



Organic Vegetable Production



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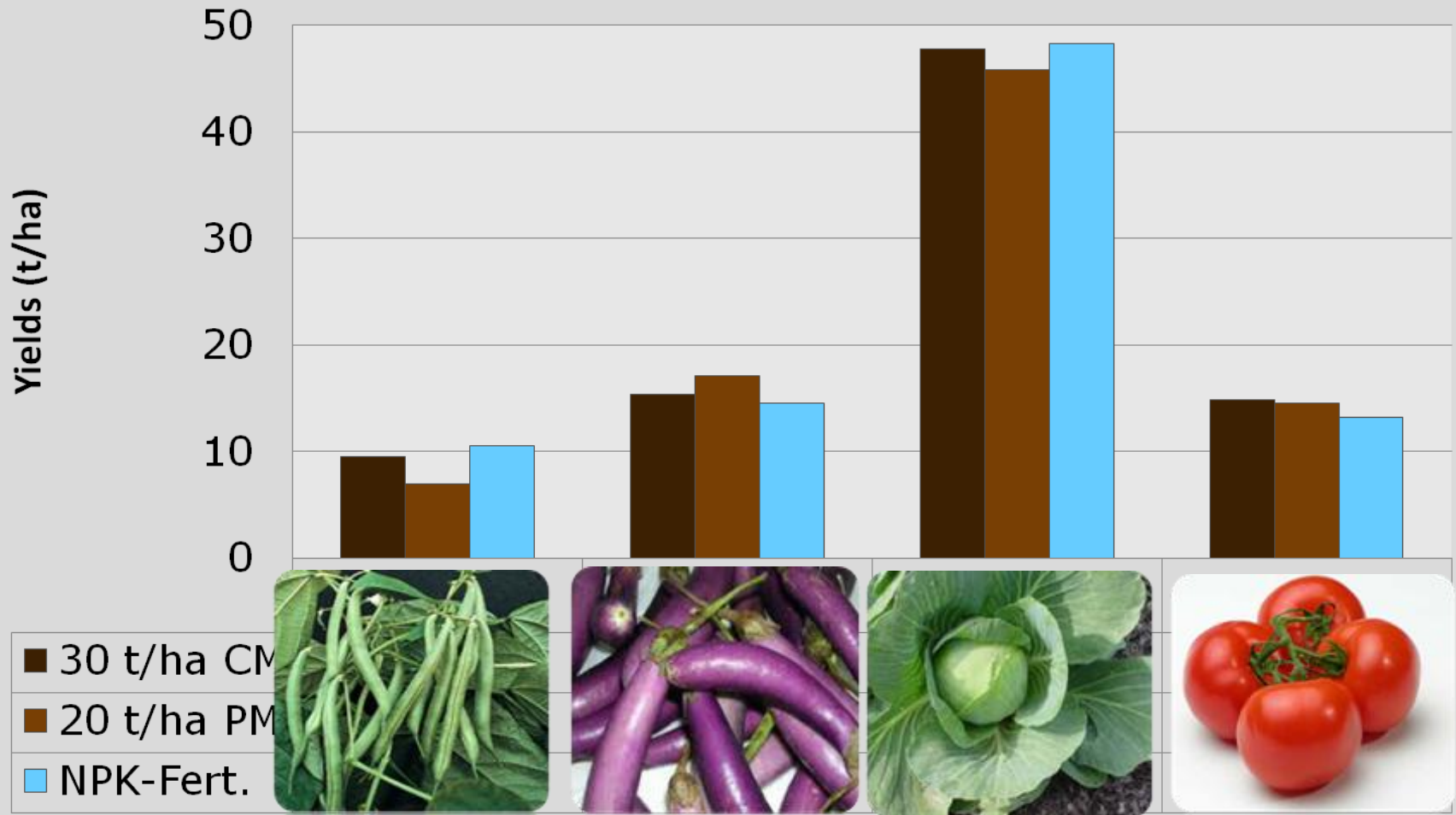
**A Systematic Research
initiated 1999**

@ HORDI

Gannoruwa

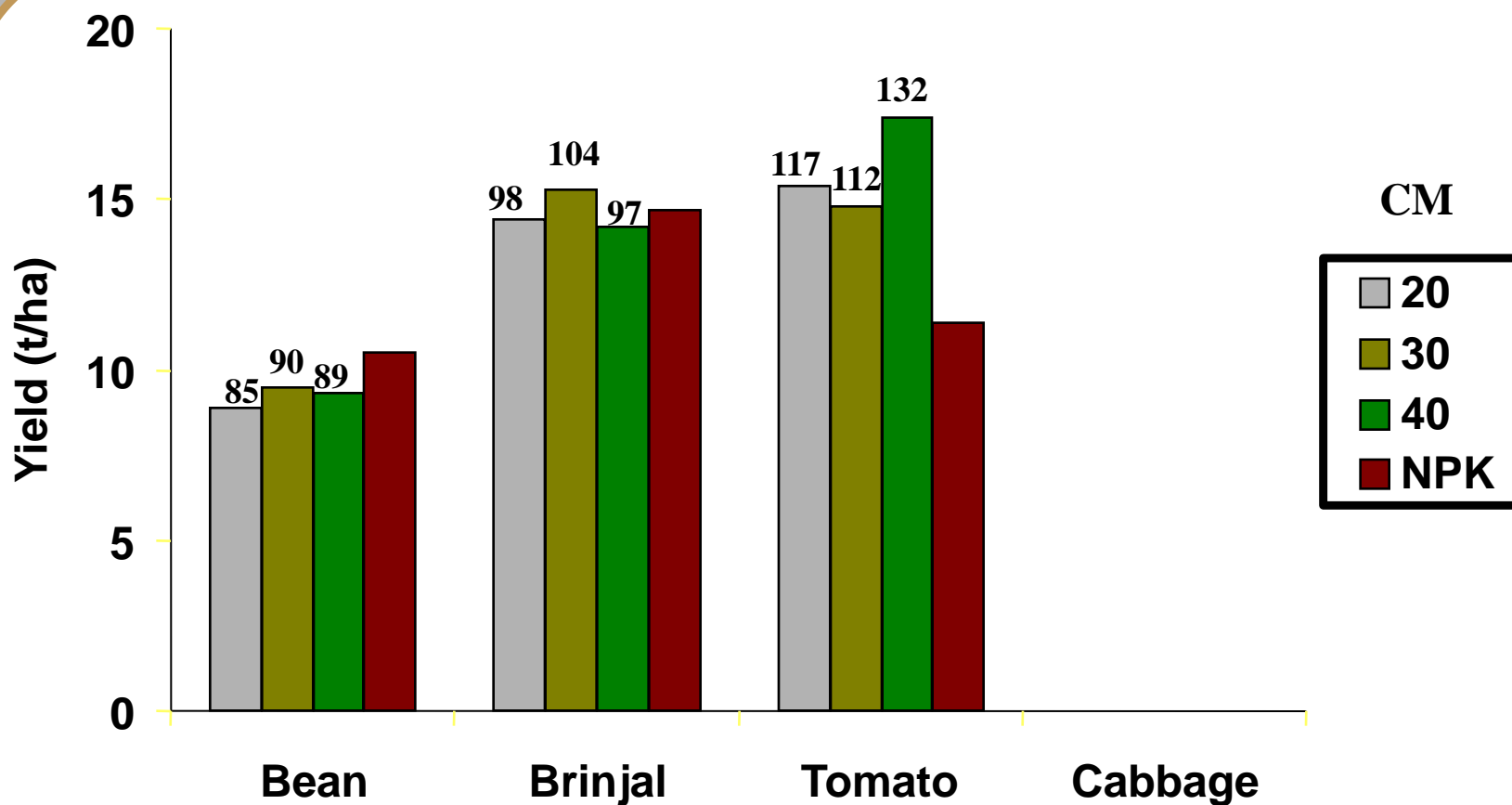
**Is it possible to obtain
sufficient vegetable yield under
Organic Farming system?**

