Course Objective of Technical Training of Trainers (ToT) and Introduction

Presented to the Participants of the Ethio-SHEP Training of Trainers(ToT)

1. Where we are

Four Steps	Activities
1. Share goal with farmers.	-Sensitization Workshop
2. Farmers' awareness is raised.	-Participatory Baseline Survey -Market Survey
3. Farmers make decisions.	-Target Crop Selection
4. Farmers acquire skills.	**ToT on Crop Production** Crop Calendar Making and Problem analysis -(optional) Stakeholder Forum --In-field Trainings (Kamishibai)
Follow-up and monitoring (including Participatory Endline Survey)	

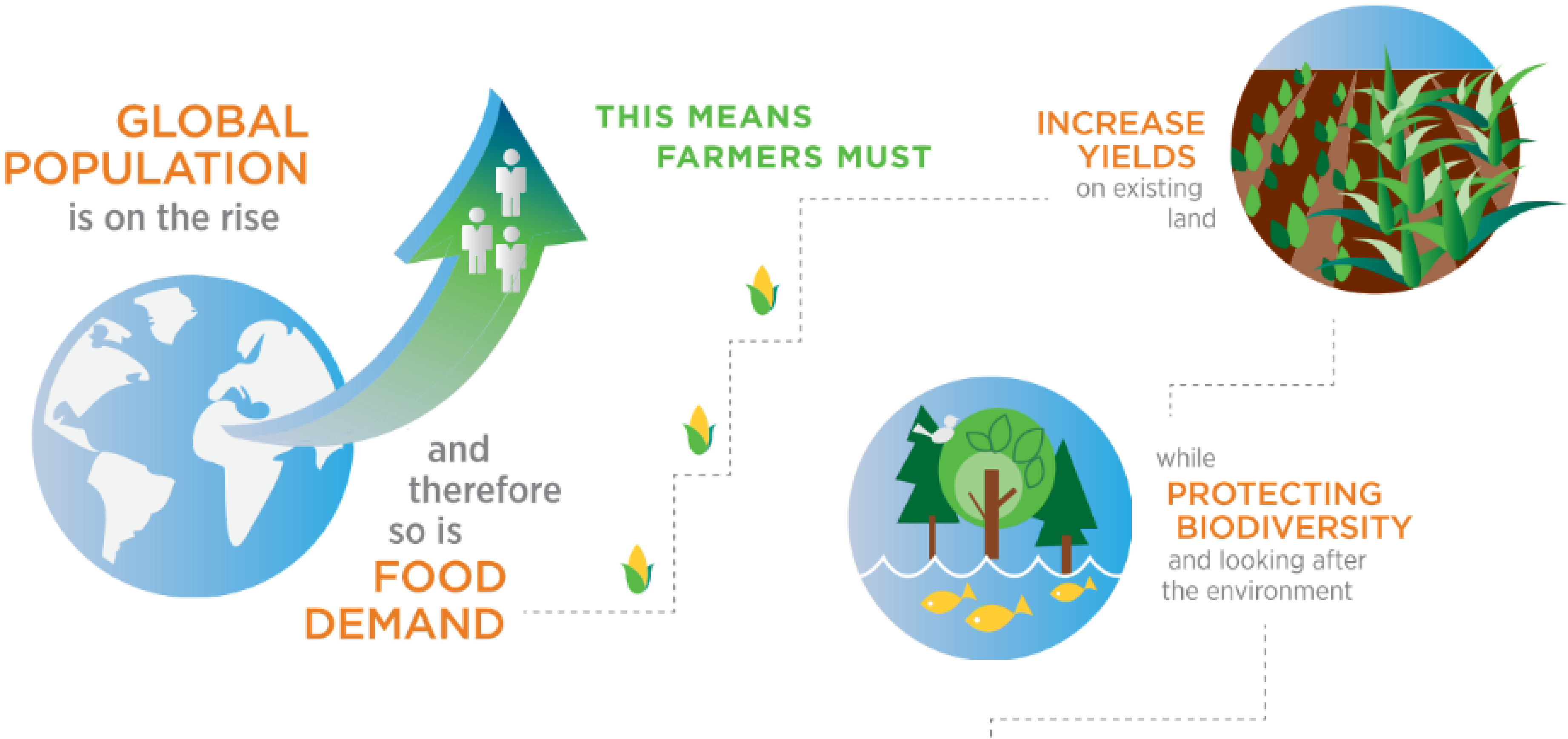
2.Objectives

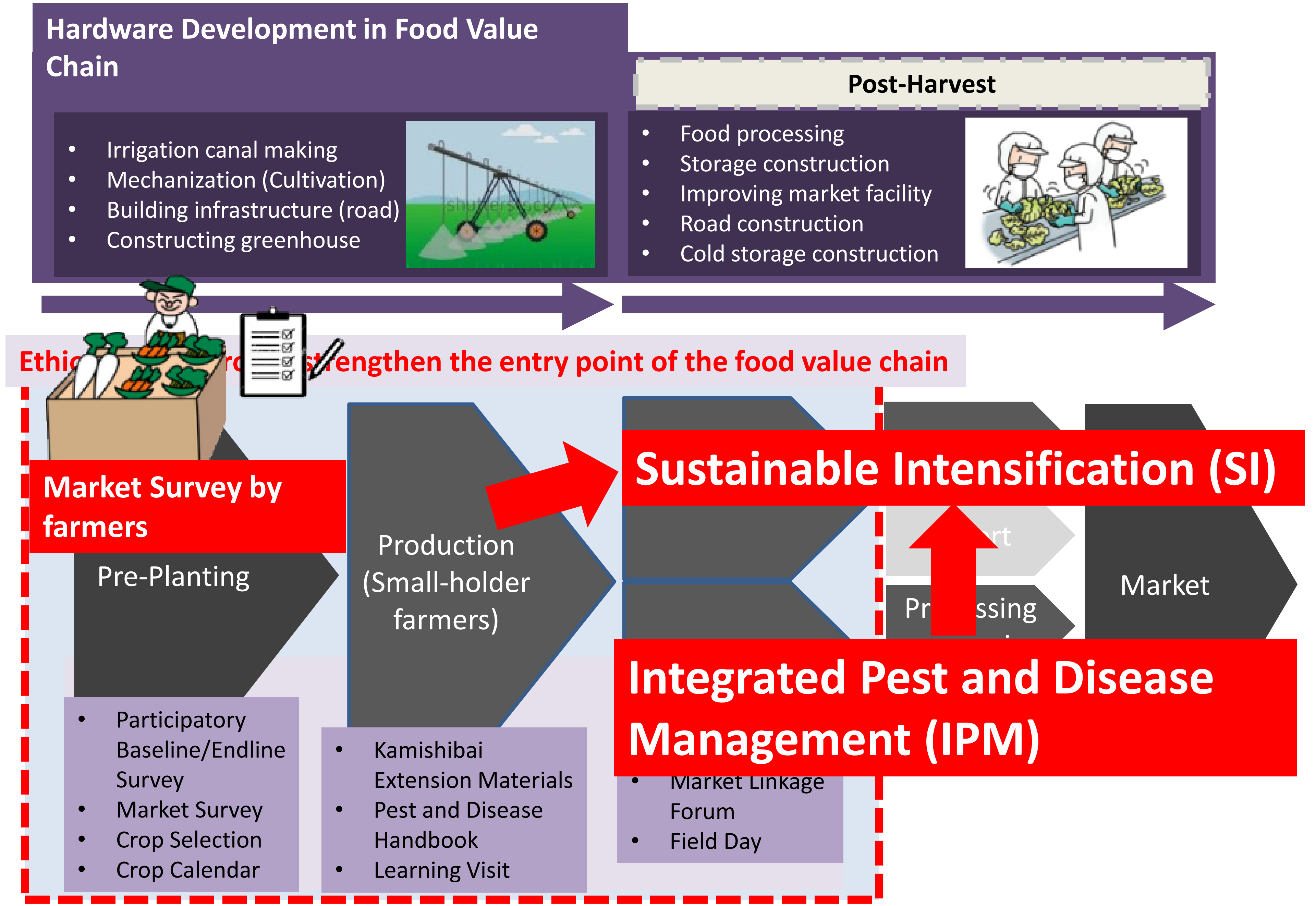
To understand:

- how to conduct in-field Training (Crop Calendar Making, Problem Analysis, Kamishibai Extension Material)
- on the importance of using several method to control pest and disease.
- the importance of continuous field monitoring and learn how to identify the problem in the farmers' field.

19 August	20 August	21 August
8:30-9:00 Registrations 9:00 Opening remarks **(Mr Dedefi** Zone Team Leader) 9:00-10:00 Course objective and introduction **(Mr Furukawa)** 10:00-10:20 Tea break 10:20-12:30 **Session:** General Horticultural Crop Production & Post-Harvest Handling Techniques(G24) **(Ms Biftu)** 12:30-13:30 Lunch 13:30-14:00 **Lecture:** bokashi making 14:00-15:30 **Practice 1:** Seed solution and Bokashi making **(Ms.Biftu)** 15:30-16:00 Tea break 16:00-17:00 Pest and Disease management **(Mr Furukawa)**	8:30 Registrations 8:30-10:00 Explain on Pest and Disease handbook 10:00-10:20 Tea break 10:20-12:00 Problem Identification **(BIftu)** 12:00-13:00 Lunch 13:00-13:30 Exercise