BIO DYNAMIC AGRICULTURAL ASSOCIATION OF AUSTRALIA

A PRACTICAL INTRODUCTION

TO THE

AUSTRALIAN DEMETER BIODYNAMIC METHOD OF FARMING

March 2023

NOTE TO THE READER

The information contained in this publication is based on the work and lectures of Alex Podolinsky and the practical application of this by farmers of the Biodynamic Agricultural Association of Australia (BDAAA).

It has been assembled in good faith by the BDAAA to provide clear guidelines for those newly engaging with the Australian Demeter Biodynamic method.

AUSTRALIAN DEMETER BIODYNAMIC

Working with nature since 1952

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INTRODUCTION

AUSTRALIAN DEMETER BIODYNAMICS – WORKING WITH NATURE

What is biodynamics?

Biodynamics is an advanced method of farming that seeks to emulate the natural world in an agricultural context. No artificial fertilisers or chemicals are used, rather the natural influences of soil, water, air and sunshine are observed and harnessed to create balance and grow plants to their full potential – in health, resilience and nutrition.

While organic agriculture often simply replaces synthetic chemicals and artificial fertilisers with ‘organic’ substitutes, biodynamic agriculture requires the farmer or grower to learn to think and work biologically, carefully observing the natural influences on their own land and acting accordingly.

The first and most important lesson of biodynamic farming is an understanding of how plants feed. The success of the biodynamic method depends on plants feeding themselves when they need according to nature, through nutrients held within the humus content of the soil; not through water-soluble nutrients from fertilisers via the soil water. This simple distinction is the cornerstone of the biodynamic method and described more fully in Chapter 1.

The biodynamic preparations form another cornerstone. When small amounts of high-quality microbial preparations are properly stored, activated and applied – with the supporting agricultural system that ensures their effectiveness – the soil change achieved is comprehensive. Chapter 2 describes the preparations and their application in detail.

The Australian Demeter Biodynamic method presents the key aspects of farm management (particularly the soil cultivation, pasture management, green manuring and sheet composting practices all detailed in Chapter 3 of this guide) in line with this understanding of how plants feed. It offers a very practical solution to the breakdown of natural plant growth conditions through forced farming methods, and deteriorating environmental conditions.

When successfully applied, the method allows farmers to build healthy, aerobic, more fertile soils with increased organic matter and humus, and in turn healthy and resilient plants, animals, and humans.

The history of biodynamics in Australia

Rudolf Steiner

The fundamental principles of a new agricultural impulse, originally called ‘biological-dynamic agriculture’, date back to 1924 when Rudolph Steiner delivered a series of lectures addressing concerns about the expansion of ‘chemical farming’. At the same time, Steiner asked a young scientist, Ehrenfried Pfeiffer, to experiment with the most effective method of making soil preparations and determine how best to apply them. At this stage there was no attempt to develop a practical farming system that would ensure the biodynamic preparations achieved soil change.

'Demeter', the Greek Goddess of Agriculture and Fertility, was chosen as the trademark to be applied to marketed biodynamic products and first registered in Germany in 1927.

Alex Podolinsky

The Australian Demeter Biodynamic method was developed in Australia in the 1950s by Alex Podolinsky. Working from the original impulses of Steiner and scientific experimentation of Ehrenfried Pfeiffer, and with the help of pioneering Australian farmers, Podolinsky developed a practical biodynamic method based on quality preparations and results. From 1952 until Pfeiffer's death in 1961, Podolinsky and Pfeiffer exchanged information on preparation making and application techniques. As well as refining the biodynamic preparations, Alex Podolinsky's development of Prepared 500 – the inclusion of the six compost preparations (502–507) with the foundation biodynamic soil spray 'Preparation 500' or 'straight 500' – provided a highly efficient alternative to the exacting and often impossible task of making and using high quality compost on a large scale and was a major step in bringing the influence of the biodynamic preparations to large farms.

Podolinsky oversaw the development of mechanical stirrers and practical spraying equipment suitable for broadacre use, and in 1953 founded the Biodynamic Agricultural Association of Australia (BDAAA) to support farmers in the adoption of the Australian Demeter Biodynamic method. In 1957 he founded the Biodynamic Research Institute (BDRI) to further research and development of the method in Australia, later establishing it as a certification body and overseer of the use of the Demeter trademark, which he registered in Australia in 1967. He also began testing and recording the increasing organic matter levels of his soil and spoke extensively of the importance of the biodynamic method of farming for both the health of the soil and the climate. His unique description of plant metabolism clearly and simply explained the need to feed plants from humus rather than with water-soluble salts. For decades he travelled extensively throughout Australia voluntarily sharing his knowledge and mentoring farmers – the origins of the strong culture of mentorship that experienced Australian Demeter biodynamic farmers offer new practitioners today.