Comparison of Vegetable yields



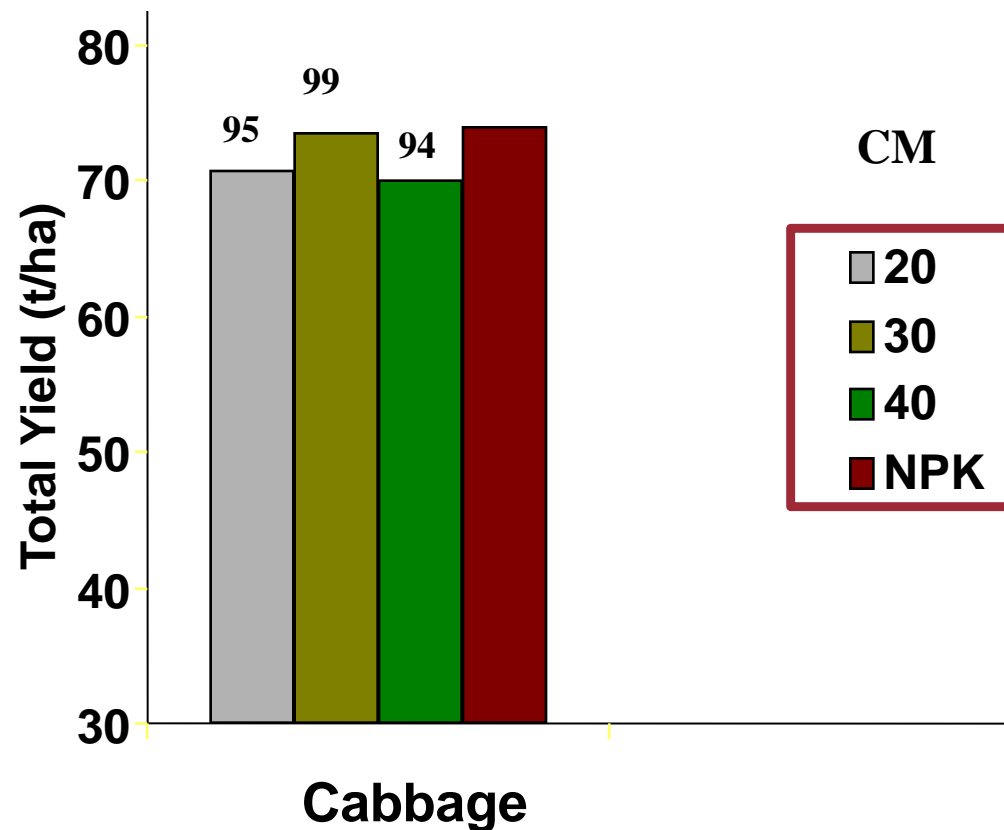
**How much manure to apply to
obtain satisfactory vegetable
yield?**

