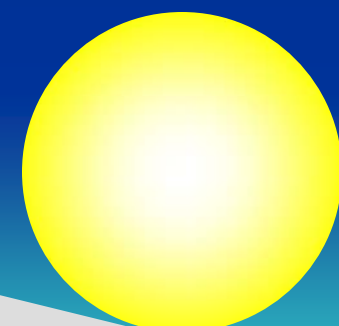


# EM tilts the balance positively

EM helps beneficial microbes  
By adding EM, beneficial microorganisms  
take over

EM

Follow the majority



# EM has a wide range of applications

- Composting organic matter in relatively short time to produce high quality HUMUS
- Enhancing crop production through improved soil physical and chemical properties
- Improving livestock feed quality and productivity
- Eco-system rejuvenation and maintenance




# Potential uses of EM cont..

- The millions of small scale farmers could process and prepared high quality organic fertilizers on their own!
- Add value to the millions of tones of Teff and other crop remains which is the main source of animal feed for SSF
- Millions of tons of coffee pulp could be converted to EM based organic fertilizer
- Sugar estates, flower farms, tobacco farms, etc could add value with least cost



# Prevailing opportunities in the area of environmental sanitation

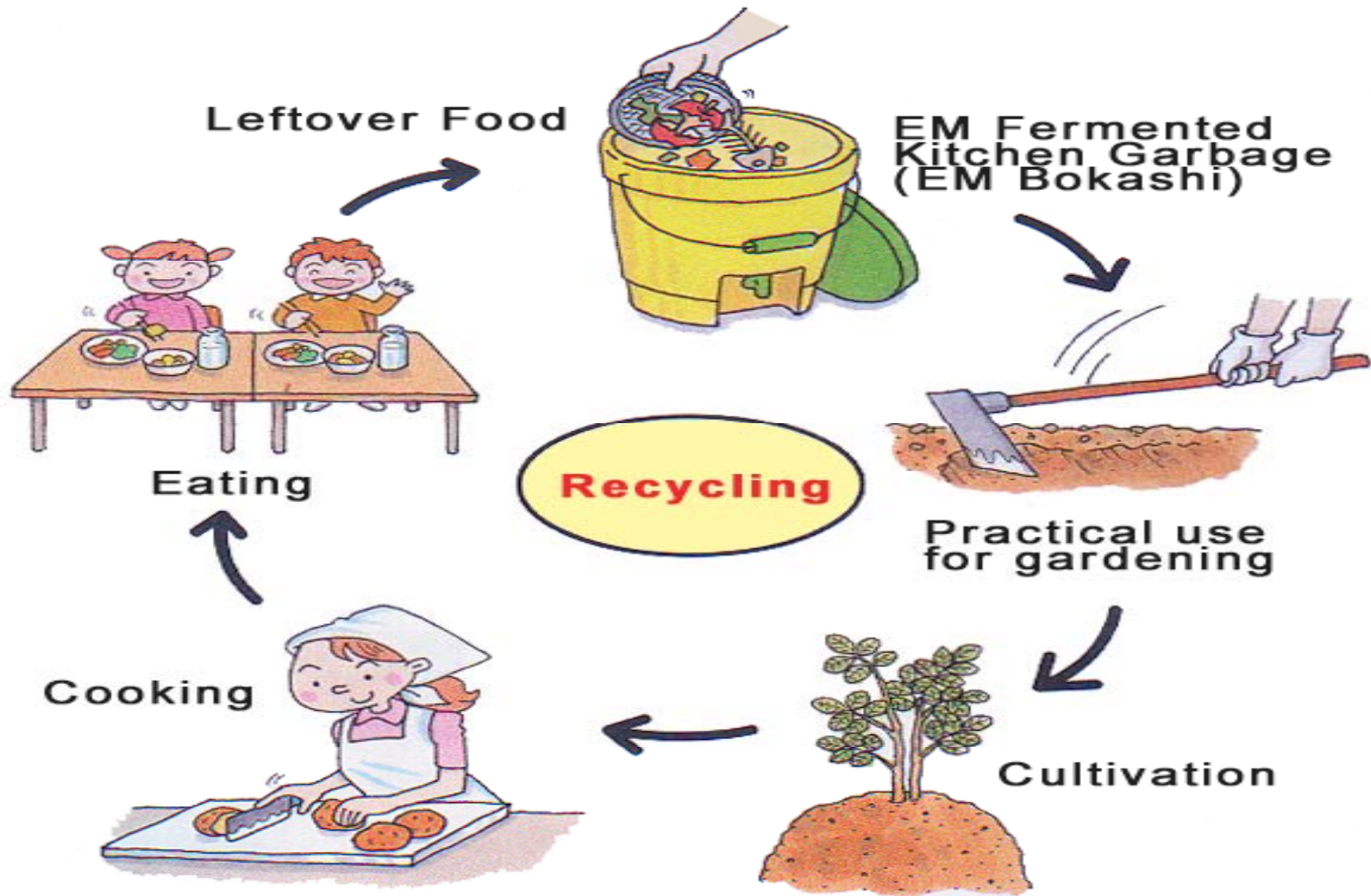
- **City refuse could be converted into productive inputs**
  - Homestead gardening and food production could be promoted
  - The volume of waste collected could be reduced – less cost of transport and less space in landfills
  - Health hazard and cost of medication decreased
- 