on body measurement **(Biftu)** 13:30 - 14:30 Research result of Crop production **(Biftu)** 14::30 – 15:30 Lecture on Crop Calendar making & problem analysis **(Mr Furukawa)** 15:30-16:00 Tea break **15:30-17:00** **Group work** Problem analysis and Crop calendar making **(Furukawa & Biftu)**	8:30 Registrations 8:30-9:00 Presentation on Crop Calendar Ms **(Biftu)** 9:00-10:10 Lecture on crop production - Potato & Tomato **(Mr Sheleme)** 10:10-10:30 Tea break 10:30-11:40 Onion & G/Pepper **(Mr Dedefi)** 11:40-12:30 H/Cabbage **(Mr Hussen)** 12:30-13:30 Lunch 13:30-14:30 Lecture: Action Plan making and Explaining Proposal format **(Ms Biftu)** 14:30 – 15:30 Planning 15:30 – 16:00 Presentation 16:00 Closing remarks 16:00-16:30 Tea break

Overview of the food production in the world





Hardware Development in Food Value Chain
Irrigation canal making
Mechanization (Cultivation)
Building infrastructure (road)
Constructing greenhouse
Post-Harvest
Food processing
Storage construction
Improving market facility
Road construction
Cold storage construction
strengthen the entry point of the food value chain
Market Survey by farmers
Pre-Planting
Production (Small-holder farmers)
Market
Sustainable Intensification (SI)
Integrated Pest and Disease Management (IPM)
Participatory Baseline/Endline Survey
Market Survey
Crop Selection
Crop Calendar
Kamishibai Extension Materials
Pest and Disease Handbook
Learning Visit
Market Linkage Forum
Field Day

Situation In Ethiopia

- Low soil fertility **(Low organic matter in the soil)**
  1) Low incorporation of crop residues
  2) Low use of compost
  3) Top soil Erosion (137t/ha/year)
  4) Miss understanding of function of synthetic fertilizer