Vegetable yields obtained with CM relative to NPK

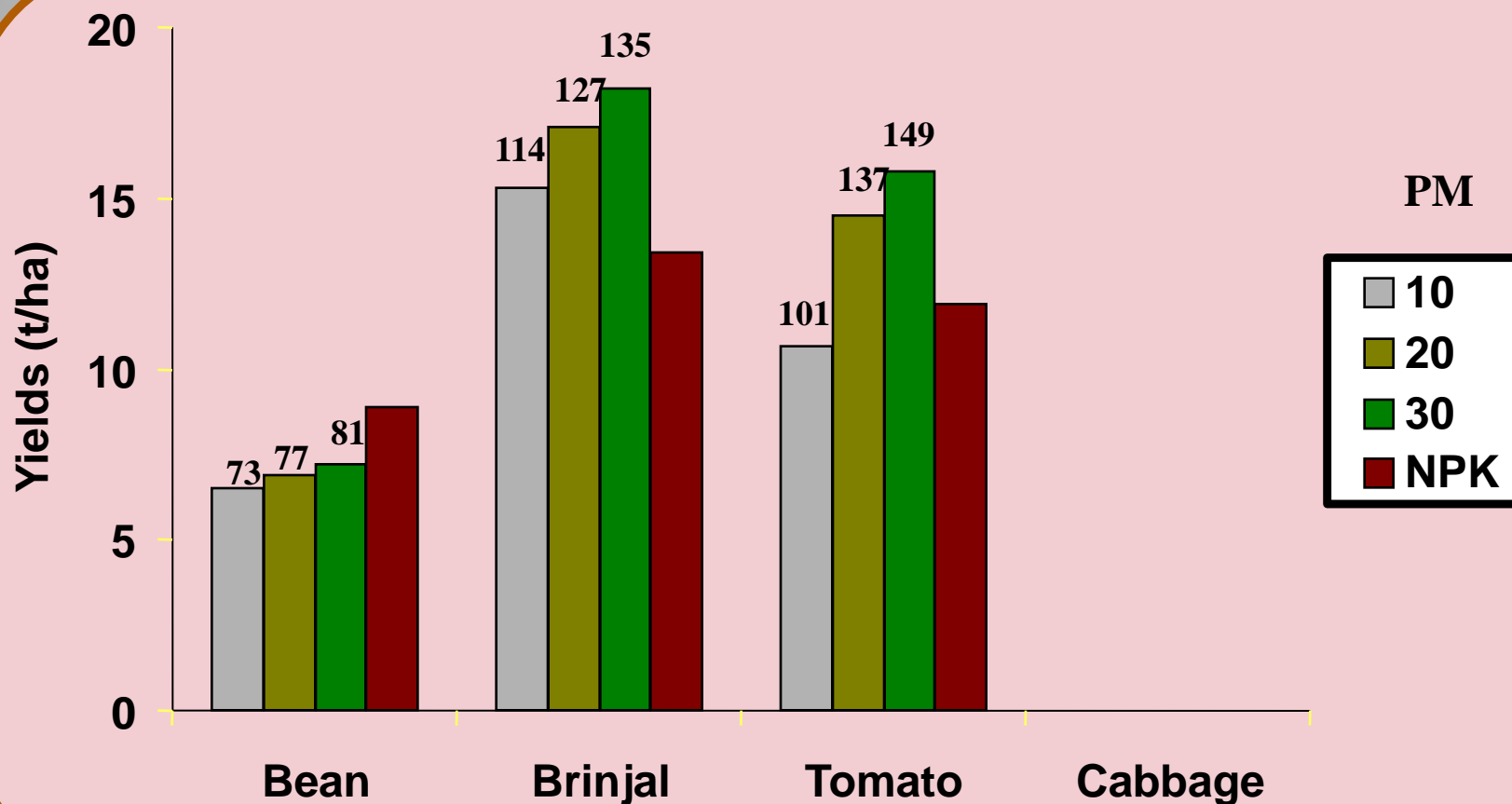


Average of 4 seasons

Cabbage yields obtained with CM relative to NPK

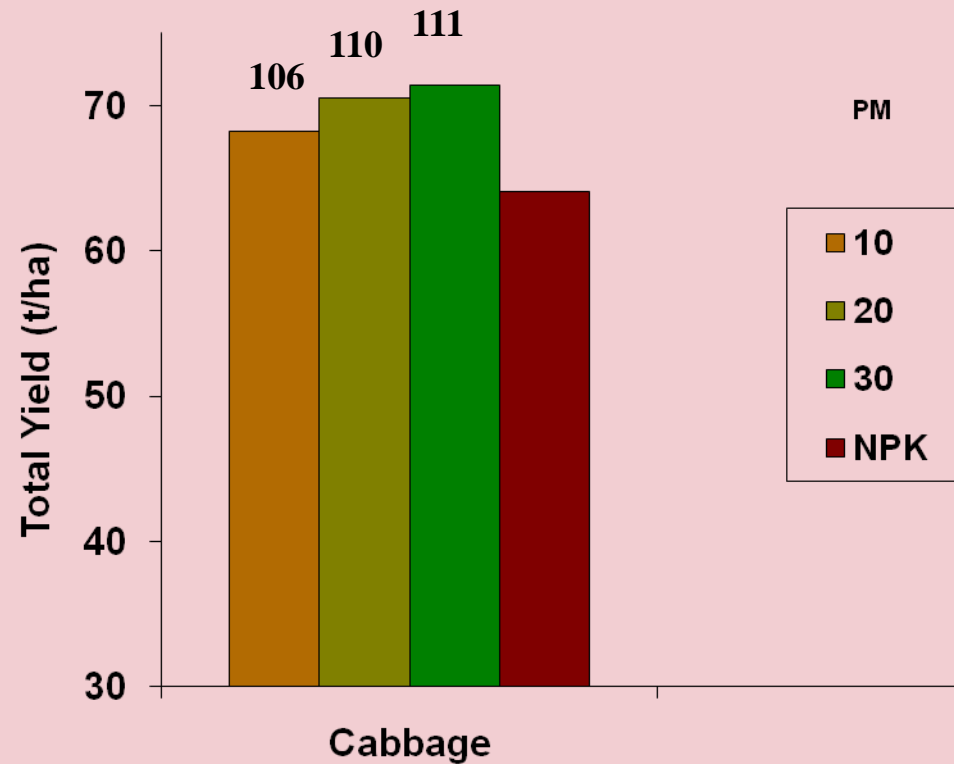


Vegetable yields obtained with PM relative to NPK



Average of 4 seasons

Cabbage yields obtained with PM relative to NPK

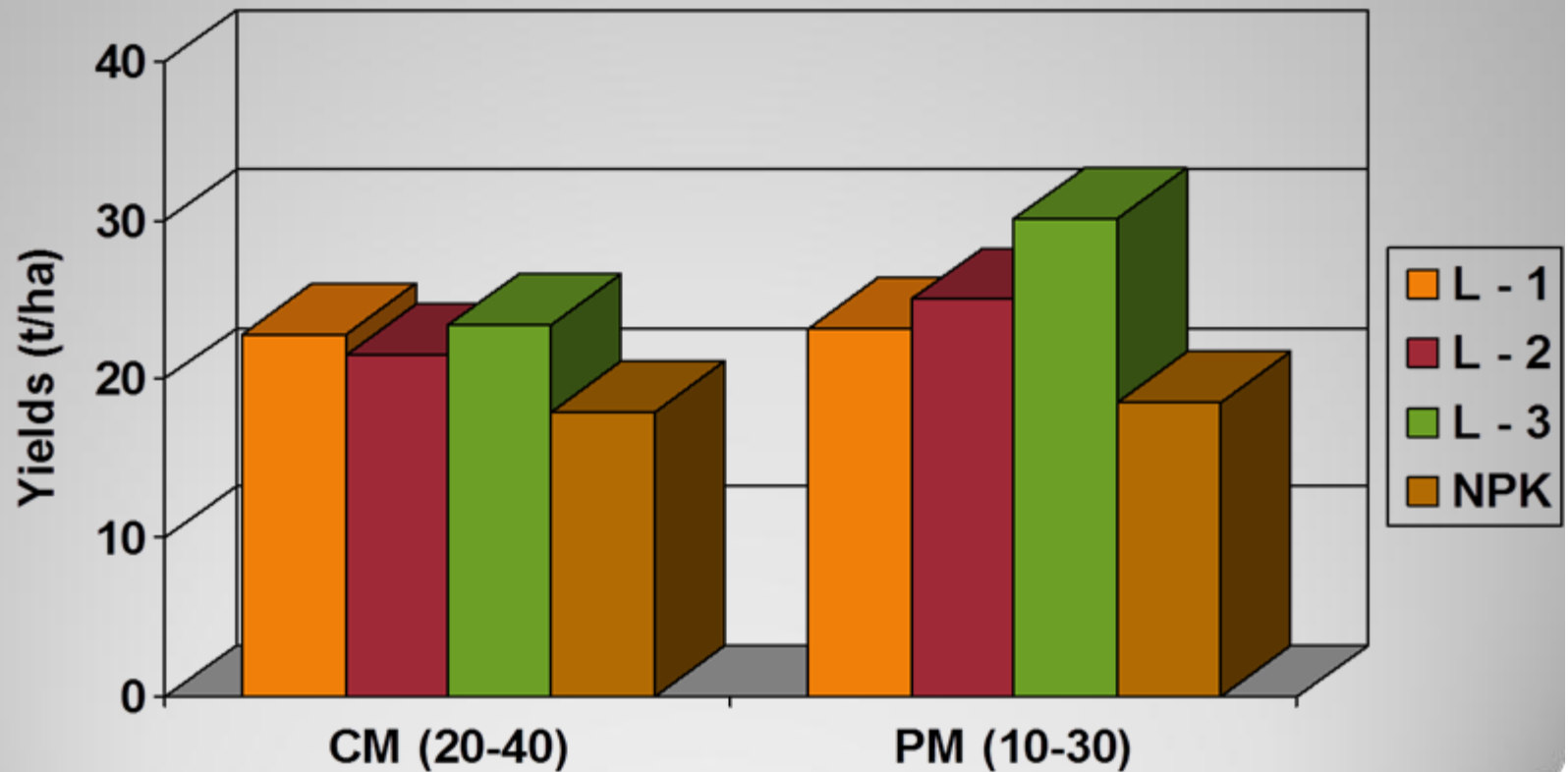


Average of 4 seasons



Will the mixed cropping give comparable yield? (MAL)

Average vegetable yield in the mixed cropping system



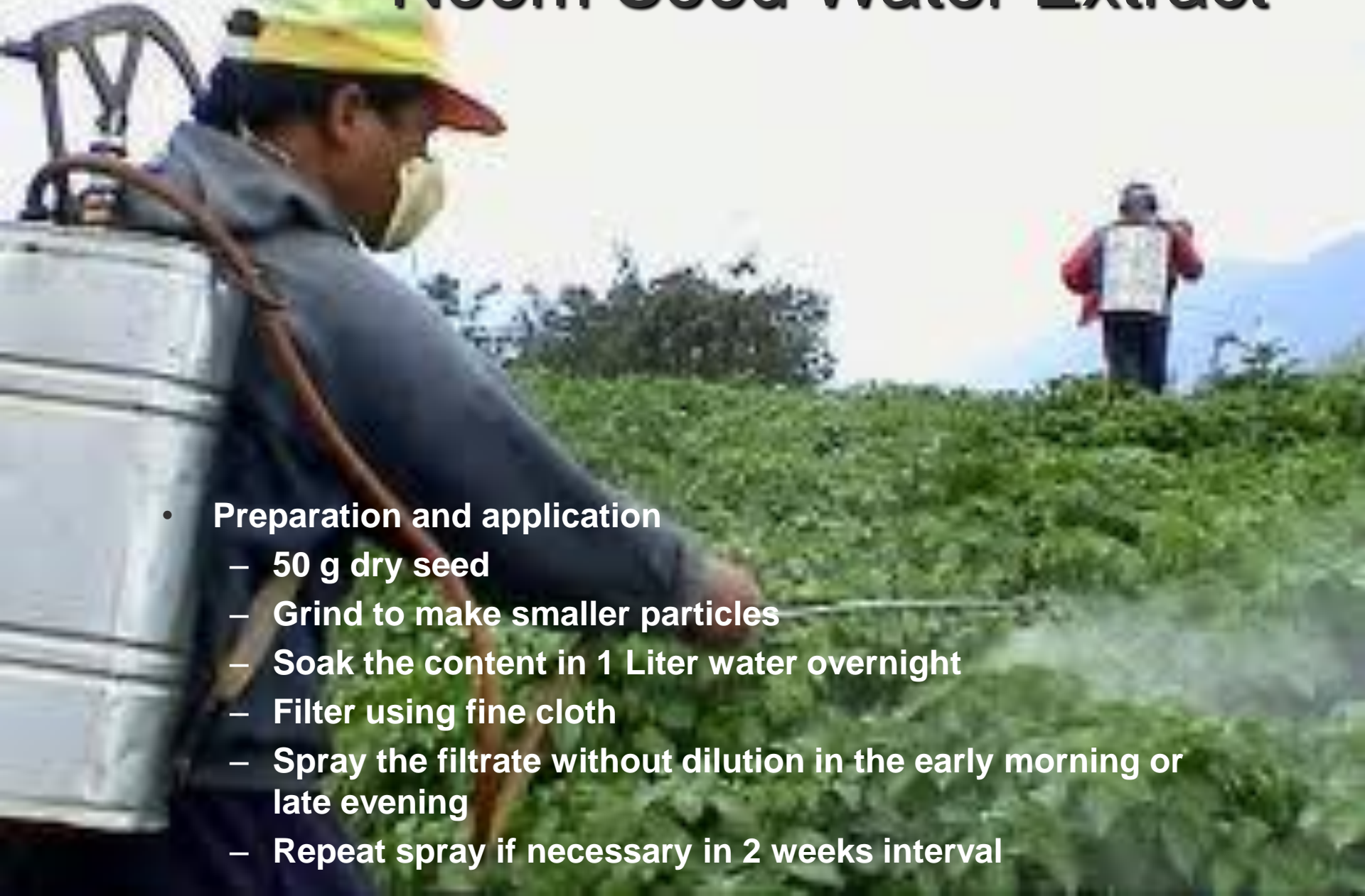
Bean, Cabbage, Carrot

Cabbage, Capsicum, Knol khol

How to control the pest?

Neem Seed Water Extract

- **Preparation and application**
 - 50 g dry seed
 - Grind to make smaller particles
 - Soak the content in 1 Liter water overnight
 - Filter using fine cloth
 - Spray the filtrate without dilution in the early morning or late evening
 - Repeat spray if necessary in 2 weeks interval



How to control the weeds?

