

# It All Comes Down To The Minerals and the Microbes

- The more we can hold carbon in the soil and get the minerals in the right relationships, the more potential there is for interactions for both the building up and breaking down of mineral compounds, the more microbes we can feed and the more energy there is released that is available for plant growth



# Step 1

## Strategy

Managing and improving plant sap sugar levels

## Technique

- Learn to use a refractometer
- Regular times during day eg 1:00 after lunch
- once a week minimum
- Always rub for same length of time ( around 2 minutes)
- Always pick leaves from the same place on plant and from several plants
- Note weather
- Check for sharp or blurry line
- Check again ½ - 2 hours after applying minerals
- Keep good records



# Step 2

## Strategy

Understanding the physical properties (the patterns) of your soil

## Techniques

- V.S.A. soil assessment guide
- Soil tests Reams (what's available to plant roots), BioServices
- Hill Laboratories (what's available in the soil)
- Healthy Soils





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## REAMS SOIL TEST REPORT

<b>SAMPLE SUBMITTED BY</b> Grant Paton	<b>GROWER</b> Kay Baxter	<b>CROP</b> Gardens	<b>Total Ha</b>	<b>REPORT DATE</b> 31/01/2013
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Reams Plant availability		Nitrate N NO <sub>3</sub>	Ammon.N NH <sub>4</sub>	Calcium Ca	Magnesium Mg	Phosphorus P	Phosphate P <sub>2</sub> O <sub>5</sub>	Potassium K	Sodium Na	pH log[H]	ORP mV	ERGS uS/cm	Para- magnetism	Humus Rating	Ca:Mg Ratio *	P:K Ratio *	Total Daily Nutrients**
SAMPLE IDENTIFICATION	Ha																
<b>Desired ranges/levels</b>	kg/ha	40-80	40-80	2000-5000	280-800	100-200	200-400	100-200	20-70	6.2-6.9	25-28	200-600	300-1200	30-40	7 to 1	2:1 or 1:1	2900
Kays Garden		70	12	1014	133	138	317	300	19	6.98	31	469	182	4	7.6	0.5	1713
Seed Garden		50	8	962	203	92	212	300	10	7.03	31	440	119	5	4.7	0.3	1532

### Interpretation of results

Excess nitrate-availability grows low-sugar, watery foliage, grass staggers & insect attack.

Low ammonium N levels mean low bacterial activity and nutrient cycling.

Low Ca means decreased reserve energy, low cell wall strength, fruit bruising, weak stems, low palatability, low yields, insect attack, grass weeds.

Every kg of soluble Mg removes one kg of N. More N is required on high Mg soils or with Dolomite.

Low P means low P:K ratio, low yields, weed problems.

High K replaces Ca in plant cells, resulting in low-nutrition foliage and compacted soil.

Mycorrhizal fungi require available P of 45-157 kg/ha to function; therefore establish minimum of 50 kg/ha P before inoculating with mycorrhizal spores [EF BioVam].

Na is important for K:Na balance, milk production, nerve function, water regulation, muscle contraction. A high Na soil can cause compaction despite a 7:1 Ca:Mg ratio.

Oxidation Reduction Potential is another indicator of microbial activity.

Paramagnetism is a subtle photon-emitting magnetic force that stimulates root growth.

Low humus means low microbial activity, nutrient cycling, water holding capacity, drought tolerance; and N leaching.

\* A less than 5:1 Ca:Mg ratio means compacted, poorly aerated soil, bacterial suppression, weed takeover.

Low ergs means low energy, poor growth and yields.

\* 2:1 P:K ratio for pasture. 1:1 all other crops. Low ratio means weed takeover, high K foliage. A good ratio discourages broadleaf weeds, increases growth vigour and leaf brix.

\*\*Combined availability of nitrate N, ammonium N, Ca, Phosphate and K. Ca is the major contributor followed by phosphate and K.

A high TDN and 2:1 P:K ratio enables 20% of growth energy to come from soil, 80% from atmosphere and enables accurate yield prediction.

A report and proposed biological ionisation management plan can be requested by the submitter and/or grower.

**Disclaimer** - Bio Services Ltd provides this report in good faith and will not be held responsible for the interpretation of and recommendations from these results by a third party.



# Step 3

## Strategy

Create 50% air space in your soil for strong root and anaerobic microbe growth

## Techniques

double digging, appropriate implements behind tractor



# Step 4

## Strategy

Create ideal or as close to as possible moisture levels in soil to achieve excellent root and microbe growth

## Techniques

- Increase humus
- Increase carbon levels
- Appropriate techniques for irrigation, or watering
- Deep rooted plants



# Step 5

## Strategies

To achieve high levels of carbon and humus to hold water and minerals, and microbes

## Techniques

- Composting 60:1 rather than 30:1
- Biointensive whole system approach
- Carbon crops
- Biochar
- Humus Builder/C++
- Forest Gardening
- Foliar Feeding
- Ramial











# Compost 60:1 rather than 30:1

Design Your Compost To Be Producing Maximum Carbon

See

The Koanga Art of Composting Booklet



# Carbon Crops: Air-dried Biomass

Yields of weight of airdired biomass yield per 10m2 (intermediate yield) for our most Carbon efficient accumulators