Podolinsky also took the method back to Europe, finding the appropriate farmers to work with to develop the method there and to make high quality preparations. Today, farmers around the world are dedicated to continuing Podolinsky's work in developing and teaching the practicality, reality, integrity, and quality of the Australian Demeter Biodynamic method across the globe.

Alex Podolinsky passed away peacefully in 2019, just shy of his 94th birthday. He lived at home on his farm in Powelltown, Victoria, until the end of his life. With perception, vibrant energy, and creativity, he gifted knowledge to the world.

Australian Demeter Biodynamics today

There are several organisations within the Australian Demeter Biodynamic umbrella that exist to support the growth and success of the method in Australia today.

Biodynamic Agricultural Association of Australia (BDAAA)

Established by Alex Podolinsky in 1953, the BDAAA operates as a guild to provide training and advice to support farmers in the adoption and successful practise of the Australian Demeter Biodynamic method. On admission to the BDAAA after the appropriate training, farmers agree to practise the Australian Demeter Biodynamic method in preference to any other agricultural method. This requires a commitment to obtaining a suitable stirring machine and spray unit, the correct storage vessel and water heating unit (as detailed in Chapter 2) and once this commitment has been made, new practitioners can access the approved biodynamic preparations.

Experienced mentors from the BDAAA are available to provide practical assistance, tuition, and technical knowledge to assist farmers as they develop the skills and techniques to transition from conventional or organic to biodynamic farming.

Biodynamic Growers Australia

Biodynamic Growers Australia (BDGA) was formed in 1975 with the aim of teaching small, non-commercial growers and home gardeners the Australian Demeter Biodynamic method. Joining the BDGA provides access to a range of resources, including storage and stirring equipment, approved biodynamic preparations, and advice regarding the application of the method on a small scale.

Bio-Dynamic Research Institute (BDRI)

In 1957, Alex Podolinsky founded the Bio-Dynamic Research Institute (BDRI) to further the research and development of the method in Australia. He later established the BDRI as an accredited certification body of the Australian Government to certify farmers to the *National Standard for Organic and Biodynamic Produce*, as well as granting the rights to use the Australian Demeter trademark.

Biodynamic Marketing Company (BDM)

In 1981, Alex Podolinsky, Trevor Hatch (a biodynamic beef and potato farmer) and solicitor John Claringbould founded the Biodynamic Marketing Co Ltd to act as the effective link between biodynamic farmers and consumers and distribute biodynamic produce to the market. Today BDM is run by Peter Podolinsky (Alex's son) and his wife Judy from their base in Lilydale on the eastern fringe of Melbourne, Victoria, despatching biodynamic and organic food Australia-wide from the Epping wholesale market, daily.

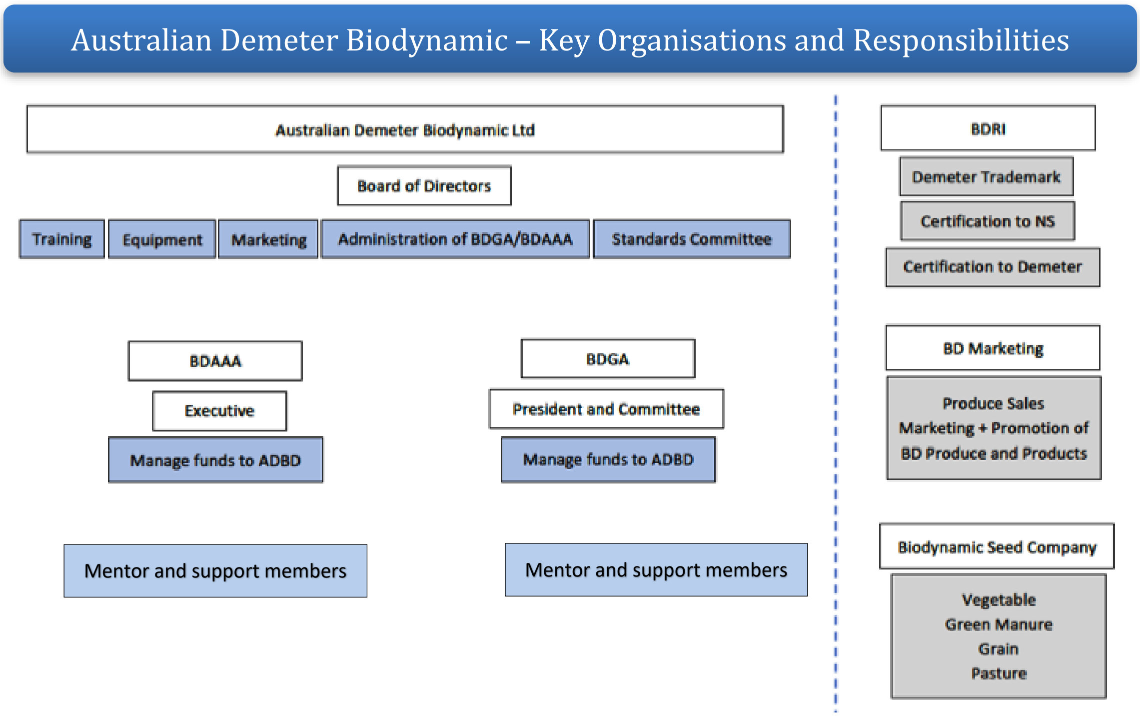
Biodynamic Seed Company (BDSC)