Mulching methods -

(Maha 2005/06 & Yala 2009)

1. No mulch
2. Polythene
3. Carbonized rice husk
4. Dried grass or straw
5. Mukunuvenna (Live mulch)

Different Mulching methods tested in organic field



17/08/2009 09:49

Effect different mulching materials on Cabbage yield

Treatment	Head Yield (t/ha)	Total Yield (t/ha)
Control (No mulch)	15.13 bc	26.64 bc
Polythene mulch	18.41 bc	32.07 b
Straw mulch	30.01 a	49.10 a
Brunt Rice Husk layer	19.00 b	33.70 b
Live mulch (Mukunuwenna)	11.85 c	20.84 c

Recommendation for organic vegetable production



- Apply 20-30 t/ha cattle manure or 10-20 t/ha poultry manure or 30-40 t/ha compost as basal and half the amount as top dressing

Recommendation

Fertilizer Recommendations for Horticultural Crops 2007



Department of Agriculture
Peradeniya

13. ORGANIC VEGETABLE PRODUCTION

13.1 All areas

Type	Time of Application	Source	Quantity
Liming *	2 WBP	Lime / Dolomite	1-2 t/ha
Organic manure**	1 - 2 DBP	Compost	30 - 40 t/ha
	1 - 2 DBP	CM	20 - 30 t/ha
	3 - 5 DBP	PM	10 - 20 t/ha
Organic manure**	2 MAP	Compost	15 - 20 t/ha
	2 MAP	CM	10 - 15 t/ha

*Apply only if pH <5

** Apply any one source or their combination as per availability of material.

DBP=Days before planting; WBP=Weeks before planting; MAP=Months after planting; PM=Poultry manure; CM=Cattle manure

Guidelines on use of soil amendments & organic manures and other practices

- Lime application should be done 2 weeks before planting and incorporated well into soil
- Use of poultry manure (PM) over 20 t/ha is not advisable
- Liming can be omitted if PM is applied continuously.
- PM application should be done at least 3 - 5 days before planting and soil should be kept moist
- Subsequent organic manure applications can be done in a circle around the plant or along the rows
- If deficiency symptoms are observed application of plant extracts is advised.
- For insect pests management use either Neem seed water extract (50 g/L) or any mechanical method or biological pest control measures or any combination.
- Weed management can be done manually or thermally

Long term monitoring

- We have been cultivating organic vegetable cultivation since 1999
- Since the introduction of compost (year 2000) we initiated a long term monitoring plot to observe the yield obtainable under compost application
- Monitoring plot consisted of 3 large (24 sq m) non-replicated plots
- Treatment consisted
 - Compost + NPK fertilizer
 - NPK fertilizer
 - Compost only (40 t/ha)

Preparation of Compost – traditional way



Long term application of compost - Since

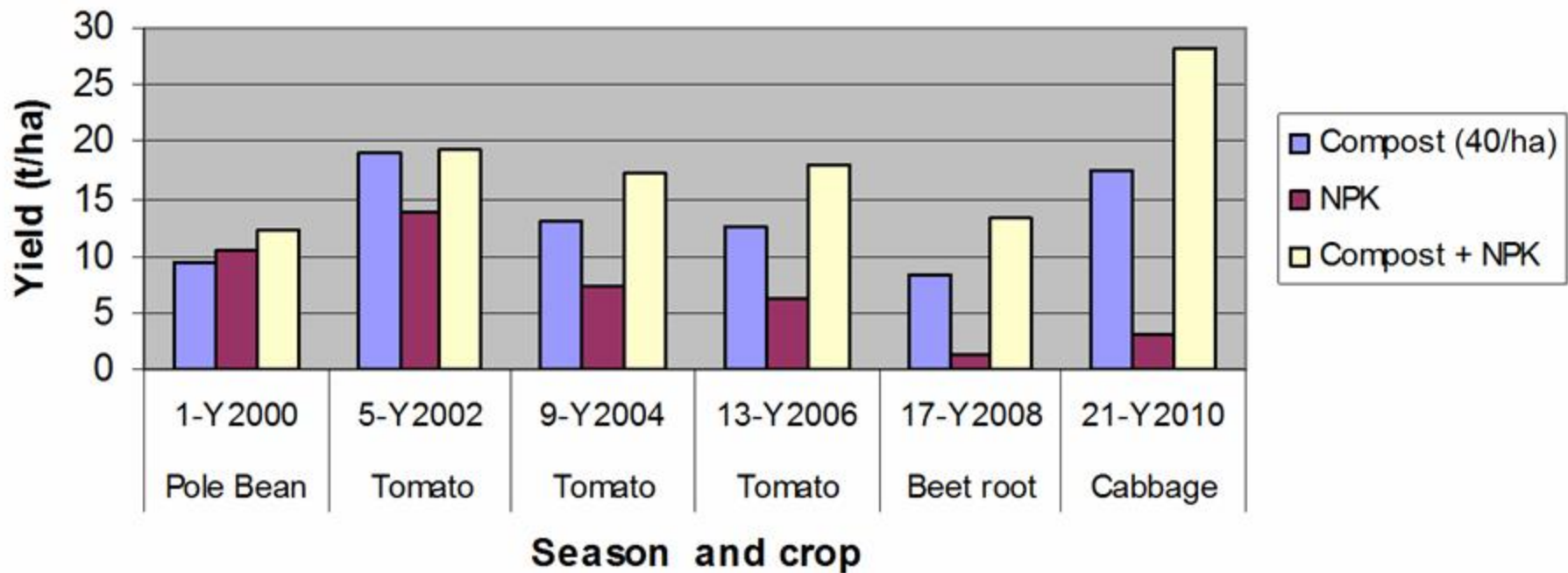
2000

Yala 2009

Better performance
Integrated use of compost + NPK fertilizer

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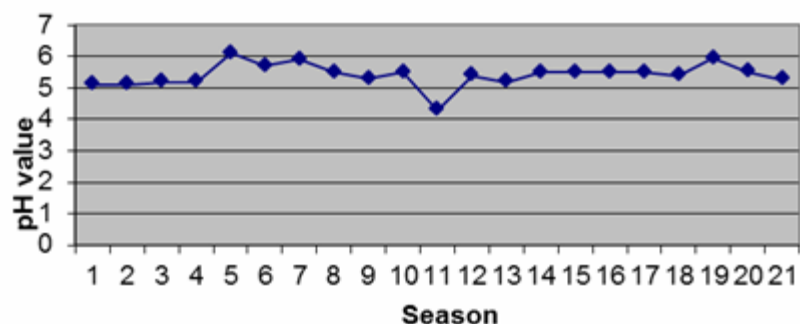
The effect of continuous application of Compost on vegetable yields



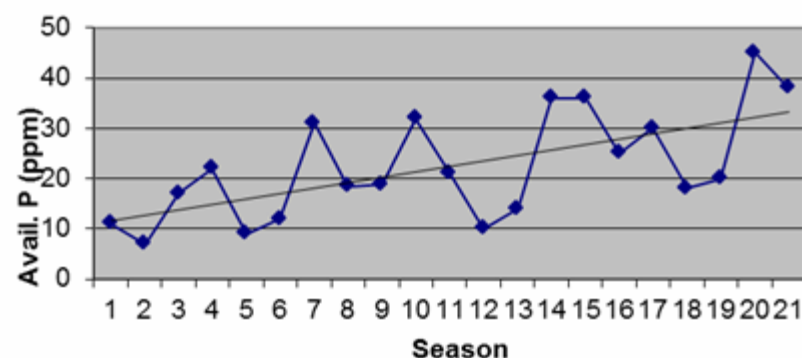
**Effect of continuous addition
of compost on soil properties.**

