

## Introduction

Biological farming and creating our own compost is something I have always been interested in. I am passionate about the environment and farming, and I was concerned if we continued to keep using conventional fertilizers, pesticides and chemicals, how agriculture is going to be sustainable in the long term. The funding and support of the Peter Olsen Fellowship has given me the opportunity to properly assess and research the alternatives. I have gained invaluable knowledge and have seen firsthand the success already achieved by farmers using these processes. Over the past year I have learnt how we can use this knowledge and experience and apply it successfully to our farm.

My goal at the beginning of the project was to find out 'how to' and 'the best way' for us to make a high quality compost and the feasibility and viability of our farm Brippick adopting biological techniques into our farming systems. I achieved this through visiting properties that are currently making compost, visiting farmers that are successfully using biological farming methods on their property, attending relevant courses and conferences and also employing consultants who have many years of experience in this field. Basically, what I discovered is that compost is a lot softer on the soil compared to manmade fertilizers and is a more diverse product. I learnt that we need to make humus compost rather than general compost, as it stimulates microbes, is slow releasing, therefore available when the plant needs it, whereas with



hard fertilizers plants absorb nutrients and minerals whether they need them or not, therefore throwing the plant health out of balance. The long term benefits of using humus compost definitely outweigh any short term gains from using conventional fertilisers and chemicals.

My experiences also enabled me to gauge firsthand the benefits and the long term gains of biological farming. The benefits are twofold, increased production and financial gains. The overall yields are as good or above average, as those using conventional farming methods, and the end product produced is of a higher quality which allows the farmer to receive premium prices. This would involve creating our own liquid fertiliser and extra biology to eliminate high use of conventional fertilisers and chemicals. The extra biology will target diseases and can even be used to reduce frost damage.

What interested me the most in my travels and from the knowledge I gained were the following benefits of making and using humus compost and embracing biological farming :

- Environmental – how to work with nature and create a healthy soil with a full complement of nutrients and minerals. Everyone benefits, the farmer, the stock and the crops.
- Financial – eventually you can cut your fertilizer costs significantly, ultimately cutting your input costs.
- Protection of crops – the balanced soil structure will naturally have less disease and pests, consequently less pesticide and fungicides.
- Production – the crops yield significantly more due to the increased soil moisture retention or soil drainage and improved soil health.
- Quality – the quality of the soil is improved, consequently the quality of the plant/crops are improved.
- Long term sustainability – the soils eventually take care of themselves as they have all the necessary elements.

Over the last year I have managed to attend many courses/seminars and visit operations both in Australia and the United States, where they are starting to embrace biological and organic farming with the use of compost. Visiting the United States allowed me to see operations already quite advanced in these areas. I have provided an overview of what I have achieved over this time.

### Australian based

Activity	Background	Goal	Outcomes and lessons learnt
Farm visit to an active compost site – Harry Youngman and Caroline Kissel at Ardgarten	Ardgaran has been producing compost for the past four years, and they use an Areomaster turner. Spread the compost on their pastures.	See a working compost sight in action. Look at their feedstock, turner and water cart.	Learnt their compost recipe, saw the improvements the compost is making to their pastures. More clover, less capeweed.
NTS Course	Biological course, minerals and soil, plant and human health	To gain a better understanding of our soils and the soil biology	There are different methods to compost; windrows, static depending on the time/frame and needs of the operation.
Landcare compost day – Greg Deerman	Compost making - different systems	See different methods of making compost	Looked under microscope learnt how to identify microbes, methods were for more small scale operations.
Taranaki farms	An operating farm, following Joel Salatin's methods – stacking enterprises and organic	Produces trustworthy food and reconnects people to the farm.	Learnt about using natural pasture and rotation. How you can interlink different livestock – chicken, cattle and sheep.