【Myth】: Fertilizers damage the soil

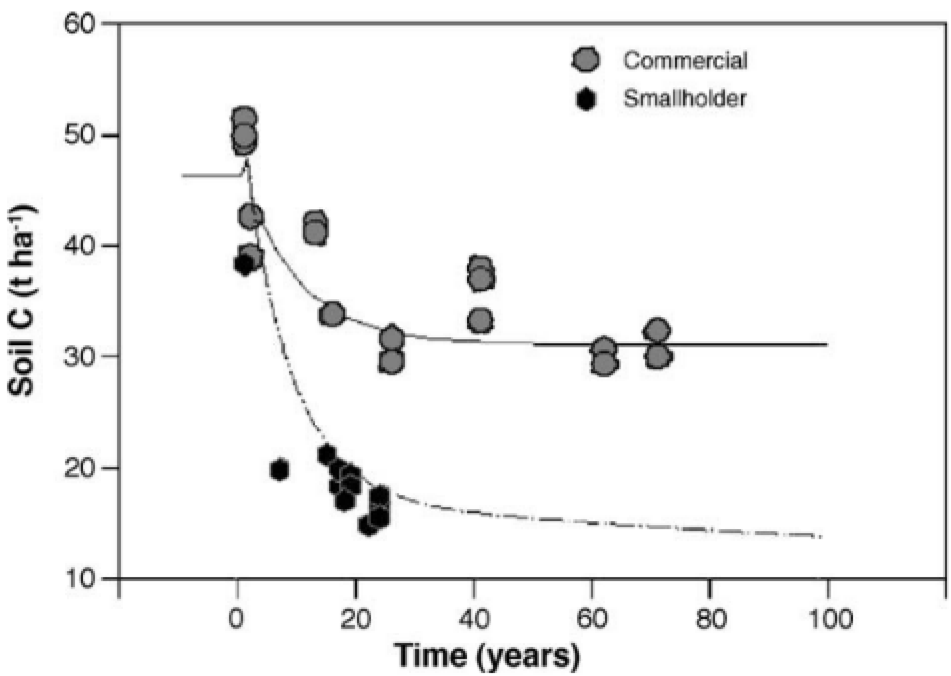


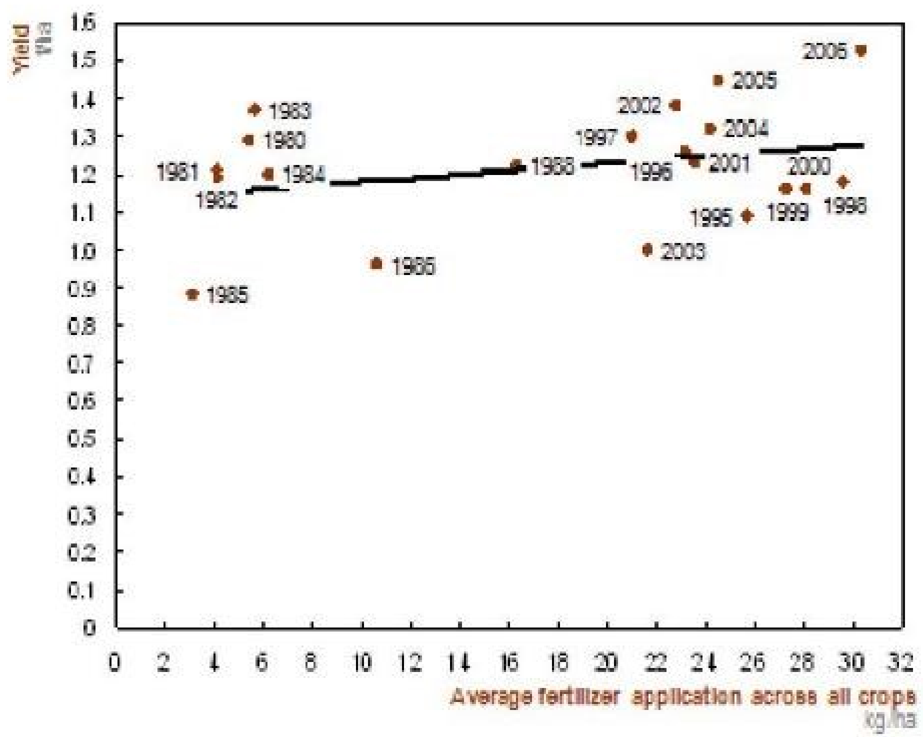
Fig. 1. Changes in soil organic C along cultivation chronosequences after forest clearance on a red clay soil (local classification 5E; FAO class Chromic luvisol) in Zimbabwe under commercial or smallholder agriculture. Source: Zingore et al. (2005).

Commercial farm vs smallholder farm

- High input commercial agriculture: Organic carbon level is 32t C/ha
- It is twice as much as the smallholder farmers (18t C/ha)

Challenges

Figure 4: Ethiopia Annual Yield (t/ha) for Top 5 Cereals (Barley, Maize, Sorghum, Te
Wheat) as affected by fertilizer application.



SOURCE: National Fertilizer Industry Agency; Eberhart (2008) citing CSA; press articles; FAO

- The amount of fertilizer application increased from 6kg/ha to 30kg/ha (5 times higher)
- But yield only **increased 10%**