Changes in Soil Quality with seasons in the Compost (40 t/ha) + NPK plot

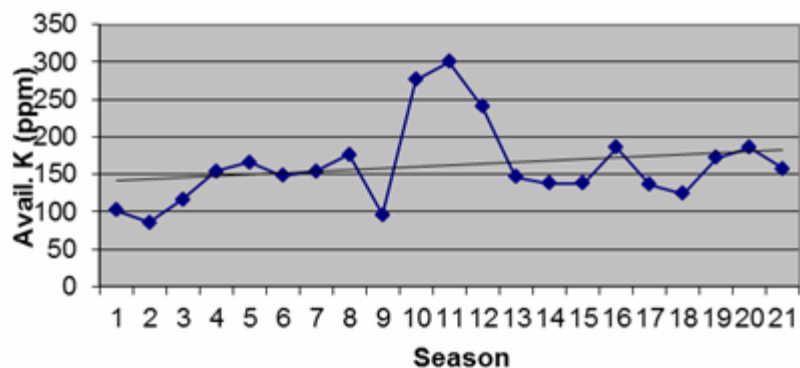
soil pH



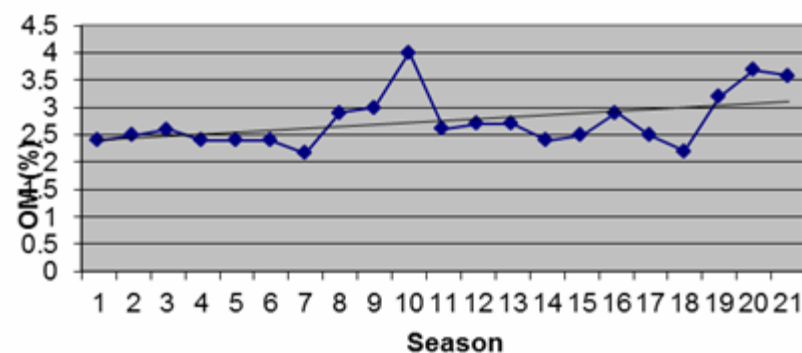
Soil Avail P



Soil Avail. K

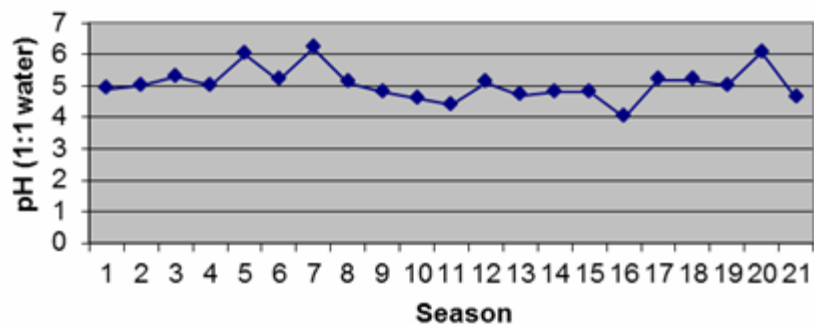


Soil OM %

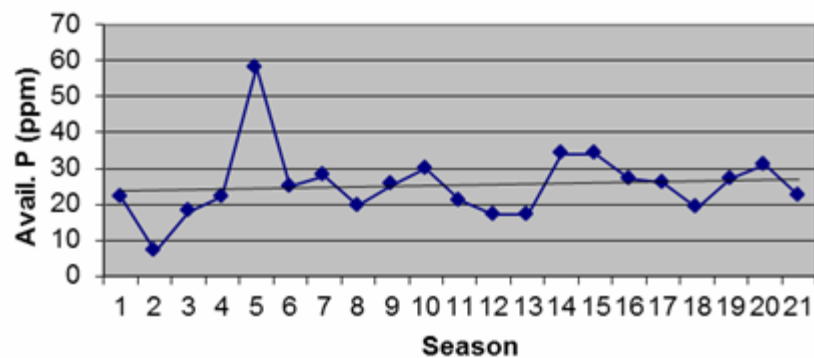


Changes in Soil Quality with seasons in the NPK plot

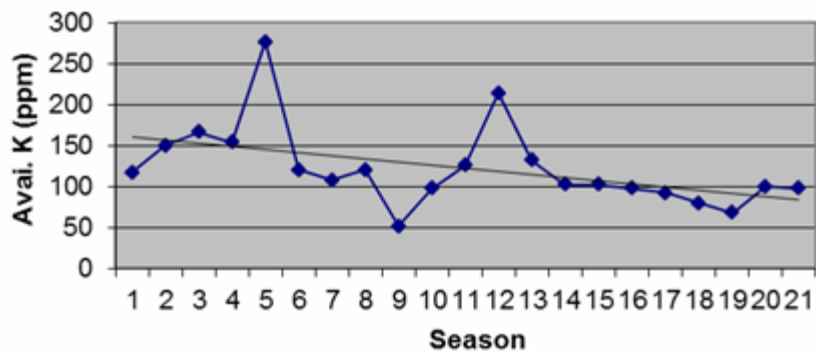
Soil pH



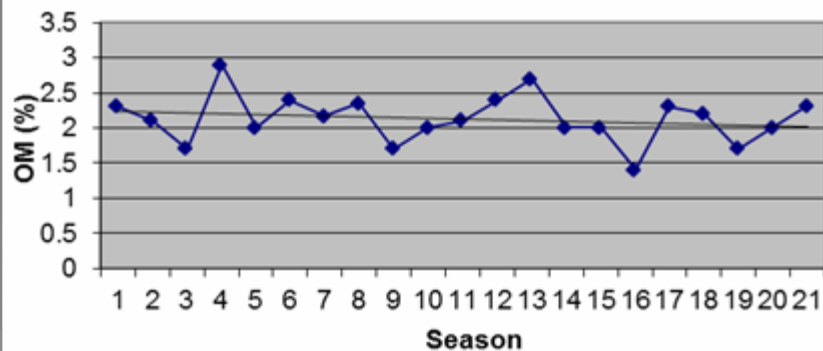
Soil Avail. P



Soil Avail. K

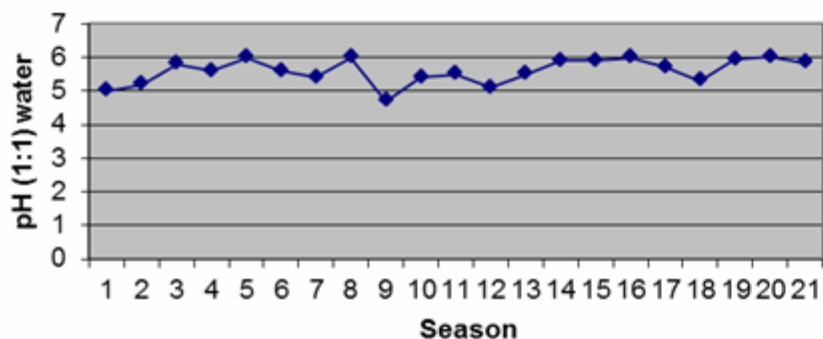


Soil OM

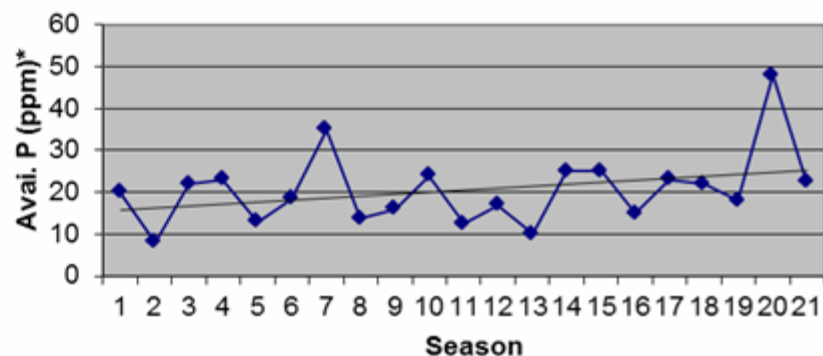


Changes in Soil Quality with seasons in the Compost plot

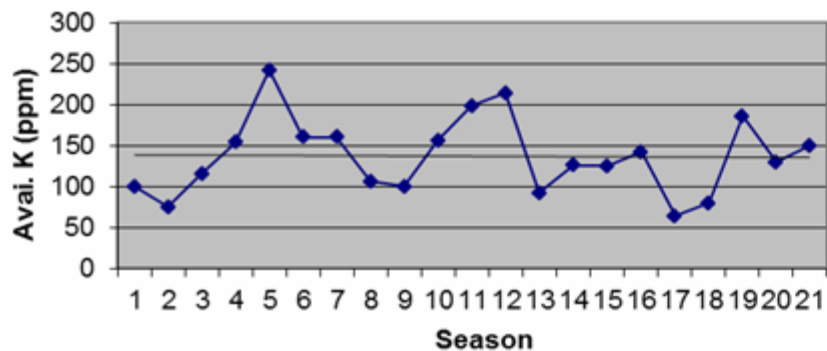
Soil pH