The Biodynamic Seed Company was established in 2019 to produce Demeter certified vegetable seed using varieties suitable for commercial growers whilst providing opportunities for biodynamic farmers to earn additional income from vegetable seed crops. The seed is produced by a collection of Demeter certified farmers across Australia, and importantly meets the requirements for certified seed under the *Australian Demeter Biodynamic Standard* and the *National Standard for Organic and Biodynamic Produce*. To become involved in this important mission contact biodynamicseedcompany@gmail.com.

Australian Demeter Biodynamic Ltd (ADBD)

Australian Demeter Biodynamic Ltd was established in 2020, with financial support from the BDAAA and BDGA, to ensure the continuation of the practical application of the Australian Demeter Biodynamic method through the provision of training and equipment. ADBD co-ordinates a series of introductory field days held each year, hosted on different biodynamic properties across a variety of enterprise types and in different regions, with a strong focus on understanding the basic principles of the Australian Demeter Biodynamic method including practical demonstrations of how to correctly stir and apply the biodynamic preparations.

ADBD also ensures up to date information and resources are available to farmers and growers using the method and is charged with managing the public profile of Australian Demeter Biodynamic, primarily via the website and social media channels. The mission of this new company is to get more producers and growers successfully adopting the Australian Demeter Biodynamic method, expanding the use of the biodynamic preparations across more soils, and ultimately having more Demeter certified biodynamic produce available for consumers.



Adopting and practising the Australian Demeter Biodynamic method

Farmers and growers interested in learning more about the Australian Demeter Biodynamic method should first undertake some introductory reading. The Australian Demeter Biodynamic website houses a selection of lectures, books, videos and case studies for both new and experienced practitioners, including many of Alex Podolinsky's original lectures, full of pertinent and timeless insights into the method.

Biodynamics – A Practical Introduction

This guide is designed for all farmers and growers who have attended an Introductory Field Day, or worked with a mentor to prepare to apply the method, and want to take the next steps. It complements the *Australian Demeter Biodynamic Standard*, providing information about the practical application of the Australian Demeter Biodynamic method. The *Australian Demeter Biodynamic Standard*, available from the Bio-Dynamic Research Institute, should be the first document for certified operators to refer to for any certification queries, and the benchmark for all BDAAA farmers.

With our farmers and growers spanning a vast range of crops and livestock, and across very different geographic and climatic zones, this guide can only offer generic information about applying the Australian Demeter Biodynamic method. For industry-specific advice in your region or from a practitioner with experience in similar conditions, get in touch via info@demeterbiodynamic.com.au and we will endeavour to put you in touch with a suitable mentor to provide relevant expertise that may help with your particular challenges.

Let doing be your teacher

Finally, while the principles of the Australian Demeter Biodynamic method are the same across all enterprises, the practices to achieve the principles are vastly different. There will be as many solutions to problems as there are farms. While there are mentors available to share their expertise borne from their particular situation, no-one can truly guide you through the process on your own land but yourself.

Ultimately, nothing is as powerful in achieving the results you want from the biodynamic method on your property as your own active perception. Begin the process, observe, and act. Once you understand the fundamentals of biodynamics, you can then apply this new biological thinking to work out best practice for managing your own soils independently. You'll learn with every season, continuously adjusting your practice based on your own careful observations, developing confidence in the method with every decision you make.