What opportunities exist with EM for promoting homestead gardening including mushroom production?



# Recycling household waste



# AT HOUSEHOLD LEVEL

## Fermenting kitchen waste for homestead garden promotion



# Composting for homestead garden promotion



The fermented kitchen waste is an excellent starter for composting garden waste

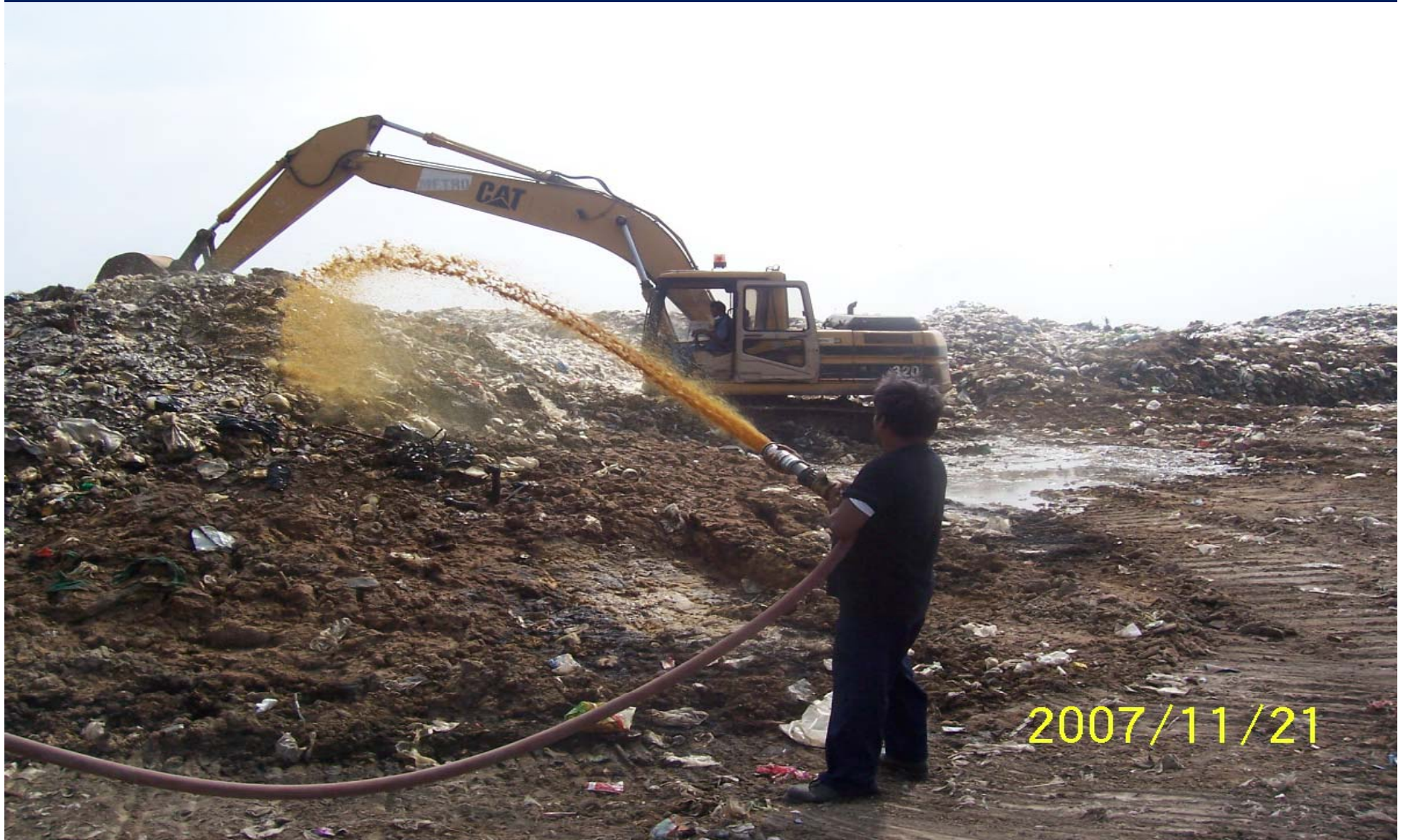


Markets generates tons of waste per day

# Sieving to separate inorganic waste



# Applying EM activated solution



# EM Compost Heap within relatively short time





# EM for recycling waste at a resort center into organic input for fertility and environment management.



# EM derivatives are in liquid and solid form

- The stock solution of EM usually referred as EM1 is a liquid solution where the microorganisms are in a dormant stage
- This is activated with molasses and pure (chlorine free) water in 1:1:18 ration to produce EM2 or expanded EM or Activated EM