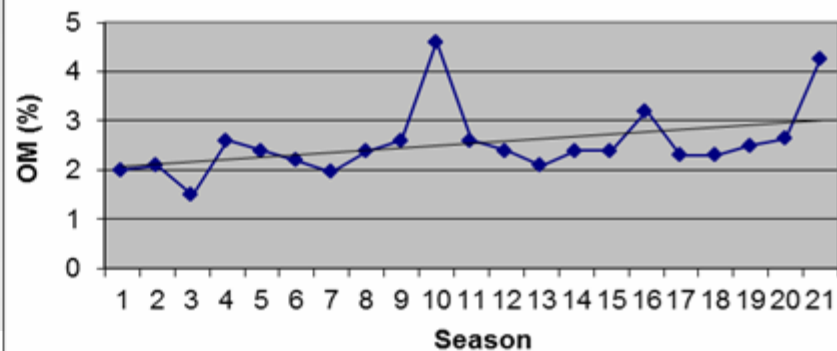
Soil Avail. P



Soil Avail. K



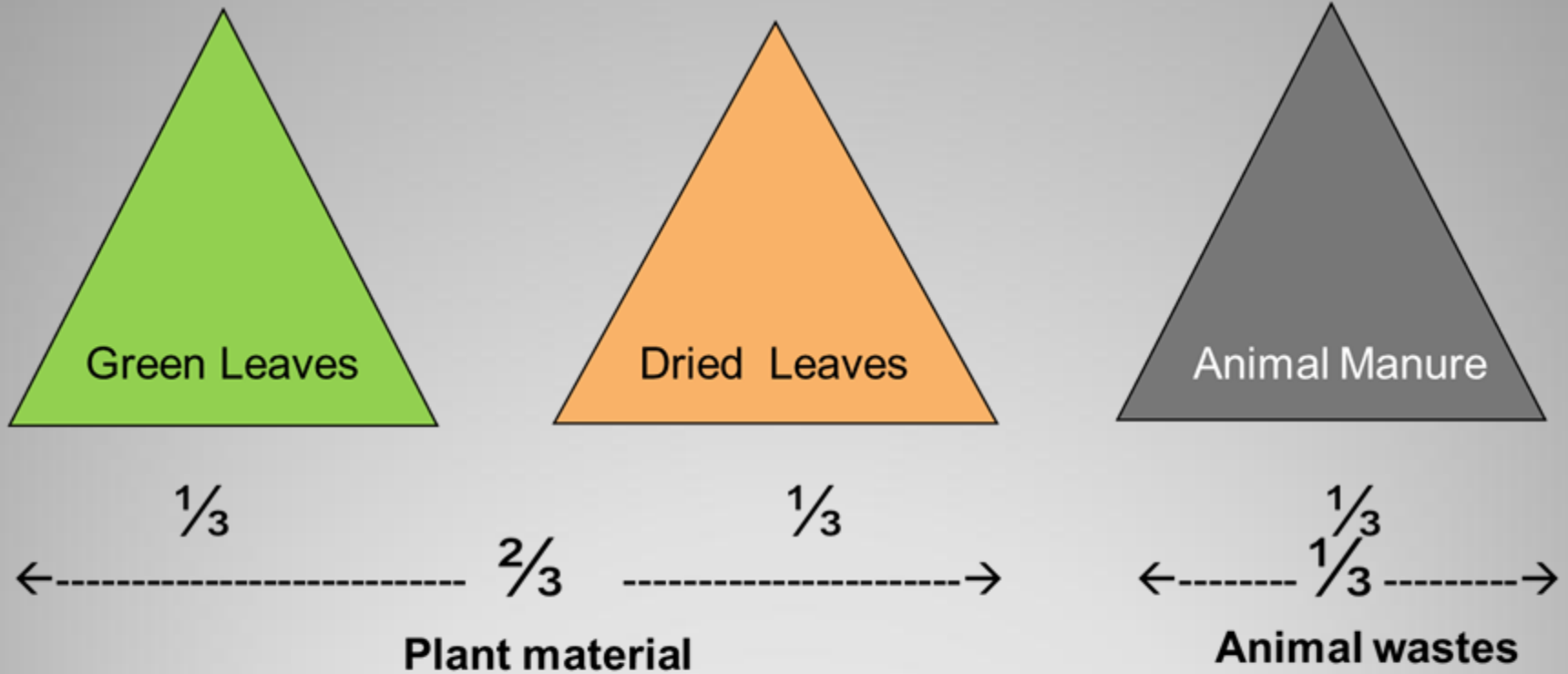
Soil OM



**Therefore the traditional
compost alone did not help to
maintain and increase long
term fertility of soils**

Then how to maintain long-term sustainability of organic vegetable yield?

Preparation of quality compost



Preparation of Quality Compost – A modern way

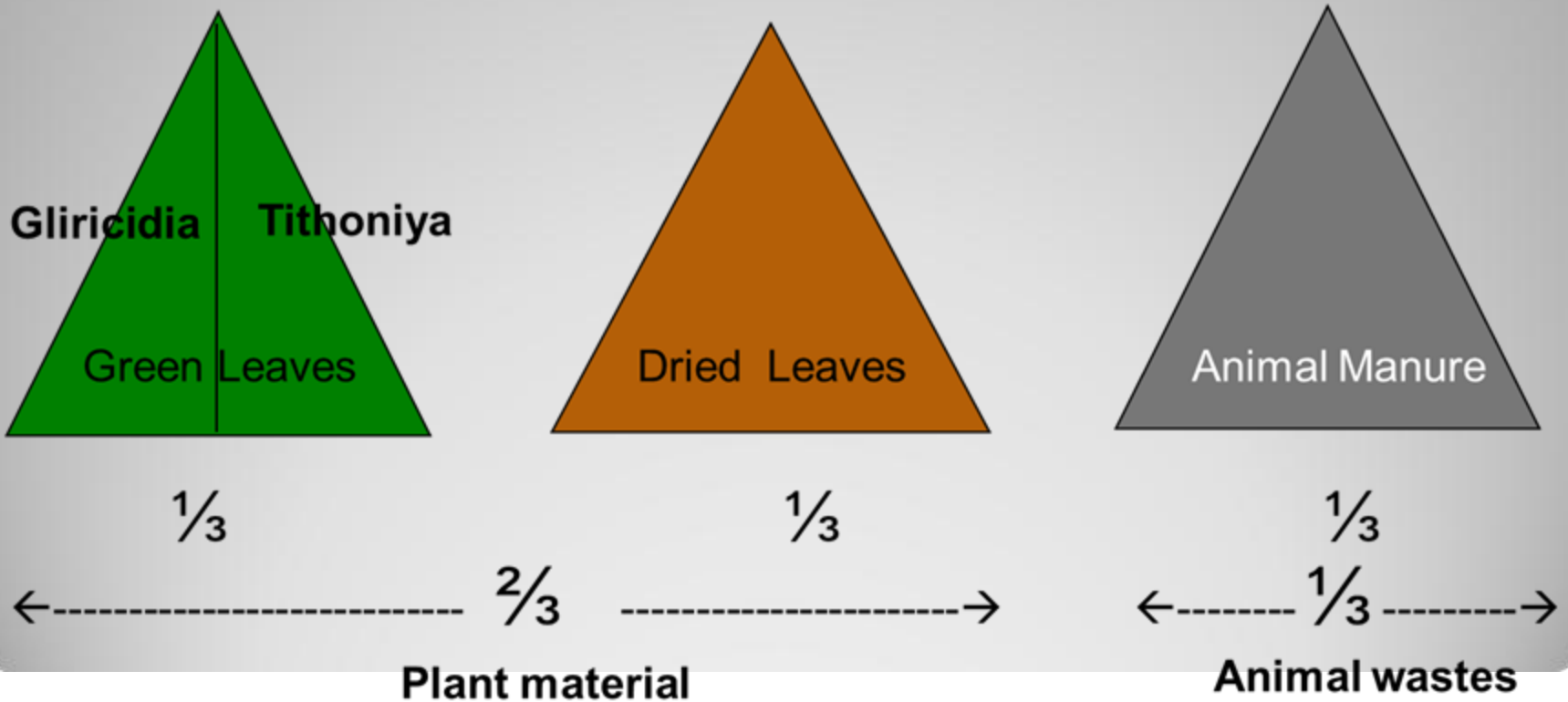
Preparation of Quality Compost for Organic farming



13/10/2009 13:20

**Use different green leaves for
compost making and testing
on organic vegetables**

The 1:1 mixture of Tithonia and Gliricidia gave satisfactory yields comparable to that of NPK.