In the words of the late Alex Podolinsky, let doing be your teacher.

CHAPTER 1 PLANT FEEDING WITHIN NATURE

To understand what we want to achieve using the Australian Demeter Biodynamic method, and how plants take up nutrient under the jurisdiction of nature, we must also understand the chemical farming system and its ramifications.

During the 1850s, a German chemist named Justus von Liebig discovered that plants can only take in elements in a water-soluble fashion. This was a valid scientific discovery but was then taken in a misguided direction during the industrial revolution when scientists and chemists began developing water-soluble fertilisers – highly water-soluble plant nutrients that are still produced today. To make these plant nutrients water soluble, they are generally salt based.

It is important to understand two of the biological plant functions we are concerned with. *Transpiration* is the process of the uptake of water via the plant roots and out through the stomata on the surface of the leaves. Plants are in a constant state of transpiration while the plant is in leaf.

Photosynthesis is a plant's ability to convert the nutrient taken up by the plant into sugars, acids, proteins etc. – all the things we require from our plant material. During the transpiration process, as the stomata open the sunlight comes in and the photosynthesis process occurs. The two processes – transpiration and photosynthesis – are inextricably linked.

When water-soluble fertilisers are used and there is rain or irrigation applied, the fertiliser dissolves into the ground water. When the plant then takes up water during the transpiration process, it is forced to take up water-soluble nutrient from the ground water. When the plant transpires, the salt from the water-soluble nutrient does not transpire with the water and remains in the plant.

Osmosis is the plant's ability to move water through plant cell membranes to balance salt and water. To try and balance the salt that remains in the plant, the plant takes up more water, but in doing so is also forced to take up more of the salt in the ground water. The amount of salt eventually builds up in the plant to an extent where the plant begins to shut down. It can no longer transpire freely. This also affects the plant's ability to photosynthesize effectively and therefore the nutritional quality of the plant.

Plants grown in this fashion do not have an upright plant expression. They are weighted down by excess water. Their colour is a dull dark blue-green due to the unassimilated excess salts. By not transpiring freely the plant holds too much water, and in combination with the salt, makes these plants more prone to pest and disease. Pests like salt and water and fungal diseases are associated with over-wateriness. These pests and diseases are an indication from nature that these plants are not fit for consumption and need to be removed from the system and recycled back to nature. Quite often the same companies that supply the water-soluble nutrients that cause the problems also supply the appropriate chemical to deal with the problems that arise from its use.

The use of these products, in combination with herbicide use, eventually leaves the soil dead and lifeless, with no soil biology, soil structure or organic matter.

There are many negative environmental, ecological, economic, and social ramifications arising from this system of agriculture. While it is widely described as 'conventional', surely creating conditions so that plants can feed as nature intended – the goal of the Australian Demeter Biodynamic method – should be considered conventional.

Humus is a colloid that is built by the soil biology consuming organic matter and naturally occurring water-soluble elements and depositing them around the soil particles as humus. Humus development is generally represented by a darkening of the soil colour. Once the humus is built, the 'nutrient' from the organic matter is locked inside the colloidal humus. The nutrients are in a plant-available, water-soluble form, as per the valid discovery of Justus Von Liebig!

Plants grown in this way have different roots that perform two functions: the fine white feeder roots that feed off the humus, and darker, thicker roots for the transpiration process. The fine white feeder roots of plants enter the colloidal humus and remove the water-soluble nutrient from the humus, as dictated by the sun and warmth. In this process of nutrient uptake, the soil water is not filled with water-soluble nutrients, so the transpiration process of the plant remains natural, not hindered by the soluble salts. Also, the photosynthesis process in not affected and is able to convert the natural nutrient uptake from the humus into the desirable nutritional qualities we want from our plants. Plants grown under this guidance of nature are much less prone to pest and disease. They also have an upright expression with a defined leaf edge and vibrant glow green colour.

There are many positive environmental, ecological, economic, and social aspects that flow from practising this system of agriculture. Put simply, plant nutrient uptake should be via the soil humus, not the soil water.

The remainder of this document is dedicated to the practical application of the Australian Demeter Biodynamic method to give farmers the ability to build deep, in-situ humus in their soils so plants can grow as nature intended.