Grasslands Society - 2015 Annual Conference "The future is in Farming!"	The whole picture – soils, pastures, livestock, farm business, people and marketing	Heard from knowledgeable people that have been making compost for many years. Scientists', Nuffield scholars who are experts in their field.	Comprehensive insight into soil biology, farm tour demonstrating a successful farm can be run without chemicals and hard fertilizers
A compost revolution hosted by - The Australian Recycling Association	Seasons included; A compost revolution, compost in agriculture and a broader view.	Network with likeminded people, gain an insight into urban waste, carbon and deep banding	Gained an understanding of the large amount of metropolitan waste which is starting to be made into compost, but is not necessary a quality product. The huge potential and yield increase from deep banding of compost.
Working with Biosys – specialists in biological fertiliser, and agronomy service.	Biosys creates beneficial input systems for clients who choose biological farming.	Gain a greater understanding of soil carbon, the chemical and biological soil structure, with lower input costs, higher yields and enhance the soil health.	A consultant who can help us grow in this field who has 20years of experience. We can learn from his mistakes and achievements. Utilize their biological products.
Mark Pridham – A Local Lucerne, potato and sheep producer	A very successful property, growing above average yields year after year, using limited conventional fertilizers	Witness a large scale farm in our local area using and making liquid fertilizers	Proof - It is possible to reduce and in most crops stop using conventional fertilizers. By mixing the liquids on farm costs are reduced by 30%.

Australian Soil Planners	ASP system captures the best of traditional and modern farming methods, working towards delivering healthier environments and sustained profitability.	To help monitor and analysis plant Status. Foliar nutritious Crop requirements	Complement Biosys, enable us to analysis plants and soils and make liquid fertilizer to complement the compost.
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## United States of America trip

09/08/2015 to 29/08/2015

Activity	Background	Goal	Outcomes and lessons learnt
Apricot Lane Farms Moorpark – LA	5 year old business. Organic and bio-dynamic fruit, vegetable and livestock farm. Stacked enterprises. Seed to plate marketing.	Experience a working organic and bio-dynamic property. Look at their compost and compost teas.	Unrealistic for average person, have not yet made a profit off property. Worms and teas were very interesting.
Greenheart Nursery Tour Arroyo Grande, CA	Grow organic and conventional vegetable seedlings for local farmers.	Observe where seedlings come from, how they are grown both under cover and out in the open.	Release beneficial insects to out compete bad insects. If farmers source seedlings they can maximize productivity, grow three crops a year. Heard about SoleVita a soil health evaluating system.

Jacobs Farms Watsonville, CA	Herb grown in hot houses and with hydroponics. All organic.	Gain an understanding of different growing methods.	Initial costs are costly but growing conditions are controlled, able to produce many crops over the year.
Tour of S&W seed plant SanJoaquin Valley,	S&W biggest Lucerne (Alfalfa) company in the US. We produce a big % of our Lucerne seed for them.	See where and what happens to our Lucerne product.	Gained an understanding of the packing and marketing of our Lucerne seed which we produce.
Day tour of region SanJoaquin Valley -	Biggest food bowl in the world. Cotton, sorghum, alfalfa, walnuts, almonds, pistachios and many more.	Gain an understanding of crops grow in the area and methods they use.	Saw a composter which was designed by a dairy farmer in this area. It separates solids from liquid manure. A lot of compost used on broad acre crops.
Union Square Organic farmers markets New York	Large organic market supplied by farmers within a 600km radius. Situated in the middle of NY	Talk to farmers, understand where product comes from, how the marketing works.	Gained an understanding of the commitment which is made to produce and then market your own product. Seems like the growers find it very rewarding to talk to your customers directly.
Stone Barns Centre Dobbs Ferry, NY	Food and Agriculture centre, taking farming to the city. Increase knowledge of customers how food can be produced in an environmental manor	See different methods of composting. Utilization of all waste materials	Small scale operation. Learnt about static composting, holding units, row composting and anaerobic composting. Compost tea machine and applicator.