Effect of different compost on vegetable yield (t/ha) – A field experiment

	Season			
	2006	2006/07	2007	2007/08
Crop Compost	Cabbage	Cb+Bn+Bt	Cb+Bt+KK	Cb+Cr+Bt
Thithoniya	49.84 a	28.55 ab	34.33 a	22.82 c
Gliricidia	43.92 b	29.20 ab	28.36 b	23.41 bc
Glr+Thi	51.45 a	29.66 a	35.83 a	25.48 a
NPK	50.34 a	22.22 b	32.51 a	24.64 ab
CV %	18.00	16.59	9.48	5.00

Composting for home-garden



05/11/2009 09:31



16/12/2009 08:32

After ~ 3 wks



29/01/2010 08:36



16/12/2009 08:49

Vermicomposting



Suitable media for culturing Earthworms

	Treatment	Ratio
1	Cow dung (CD)+ Crop Residues (CR)	10:3
2	CD + Kitchen Waste (KW)	10:3
3	CD + Partially crushed leaf litter (LL)	10:3
4	CD + Vegetable kitchen waste (VKW)	10:3
5	CD (one week old)	
6	CR + KW + LL	1:1:1
7	Fresh CD	
8	Fresh CD (Control – w/o Earthworms)	

5 worms (7-10 cm long) Inoculated and incubated for one month → worm count

Suitable media for culturing Earthworms

	Treatment	Earthworms
1	Cow dung (CD)+ Crop Residues (CR)	17
2	CD + Kitchen Waste (KW)	294
3	CD + Partially crushed leaf litter (LL)	276
4	CD + Vegetable kitchen waste (VKW)	135
5	CD (one week old)	221
6	CR + KW + LL	140
7	Fresh CD	216
8	Fresh CD (Control – w/o Earthworms)	0

Preparation of Vermicompost

Vermicomposting

Container

Dried Organic material wetted with water

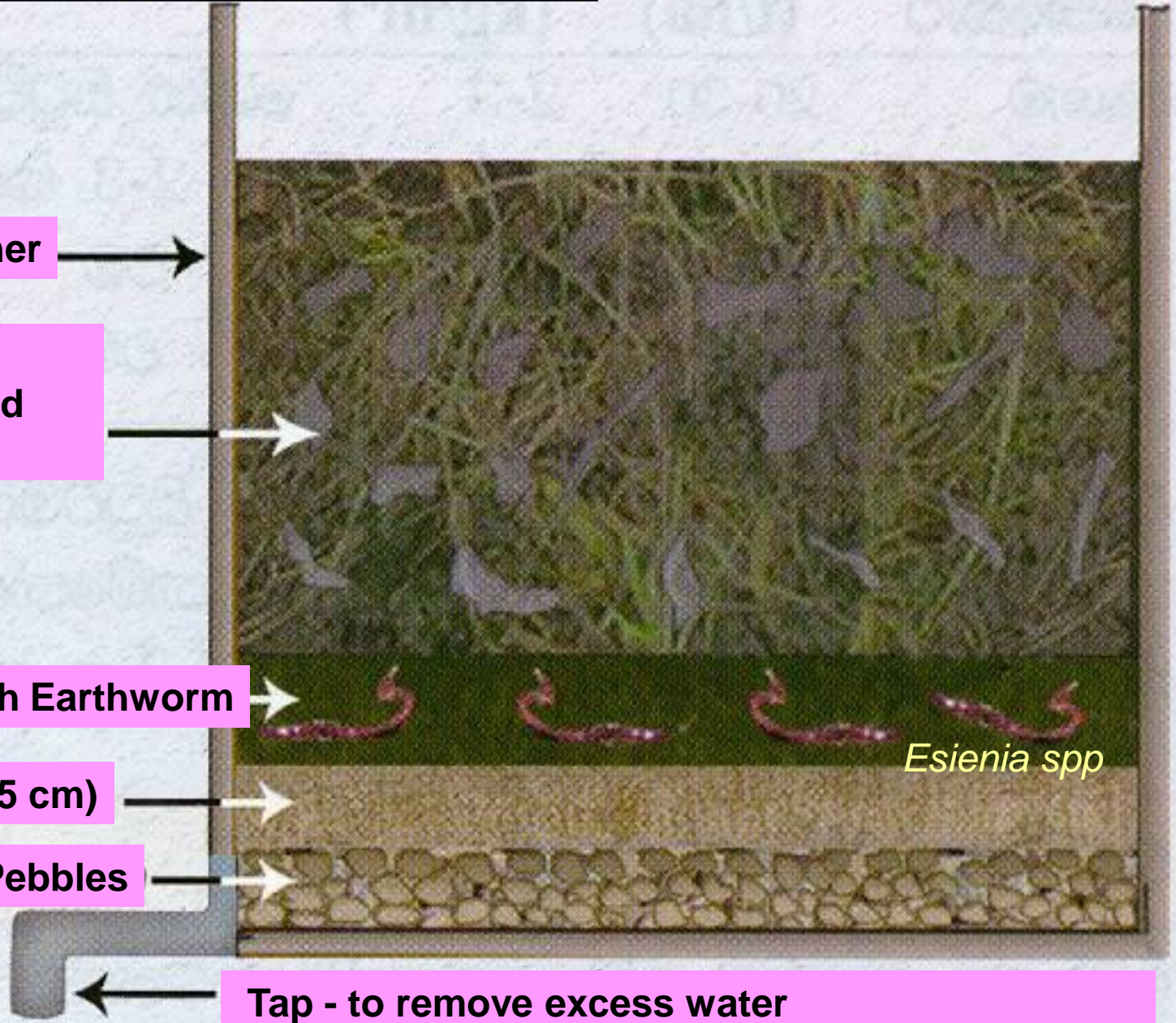
Cattle dung with Earthworm

Surface soil (5 cm)

Coarse sand & Pebbles

Tap - to remove excess water

Eisenia spp



Earthworms for sale



1. 25 Earthworms in a medium +
 2. A leaflet explaining how to make Vermicompost for sale @ Rs. 50.00 (Prior booking necessary)
- Training is available for interested groups (on request)

Preparation of Quality Vermicompost

and

Testing the different Vermicompost on Organic vegetable crops

Effect of different types of Vermicompost on dry matter yield of Tomato – A greenhouse study

Treatments	Plant Fresh wt. (g/pot)	Plant Dry wt. (g/pot)	Plant uptake (mg/pot)		
			N	P	K
Grass only (Control)	77.01	11.58	21	0.9	33
Grass + Gliricidia	139.23	26.18	66	1.3	100
Grass + Tithoniya	106.14	14.00	28	0.9	55
Grass + Rice straw	105.18	14.38	21	0.7	55
Grass + Kitchen waste	117.18	17.20	40	1.0	70

V. Compost – CD : dried Grass : Green leaves 1:1:1



Control

Gliricidia +
Grass (1:1)

Thithoniya +
Grass (1:1)

Rice Straw +
Grass (1:1)

Kitchen
waste +
Grass (1:1)

19/09/2008 09:41

Addition of Gliricidia leaves

**Increase P content of
vermicompost with ERP**

Improving the solubility of Eppawela Rock Phosphate (ERP) through Vermicomposting Process (Yala 2009 – 2009/10)



Treatment	Tomato Yield (t/ha)
Control (No compost)	6.16
Vermicompost	22.47
Vermicompost + ERP	36.26

Biological test methods for compost quality

Biological test method for compost quality assessment.

50 sample tested with 3 replicates

Correlation coefficient (r^2) at 3 weeks stage of sorghum plant grown in the compost mixture

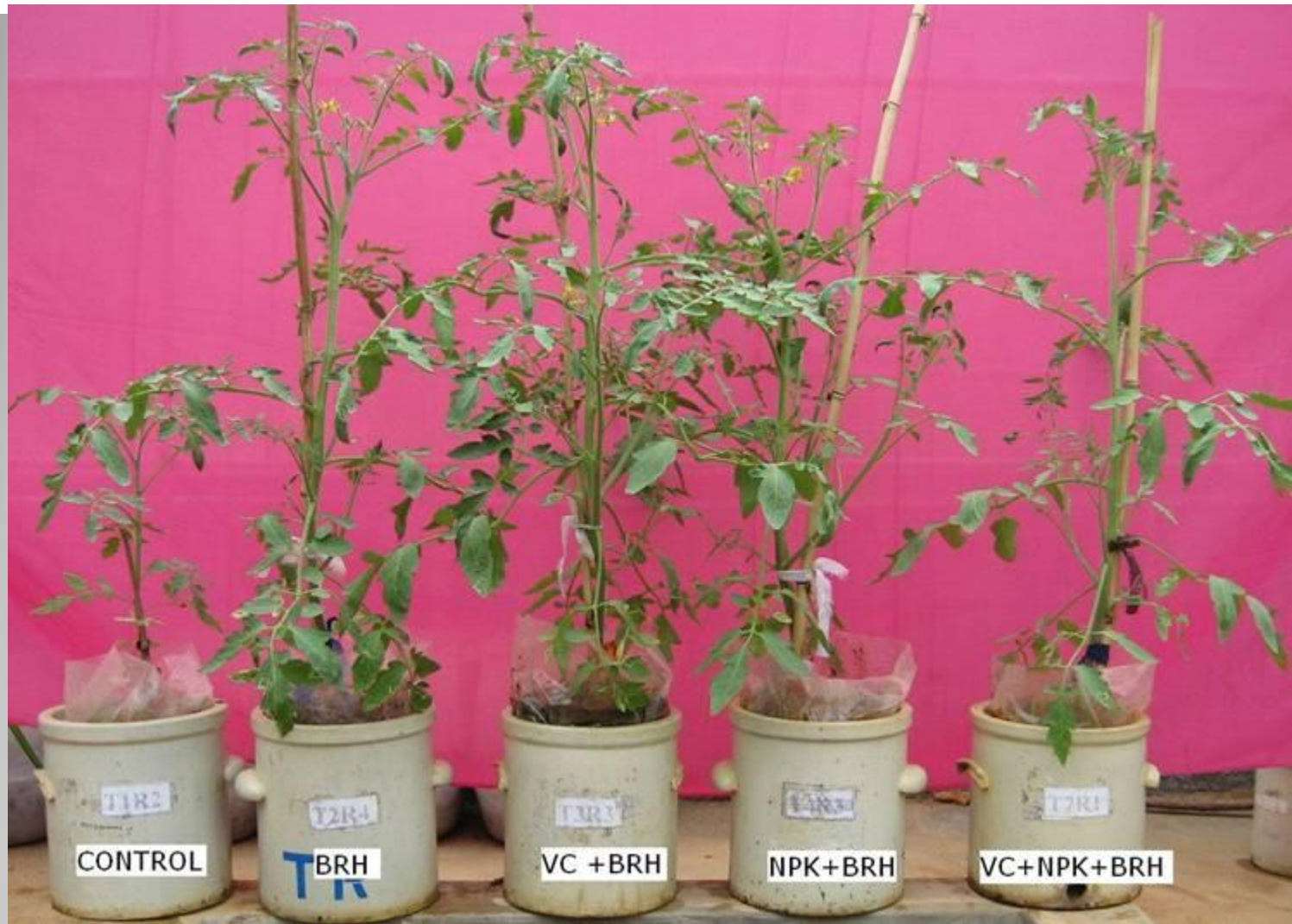
Chemical Parameter of Compost	Plant Dry weight	Plant Height	Leaf colour
Total N (%)	-0.318	-0.398	-0.413
Org C (%)	-0.262	-0.306	-0.153