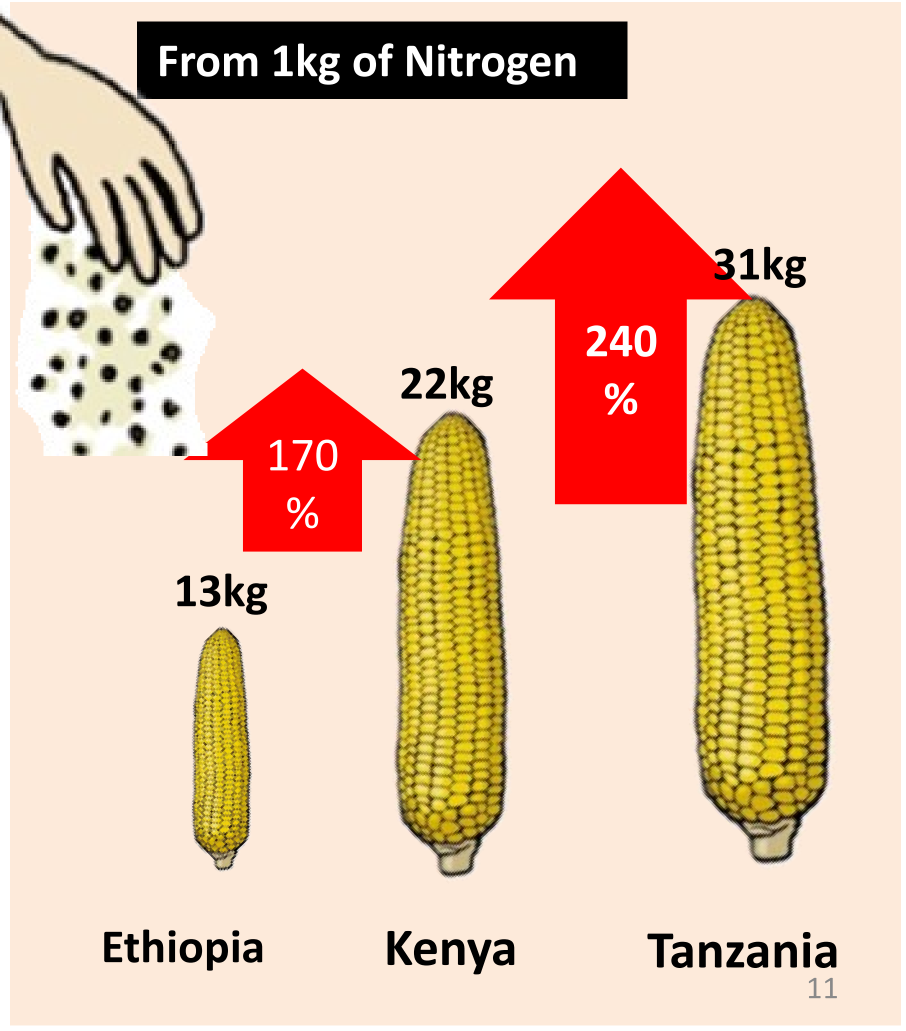
Fertilizer use efficiency

- Fertilizer is applied **50% less amount** compared to optimal dosage levels

- Eyasu (2002) study in southern Ethiopian highlands showed lack of Nitrogen is **-102kg/ha.**

Low Fertilizer Use efficiency

- Low fertilizer use efficiency in Ethiopia compared with other neighboring countries
- The nutrient use efficiency (NUE) of maize:

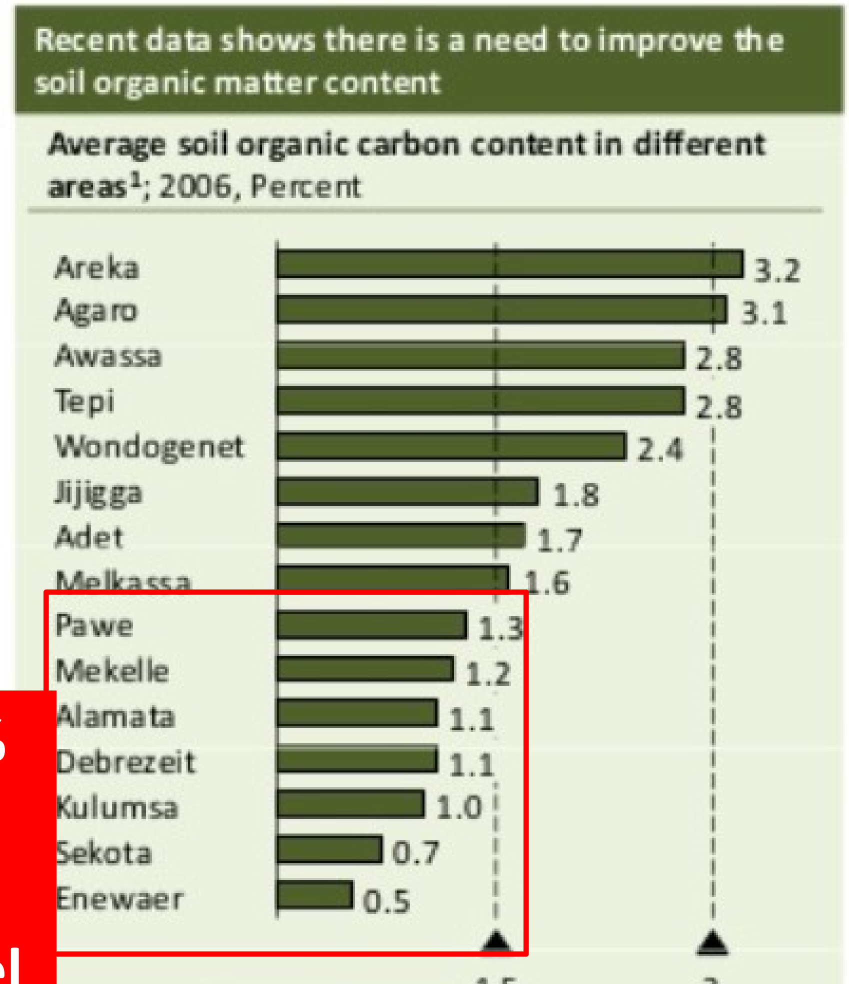


Why?

In 1991,
researchers defined:

- less than **1.5%** of organic carbon in the soil as "**Low**",
- **1.5-3.0%** as "**Medium**"

Over 50% of the areas are low C level



Source: Tekalign et al. (1991)

Micronutrient depletion

Micronutrient depletion and acidity are another problems

- Micronutrients including Fe, Mn, Zn Cu, B, Mo and Cl.

- Lack of micronutrient causes poor plant growth, inhibited cell division, reduced nitrogen use efficiency, inhibited respiration etc.

Acidity

- Where soil pH is lower than optimal (**lower than 5.5**); reduces the availability of nutrients for growth
- Deficiency in N, P, K, Mg, Ca will be happen.