Tour around Edwin Blosser's organic farm	Organic farmer who produces Humus compost and makes the Aeromaster turners.	Experience a large broad acre organic property.	Harvesting above average yields and getting a premium for their product. Shows us first hand that composts works.
Day at compost site Tampico, Illinois	See the Aeromaster turner in action making humus compost.	Learn their process, get an understanding of humus composts and the difference between compost and <b>humus</b> compost	Break it down – build it up. Invaluable information on composting methods, feedstock and timing of the compost process.
Soil course – Edwin Blosser Tampico Illinois	Edwin Blosser has been working with soils and compost for 20+ years. Not only does he teach these topics he has hands on experience, running his own organic farm	Gain in-depth knowledge of humus compost as it relates to soil fertility. Topics – impact of humus on the soil and plant, best practises for humus application, effective humus supplements.	Gained a greater understanding of microbiology, minerals and nutrients. Learnt the importance of humus for our soils

## Overall Findings

### Conventional fertilizers

- Conventional fertilizers are harming our soils – eating away our carbon sources.
- Conventional fertilizers are inefficient– not all that is applied can be up-taken by the plant, a large % ties up in the soil.
- Conventional fertilizers create an out of balance soil – certain mineral ratios are vital. eg. Urea is taken up even if the plant doesn't require it, which can have a detrimental effect on the plant health.

- Increasing cost input, which the farmer has no control of.
- Long term use will damage our soils.

### **Compost**

- Turns a waste product into a valuable bi-product.
- Slow releasing, so is available as the plant needs it.
- Long term benefits – the soil health is improved.
- Balanced product – creates all vital minerals and nutrients, plus carbon is available.
- Cost is significantly less than conventional fertilizer.
- Humus compost is more beneficial than a regular compost.

### **Biological farming**

- Enhances soil quality.
- Breeding microbes, fungi bacteria to prevent diseases and help soil health.
- Working with the natural elements of the soil.
- Using the benefits of biology which unlock the nutrients to become available to the plants.
- Greater moisture retention.
- Looking forward to the time when we are using less insecticides, fungicides every year.

A key learning for me was that we need to create **humus** compost, a 'compost with an injection of science' which is of a much higher quality than general compost. The reason for this is that humus is made up of proteins which are formed during the compost process, they sustain life better than anything else, are slow releasing as needed, and help to build the soil structure and nutrient richness, prevent weeds and insect pressure and increase yields. When humus is applied to the soil, the roots excrete a liquid which meets with the protein and multiply into the microbes which are beneficial to the plant, therefore the plant is in control of the microbes. The humus "polymer" material that the specific microbes make, lock in the goodness of the fertilizer, and are released into the soil as required.

In relation to the compost there were two significant points which I learnt over the year 1) the importance of getting the carbon: nitrogen ratio correct – 25-30:1 and 2) the calcium:magnesium - a balanced C:N creates balanced Amino acids, both these ratios are essential to creating a healthy, productive soil which leads to healthy plants.

## **Intentions**

- To create our own humus compost to spread on our farm
- To farm biologically
- To use biological processes
- To eventually buy a turner

## **CREATING OUR OWN HUMUS COMPOST TO SPREAD ON OUR FARM**

To succeed in creating quality humus compost it is important we follow a particular process enabling us to manufacture a consistent quality compost.

The important points of the process we intend to use are:

- Give attention to the 'beginning material' recipes
- Process to be based on accurate readings: temperature, CO2 and moisture
- Essential to turn materials to aerate the compost so non desirable readings can be corrected
- Laboratory Analysis – test compost to ensure optimum quality

We will use the simple approach and most practical - ***“BREAK IT DOWN - BUILD IT UP”!***

The recipe we intend to use is below - this recipe was developed from a combination of what I learnt and have taken from all the knowledge and information I gained on the field trips, farm trips in both Aust and US and courses I attended. The reason I chose this recipe is because it incorporates all the necessary components required to get the carbon to nitrogen ratio correct, which will eventually achieve a high quality compost which in turn will produce a high quality end product.