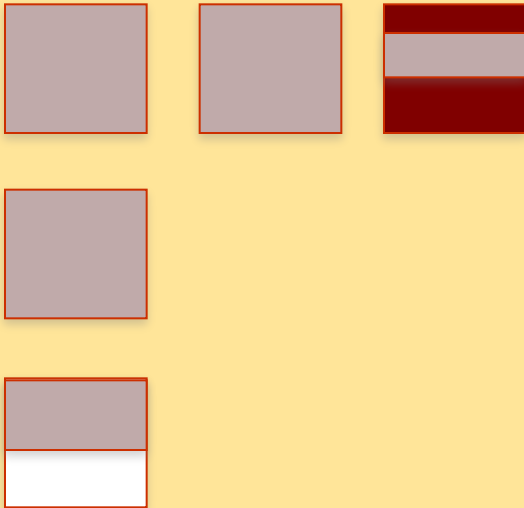
Carbon Crop	Biomass Yield
Corn	21 kgs
Amaranth	10 kgs
Millet	18 kgs
Sourghum	22 kgs
Wheat, rye, oats, barley, lupins	13.5 kgs
Sunflowers	18 kgs
Broadbeans (9 months in the ground)	16 kgs
Broadbeans (6 months in the ground)	7 kgs
Quinoa	18 kgs
Jerusalem Artichokes	18 kgs



# Compost Ratios

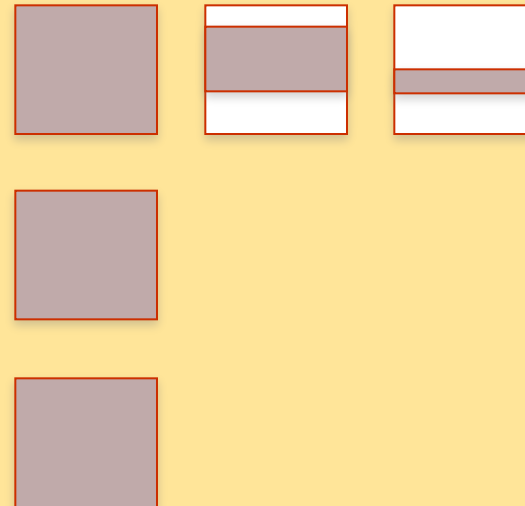
**45:1 compost heap will be made up of:**  
2 – 2 ½ parts mature material, 1 part immature, ½ part soil

Mature Plants 2 ½    Immature Plants 1    Soil – 1/3



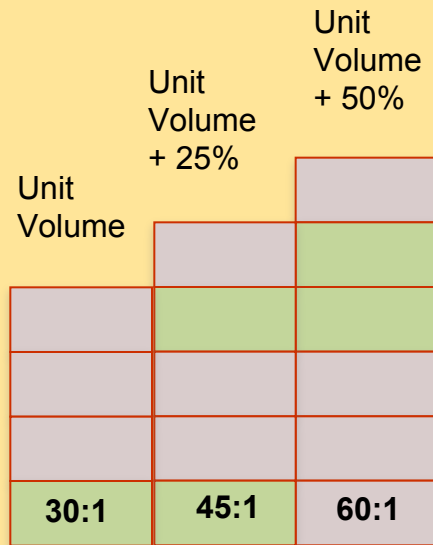
**60:1 compost heap is made by using the following ratios of material:**  
3 parts mature, ½ part immature, ¼ part soil

Mature Plants 2 ½    Immature Plants 1    Soil – 1/3

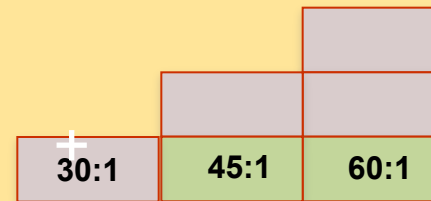


# Carbon / Nitrogen Ratios

Increase in compost volume produced with increased carbon/nitrogen ratio (C:N)



Increase in garden production per sq m with increased carbon/nitrogen ratio (C:N)



# Step 6

## Strategy

### Right Minerals in Right Relationships

If we use low brix material to make our compost we are recycling the deficiencies and won't grow high brix food.



## Techniques (Transition/ sustaining)

- Blocking the leaks
  - Mineralised Composting
  - Burn bones shells to ash and recycle
  - Choosing specific compost crops
  - Returning humanure
  - Biochar
  - Black Soldier Flies
  - Bringing in fertiliser based on Reams soil tests
  - Learn to make our own fertiliser Koanga Knowledge Base
  - Mineralised worm farms
  - Use salt water, seaweed, fish waste, milk, leaves, iodine
  - Harvesting biomass from some other appropriate perennial situation eg wetland
  - Use tree leaves selected for specific minerals
- Ramial





quick reference chart showing the most appropriate trees to grow in our forest gardens to ensure wide range of minerals are accumulated and recycled and or gathered to use in vege garden for compost

	nitrogen	calcium	magnesium	phosphate	potash
willow leaves and bark			*		
oak leaves		*			
cassurina				*	
birches				*	
mullein			*		
comfrey		**	*	*	**
plantain			*		
cleavers			*		
horsetail		*	*	*	
linden		**		**	
maples					*
dogwoods		**			
lupins	*	*		*	
oats		*		*	
alfalfa	*	**	**	**	**











# Step 7

## Strategies

Support Strong Active Microbe Populations

## Techniques

- Getting the carbon/humus, minerals, air, and moisture levels right
- Compost tea
- Compost/only if it's well made
- Seedling inoculant
- Biopesticide
- Vermicast
- BD 500
- BD Cow Pat Pit
- Organic Raw Milk



# Recommended reading

Nourishment Home Grown A.E. Beddoe

Growing Nutrient Dense Food K. Baxter

The Art of Composting Booklet K. Baxter

Koanga Garden Guide K Baxter

Koanga Knowledge Base

Eco San Res



# Recommended Further Learning

- Koanga Gardening Masterclass
- Biointensive 3 days
- How To Grow Nutrient Dense Food 2 days
- Employment
- Apprenticeship
- Internship after Workshops
- ReGeneration Productions- online workshops