- The solid form called Bokashi is fermented wheat bran and/or other organic matter using fresh EM2





Wheat Bran	1 part
Organic waste	1 part
Chicken Dung	1 part

EM	1
Molasses	1
Water	100



S B C

*EM BOKASHI*

*Moisture content of the final mixture should be 30 – 40%*



*EM BOKASHI*

*Mix well all organic material*

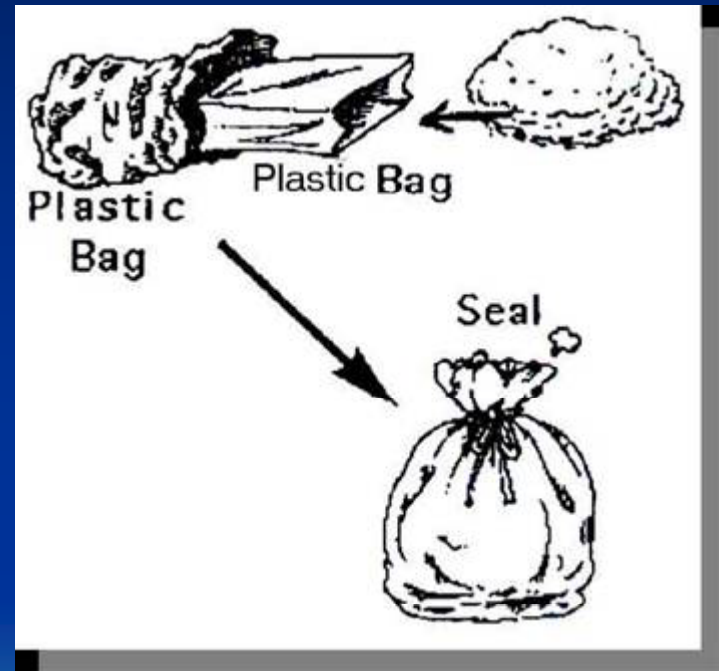


EM2 is applied to bring the moisture content to about 40%

# Fermentation - Keep air-tight condition



Plastic containers



Plastic Bags

**EM Bokashi is ready for use, when it has a sweet-sour fermented smell.**



**1 - 2 weeks**

**Anaerobic EM Bokashi can be kept about  
6 months with good storage condition.**







EM compost can be sold to generate income or add value by using it to grow high value crop like mushroom





# *MUSHROOM CULTIVATION*

*Grow fast, taste good*

# Promoting healthy urban agriculture



# Promoting healthy urban agriculture



# Incorporating EM into the soil



**Thank you!!**