### **Recipe**

- Want the break down process to happen in first 3 weeks, which will then start building the humus proteins.
- **Required:**
- 50% manure/straw
- 35% Straw or bark chips
- 5% clay
- 10% old compost

- Synchronize manure/straw and also pure straw in separate pile, make sure all carbon sources are wet – this is to ensure the quickest breakdown process.
- When both products are synchronized - add together
- Add old compost
- Add clay, do not want too wet otherwise clay balls will form which is not desirable
- Reach and maintain a 50% moisture level throughout the process
- First 3 weeks add N convertor – inoculants, helps to hold in volatile gases (nitrogen)
- Over the entire process monitor temperature – turn when over 65degrees
- After 3 weeks combine two rows into one, move both rows so that any product on the ground is mixed into heating process
- After first 3 weeks start monitoring CO2 when over 10 turn
- Finisher inoculants added
- 10 – 12 weeks process should be complete, know pile is finished when temperature is within 10degrees of air temperature and CO2 is below 8.
- If not spread straight away, it is necessary to turn once a month and add water.
- Hygiene – over the first 3 weeks the product that falls to the edge can be scraped into the row but after this period should be put into a new row.
- Wet top of row before turning if there is a dry crust – dry product slows down the process
- Compost has to be turned, so initially, due to the high cost, we will hire a machine (a compost turner) to turn, add moisture and aerate to add oxygen to the soil. This turner is a vital part of turning the manure into compost, the turner would be used all year round to produce the compost, this year we are aiming to produce 3000t and into the future we are aim to increase this tonnage.

Our eventual intention is to buy a machine (Aeromaster compost turner) with all the necessary attachments to create high quality compost. From what I have seen and learnt - the Aeromaster compost turners are world renowned, they offer large capacity, high productivity, heavy-duty construction and advanced technology. I saw them being produced and in action in Tampico, Illinois. The machine is designed to increase the quality of the compost we produce. This machine has a superior watering system which is vital for the breakdown process, the jets allow a wide spread of fine droplets which will wet every particle of feedstock. These jets can be changed depending on the maturity of the compost.

**Costs of producing compost on farm:**

<b>Requirements</b>	<b>Costs</b>	<b>Total</b>
<b>Manure/straw</b>	\$10t	\$10
<b>Labour</b>	\$25 per hour, 80t row turned in hr, 20 turns	\$6.25
<b>Inoculants</b>	3t	3t
<b>Turner – hired</b>	\$1	\$1
<b>Cartage</b>	\$150hr, 45t truck – hour per load	\$3.3
<b>Spreading</b>	\$8	\$8
	<b>Total costs</b>	<b>\$31.55/t</b>

When we buy our own turner – the Aeromaster, at present, it would cost \$90 000 landed in Australia with all the application accessories needed – water cart, motor and pipes.

To do this we would take out a five year loan with a yearly principal payment and interest of \$18720. Over the five years, if you produced 3000 tonnes of compost it would cost \$6.42 per tonne per year. Over the five years, the repayment of the machine would be paid off.

Once the humus compost is successfully made and is ready for spreading, we intend to spread over the cropping and pasture paddocks.

We are looking at including the necessary lime and gypsum into the completed compost if the tests show the individual paddock requires it. For the same result a reduced amount of lime and gypsum is required when mixed in the compost, which will be a major benefit to cost saving.

## **TO FARM BIOLOGICALLY**

To complement the humus compost – we are considering the possibility of brewing biology and mixing our own liquid fertilizer. The biology which we brew will be able to be used in the compost, on the seed before sowing, apply during growing season – for fungicide protection, frost protection. For this process to be undertaken we would need some capital inputs.