Acidity Cont'

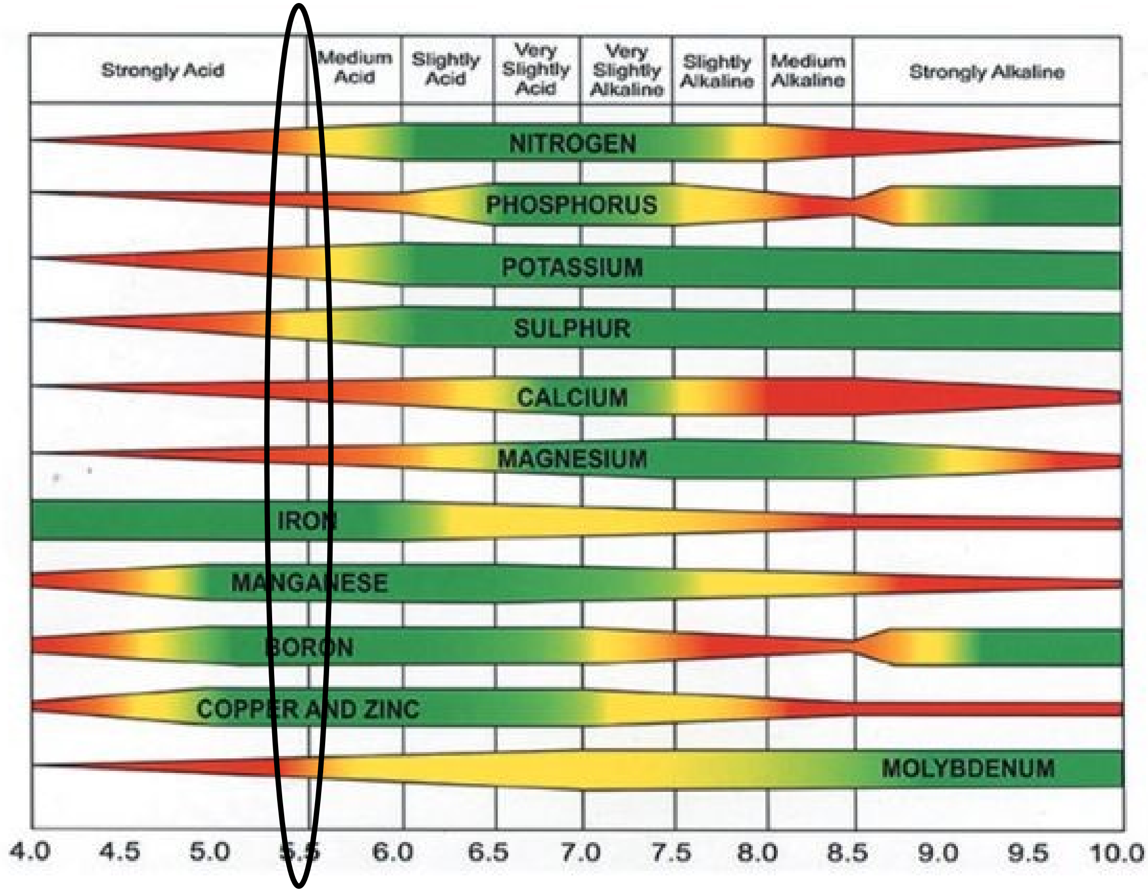


Fig. 12.1 The pH scale, showing the effects of soil acidity and alkalinity on the availability of different minerals. Colours indicate availability of the elements. *Green*: available; *yellow*: low availability; *red*: not availabile

Green: Available

Yellow: Low Availability

Red: Not available

Solution

Simple but most cost effective, and easy solution is “Applying **compost**”

- Improving organic carbon and nutrients levels
- Improving Nutrient Use Efficiency
- Reduced topsoil erosion
- Mitigated acidity and salinity
- And effects are long-lasting (more than 2 seasons)

Chemical fertilizer is not enough?

- **Chemical fertilizer is effective** under the right soil conditions
- Right pH level
- Adequate soil physical character will improve **nutrient holding capacity** which would improve **nutrients use efficiency**

Chemical fertilizer

- Nutrients applied to acidic soils can become fixated so it is not available for plant growth.
- On depleted topsoil, nutrients can be leached away.

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- Low Nutrient Use Efficiency