Use of Carbonized Rice Husk as soil amendment

Use of Carbonized Rice Husk



Effect of Carbonized Rice Husk on Vegetable Cultivation (A Greenhouse Study)



The effect of Carbonized Rice Husk on tomato.

Carbonized Rice Husk for Organic farming

Use of Carbonized Rice Husk on Organic Vegetable cultivation (Maha 2008/09)



- **Recommendation for CRH**
- 200 g/planting hole or 8000 kg/ha together with recommended quantity of Compost

Effect of CRH on Brinjal yield – A Field Experiment (Yala 2010)

Treatment	Yield (t/ha)
Compost	15.20 bc
Compost + 100 g CRH	14.30 c
Compost + 200 g CRH	19.21 a
Compost + 300 g CRH	18.76 a
NPK	17.95 ab
CV %	11.42

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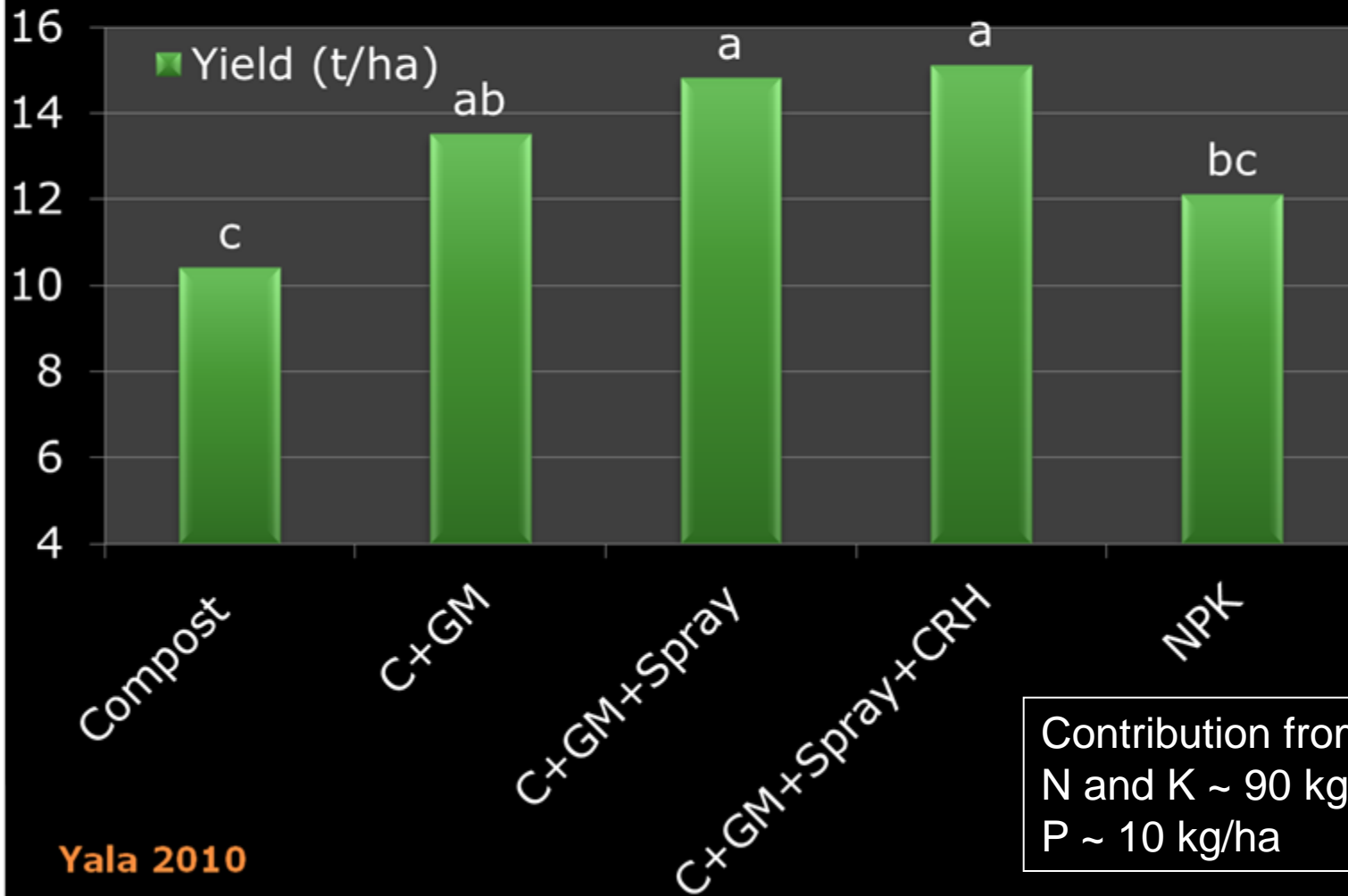
Maintaining Soil Fertility of Organic fields



45 days old Vegetable cowpea

Use of *insitu* green manuring for improving soil fertility

Effect of different nutrient management practices on Tomato yield



Yala 2010

Preparation of Liquid Organic extracts for Organic farming

**Green & Animal manure
extracts as foliar fertilizers
for organic farming**

Effect of different liquid Organic fertilizer on the yield of leafy vegetable – Mukunuwanne)

Treatment	Fresh wt (g/m ² /month)	Dry wt (g/m ² /month)
1. Control	433.94	79.24
2. Fresh water plants	473.60	86.34
3. Animal waste (CD, PM)	731.87	133.93
4. Kitchen waste	518.54	98.66
5. Fish waste	742.49	139.73
6. Leguminous leaves	564.33	99.12

- N and Fe uptake was greater in GM based foliar fertilizer
- K, Zn, Fe and Cu uptake was greater in AM based foliar fertilizer
- **Preparation of Extract:** At the rate of 1:20 incubate for 2 months filter and spray on leaves

Findings

**Improvement soil Biological activities
under organic farming**

-

Monitoring of earthworm population

Earthworm Population in (cubic feet) Organic fields

Expt: Long term Compost application

Trt	Nos/Cu ft
Compost + NPK	15
NPK	9
Compost	46

Expt: Compost and ERP compost

Trt	Mean
Compost + ERP	9.75
Compost	13.5

(Yala 2005)

Earthworm Population in (cubic feet) Organic fields

Expt: Application of Different Compost	
Trt	Mean
Thithoniya	5.5
Gliricidia	5.5
NPK	1
Vermicompost	7.5
T + G	4.5

in Yala 2007

THE END

Conclusion

- Soil fertility management is very important to sustain organic vegetable production
- Continuous application of (40 t/ha) traditional compost alone may not be sufficient to sustain organic vegetable yields and to maintain long term fertility of soils.

Conclusion ...

- In order to overcome the soil fertility problems, with the regular monitoring of soil quality the following practices or combination practices can be recommended:
 - 1. **Use of animal manures**
 - 2. **Preparation and use of quality compost rich in major nutrients**
 - 2. Use of vermicompost
 - 3. Use of enriched vermicompost
 - 4. Use of carbonized rice husk
 - 5. *In situ* green manuring or crop rotation with the leguminous crops.
 - 6. Use of Organic foliar sprays



Thank You

08/04/2011 10:13