### **To brew our own bacteria and fungi (biology).**

Required:

- Tanks, heater (for water), pump, pipes and fittings (\$20,000)
- Use is for – adding biology to the compost
  - Putting it on as a seed dressing
  - Throughout the growing season we can put fungi on instead of fungicides to stop disease (still to be trialled)
  - Applied by boom sprayer

## **Making our own liquid fertilisers (cutting out all conventional fertilizers) :**

### Benefits

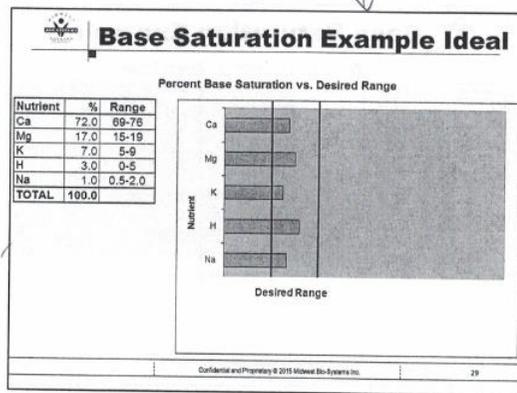
- Won't have to buy in liquid fertilizer
- Halve the cost of buying liquid fertilizer.

### Required:

- First year – up front capital costs expensive (one off) - approx \$20,000
  - Tanks
  - Mixer
  - Pipes and fittings
  - Motor

The natural liquid fertilizers will be used on crops according to what they require which will be decided by analysis through lab testing of the plant and also us testing the plant in the field. By making our own liquid fertiliser we can make a specific recipe based on the specific requirements of the paddock and plant.

This will be monitored by us and our biological advisor who has 20 years experience, who has already been involved in previous trials and advises other farms using these techniques successfully. For us, it is important to employ a Biological agronomist, a consultant that is on the same page as us to help and support us to grow and work towards our desired direction.



From the methods we intend to apply and the professional guidance together with own knowledge, we aim for our plant and soil tests to end up like this example below.

For your plant to be healthy and strong all these nutrients need to be in the desired range.

## Conclusion

Our long term plan is to farm biologically, whilst initially still using some commercial methods – some herbicides, initially for weed management while we are in the process of soil improvement. Our intention is to slowly build the soil structure and plant health, whilst remaining viable.

The experiences I was able to have through the Fellowship have convinced me that biological farming and using humus compost is part of the future. My overall outlook is now very strongly toward biological farming. In seeing firsthand the farms that have embraced biological farming through use of humus compost, and successfully implemented it into their program – the results speak for themselves. The health of the soil is the key to growing quality plants. The soils, when tested after using humus compost, are healthier, with the plants responding positively, by having the correct nutrients and minerals in our soils. This will help the environment enormously, as well as ensuring the sustainability of our farm and allowing us to have control over our future and the ability of our farm to grow successful and healthy crops and pastures.

By using our own humus compost and farming biologically, it means I am able to farm successfully, both in production and financially, and also look after the future welfare of the environment which makes it a win:win situation for all concerned.

An interesting point I have noticed, already this year I have seen our crops looking great but the season has not provided any rain for the past month and there has been above average temperatures. It can be clearly seen in the crops which compost has been applied they have not shut down as quick as the crops which have not had compost.

I would like to share with you some key points I have heard and taken on board over my very stimulating year:

- *Work with nature not against it.*
- *Need to remember that no quality humus compost will over ride good management – management is the key!*
- *Break it down, build it up.*
- *If you feed a crop something unhealthy it will be unhealthy.*
- *“It’s not the speed that’s at fault it’s the pressure of the accelerator” – we need to go back to the root cause of the problem. Like altering the ratios on soil or plant tests, so the plant is balanced.*

I am so grateful for the Peter Olsen Fellowship. It has shown me that knowledge, research and learning are so important and I have really enjoyed the process of seeking information and sharing experiences. I realise we are always learning. I am excited for the future and am ready to embrace change.