Integrated Approach is Needed

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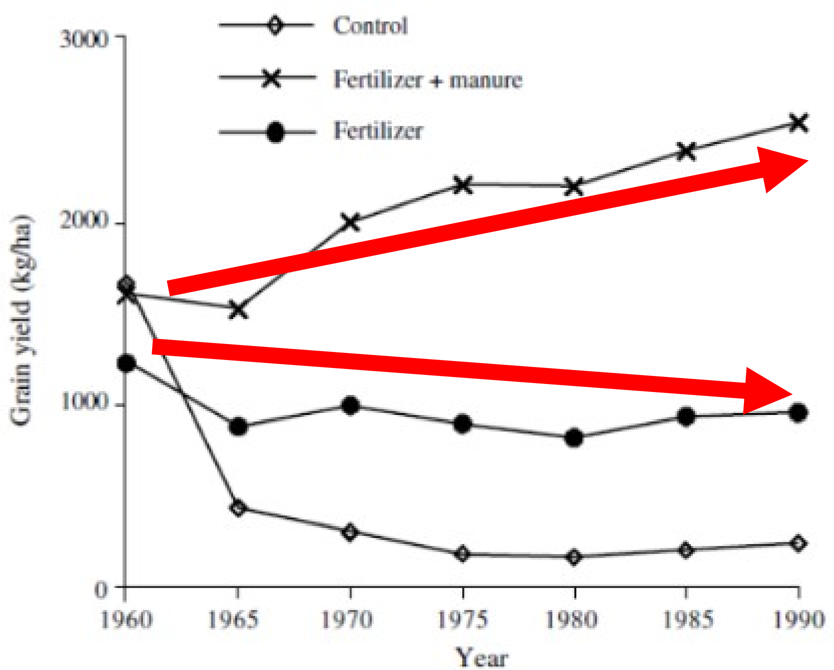
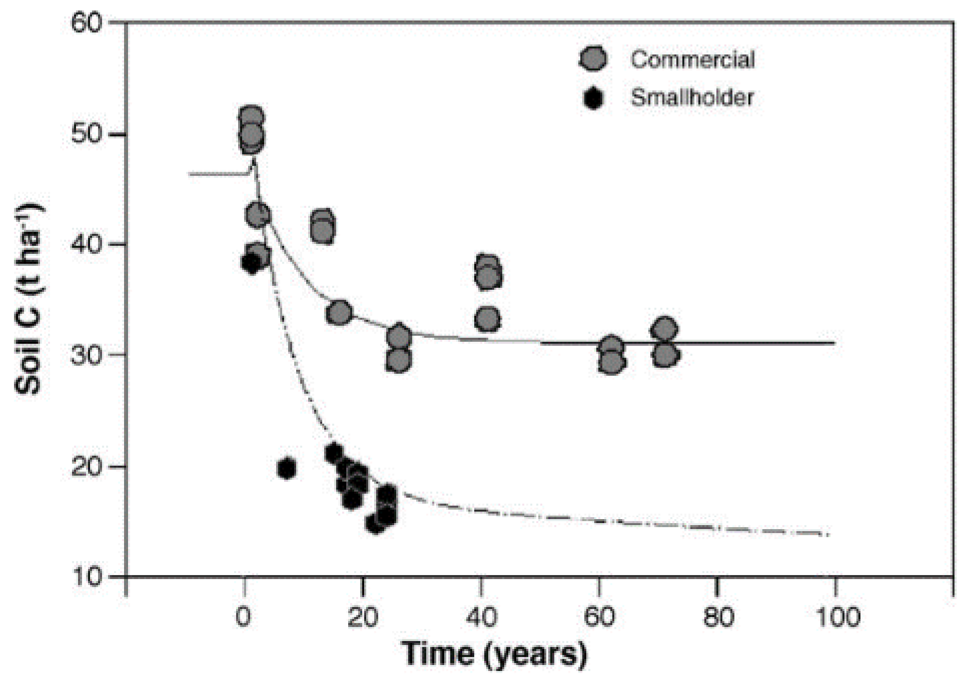
Manure + Chemical fertilizer

Figure 3: Sorghum Grain Yield as Affected by Mineral and Organic Fertilizers over Time



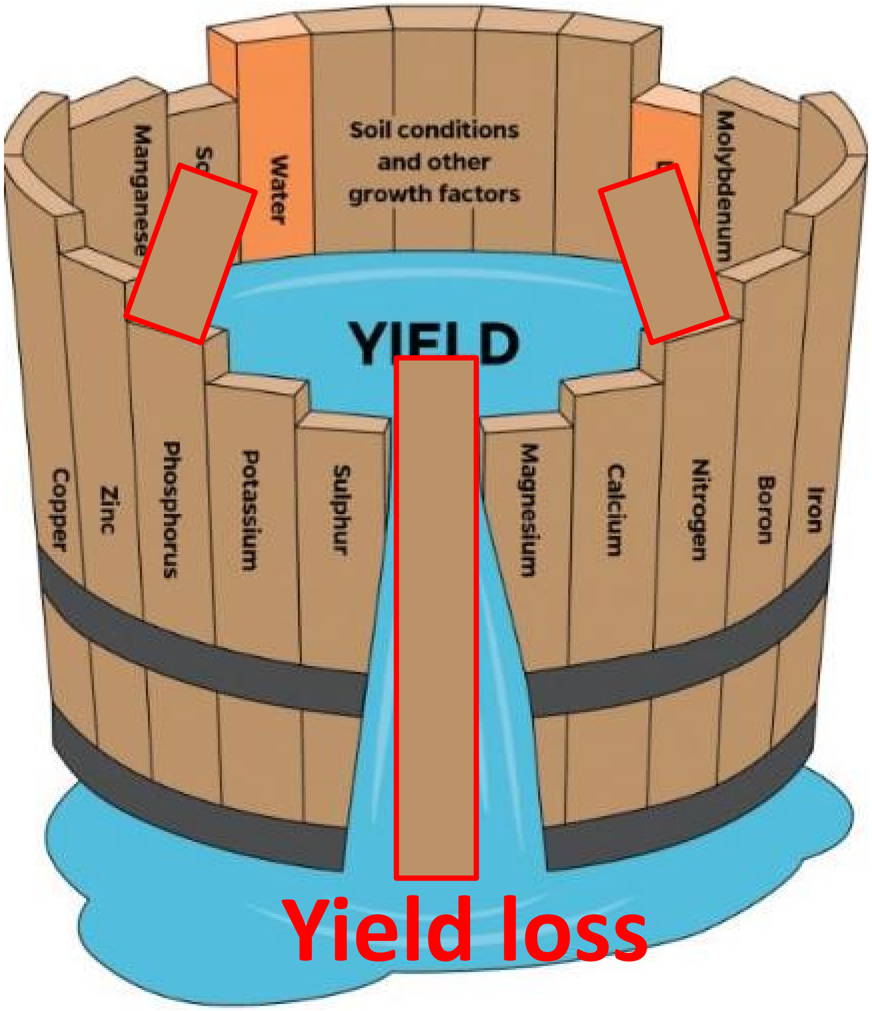


SOURCE: Bationo et al. (2006)

Soil analysis

- Many mineral nutrients, although present in the soil and detected by soil lab analysis, **may not be available to crops**, because of **immobilization due to pH levels** and presence of other competing minerals.

Liebig's Law of Minimum

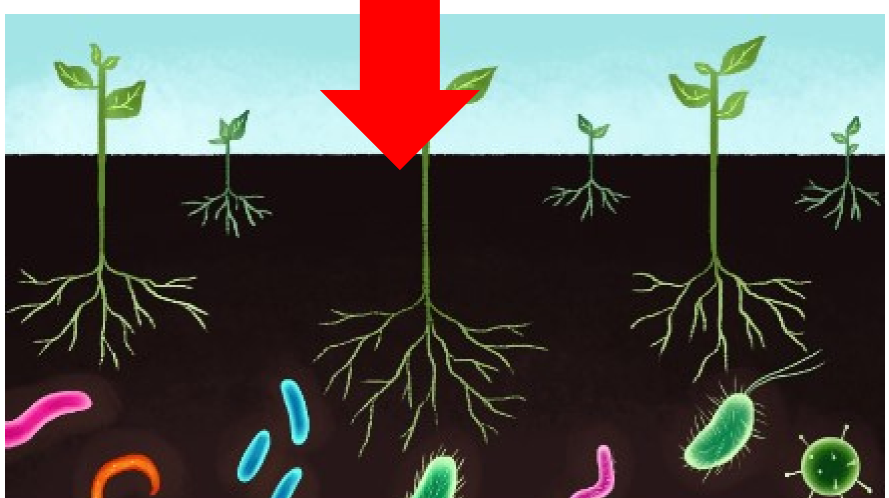


- Liebig's Law of The Minimum summarizes that plant growth and health is *not controlled by* ***the total amount of nutrients available in the soil****… But instead plant growth and health is controlled by the* ***scarcest of the nutrients available in the soil****.*

- Most of the farmers only applying **on 2 major nutrients** which are Nitrogen and Phosphorus (**+ sulfur)**.
- But plants needs Approx. **17 different macro-** and **micro-** nutrients

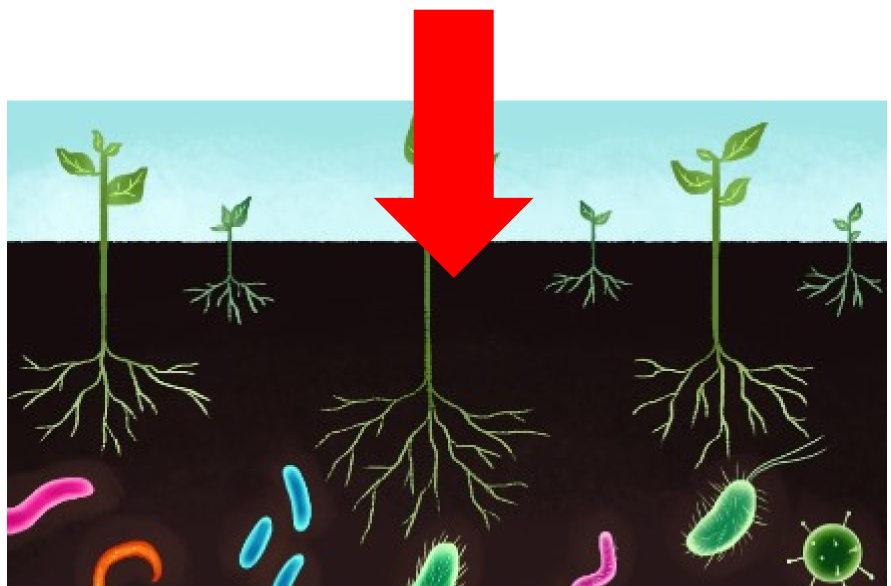
Compost and Chemical fertilizer

Manure is **a food for the soil and plants** (energy source for soil microorganism)



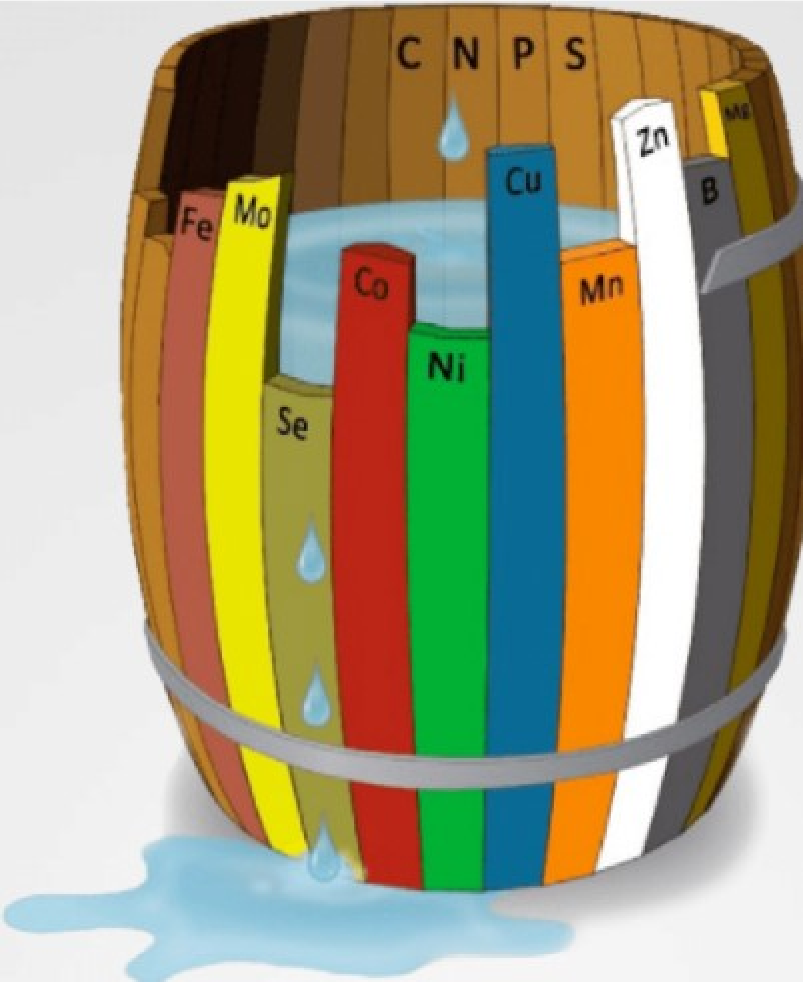
Compost and Chemical fertilizer

Chemical fertilizer is just **a supplement.** (without food, plant cannot grow as healthy plant)



Compost

- Compost contains all the necessary nutrients for plant growth
- It will also adjust pH level in the soil
- It can also reduce pest and disease incidence



Locally-tailored solutions

Sustainable intensification needs to take into account:

- Socio-economic and biophysical environments
- Characteristics of the farming household (income, size of family, size of farm and grazing land)
- Other aspects of the farm system such as livestock, general farming practices and production objectives of a given area

Different types of compost

Type of compost	Fermentation process	Characteristic	Time
Pit compost	Aerobic	Low N, improving soil physical character	2-3 months
Heap compost	Aerobic (*attachment 1*)	Low N, improving soil physical character	2-3 months
Bocashi	Aerobic (*attachment 2*)	Moderate N, quick to finish decompose	3-4 weeks
	Unaerobic (*attachment 3*)	Moderate N, quickly effect to the plant	1-2 months

Compost making

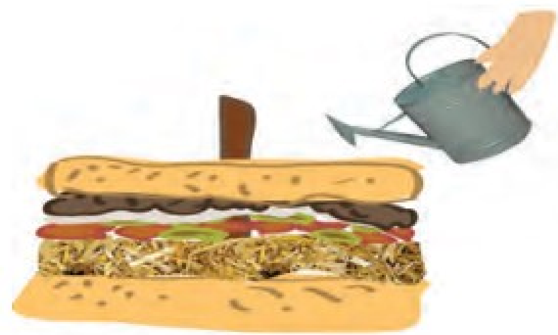
Step①: Chose sunny & dry place, then loosen the soil 30cm deep

Step②: Bury a 2m high pole in the center, then put straws / dry grasses

Step③: Add kitchen / vegetable scraps

Step④: Sprinkle ash to adjust pH

Step⑤: Place 5cm of cattle dung (or other manure)



Step⑥: Add virgin soil & repeat the step ②-⑥ until reach 1.5m high

Compost making

Cover with 3 cm of soil

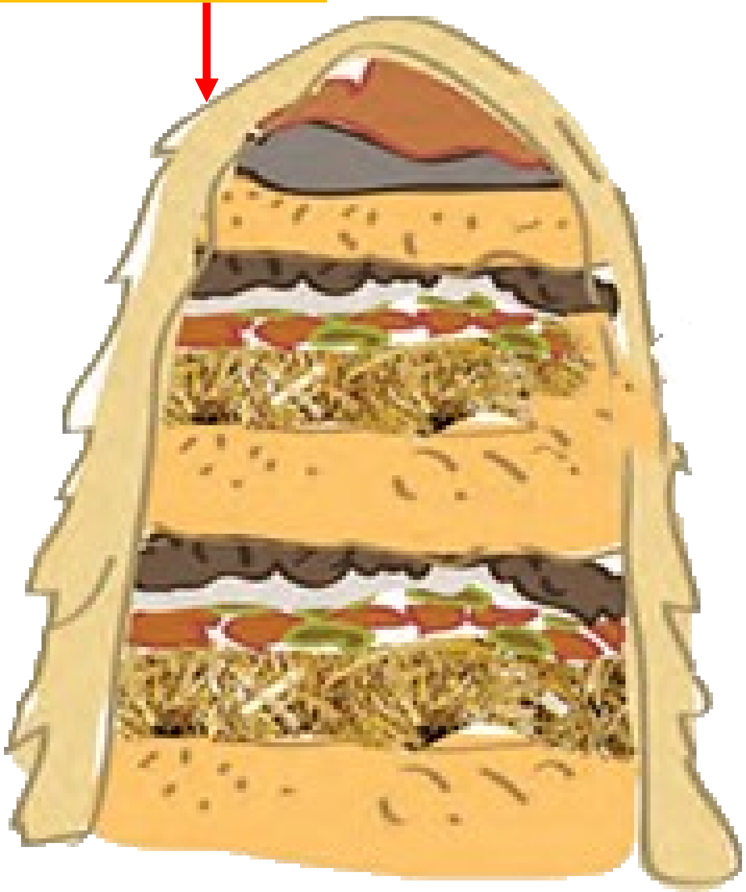


Image courtecy: FAO(2014)

Step⑦: When the heap reached 1.5m, cover with 3cm of soil

Step⑧: water the heap and remove the pole, which will leave a vent for aeration

Step⑨: 2 days later, put your hand into the heap and check the temperature.

Step⑩: Grab some compost and squeezing a handful of the mixture: if nothing comes out, it is too dry. You have to add water.

Step⑪: After 3 weeks, mix the compost and keep mixing every 2 weeks (add water if it's dry)

Step⑫: Finish when the color gets dark and original shape of the material disappeared.

Attachment: 2

A Type of Quick Making Compost


Lantana camara	Legumes

Material	Amount
Cattle dung	4 buckets
Plant residues (Green grass)	5 buckets
Virgin soil / Anthill soil	3 buckets
Ash	1 bucket
Yeast (banana, mango peels)&Sugar	1 table spoon
Water	3 – 4 buckets

Step①: Chose dry place under the roof to protect from rain

Step②: Collect the above materials

Step③: Mix all materials

Step④: Add water

Step⑤: Make heap & covered by banana leaf or dry grasses

Step⑥: Mix the heap every day for 2 weeks (Ready to use!!)

Attachment:3

Organic fertilizer(*bokashi*) making

Measure materials

Mix solid materials

Prepare water mix

Mix water part to solid mixture

Press into barrel or bucket with lid

Put paper on the top (humidity adjustment)

Cover by plastic sheet with lid (no bugs invading)

<u>Fermentation 1 month at least</u>

If needed, dry & packed for sale

Thank you for your attention

THANK YOU

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