(Reference: *Bio-Dynamics: Agriculture of the Future, Living Agriculture and Bio-Dynamic Agriculture Introductory Lectures Volume 1*)

CHAPTER 2 BIODYNAMIC PREPARATIONS AND THEIR APPLICATION

2A INTRODUCING THE BIODYNAMIC PREPARATIONS

2A.1 Preparation 500

Preparation 500 is the foundation soil spray on which biodynamic activities are built. Properly made and applied, Preparation 500 structures soil, promoting root growth, humus formation and microbial activity. The specific power of this preparation cannot be fully understood from biological or chemical tests. It is not a fertiliser, but rather a **dynamic activator and soil enlivener**. (Reference: *Bio-Dynamics: Agriculture of the Future* , *Living Agriculture* and *Bio-Dynamic Agriculture Introductory Lectures Volume 1* by Alex Podolinsky for more detailed information on these processes.)

500 is made from specially prepared cow manure correctly buried underground in cow horns during intense winter coldness, i.e. a period where no or low microbial activity is occurring in the soil. Winter cold is essential for the manure to undergo a transubstantiation to 500. If the manure-filled horns are placed underground in warmer climates, the manure will change in appearance but will have been under the influence of microbial activity. Therefore, it only transforms into a composted substance and will not have the dynamic activating power of preparation 500. (Refer to *Active Perception* for more information on this special power of activation.)

Preparation 500 was named by Dr Ehrenfried Pfeiffer as a result of his bacteriological studies. He discovered that the neutral colloidal humus contained 500 million aerobic bacteria per gram. All of the other biodynamic preparations were named sequentially from 500 as the base number.

2A.2 Preparation 501

501 is the preparation used to stimulate activity in the upper part of the plant. It functions by greatly enhancing light metabolism and brings a crispness and crystallinity to plants that are over watery and therefore prone to pest and disease. Chemically, Silica is inactive, but *dynamically* it is active. It is able to influence the form of a plant and to enhance aroma, keeping quality and any medicinal power in the plant.

501 is made by grinding high quality clear quartz crystal into a very fine powder. The powder is placed in cow horns and buried in the ground over summer, so there is an intensifying of the ‘sun power’ in the quartz powder.

2A.3 Preparation 502

Achillea millefolia, also commonly known as **Yarrow** or **Milfoil**, is the herb from which preparation 502 is made. Yarrow's roots have the ability to transform and store soil minerals in significant quantities. Yarrow has a strong relationship with potassium, sulphur, calcium, and carbon. Yarrow possesses the capacity to carry the strong life force of its roots into the umbels of its flowers. To make 502 the flowers of yarrow are placed into a stag's bladder and buried over winter.

2A.4 Preparation 503

The healing force of **Chamomile** (*Matricaria chamomilla*) is well known in general herb lore. Chamomile's associations with calcium, potassium, magnesium, and zinc are strong. The flowers of Chamomile are placed into the small intestine of a cow and buried over winter to make 503.

2A.5 Preparation 504

The European perennial **stinging nettle** (*Urtica dioica*) is used to make 504. Nettle displays a unique relationship with iron in particular, but also with nitrogen, silica, potassium, and calcium. The capacity of nettle to work on soil formation and into life processes is made use of in the form of the Biodynamic Preparation 504. No animal part is used for 504, but the leaf of the nettle is placed into clay pipes and buried in autumn for one year.

2A.6 Preparation 505

As a collector of calcium there is no other plant comparable to the mighty **oak** tree (*Quercus robur*). In spite of the high calcium concentration in the bark, it is a different quality of calcium to that of the pure mineral form, since the calcium remains within the living realm of the plant. The oak also has strong affinity to phosphorous. To make 505, the ground bark of an old oak tree is placed into the skull cavity of a domestic farm animal and placed into slow moving water over winter.

2A.7 Preparation 506

Dandelion (*Taraxacum officinale*) is another medicinal plant. The plant builds up a strong tap root where potassium, sodium, phosphorous and silica are prominent. In the pappus hair of the flower, the silica-content is striking, while the leaf-rosette contains much potassium. The flowers of dandelion are wrapped in the mesentery of a cow and buried over winter to make 506.

2A.8 Preparation 507

Valerian (*Valerian officinalis*) is another enormously therapeutic plant. Some think its name was derived from the Latin 'valere' – to be of value, strong, to feel well. Its strongest affinity is with phosphorous. Unlike the other herb-based biodynamic preparations, the valerian flowers are used as a liquid extract by placing the flower in water and hanging in gentle sunlight.

2A.9 Compost preparations

The above preparations 502–507 are collectively referred to as the compost preparations. All of the compost preparations undergo a transubstantiation into a colloidal humus similar to 500. The use of the compost preparations is an essential part of the Australian Demeter Biodynamic method and they are usually applied via the use of Prepared 500, described below. The compost preparations can also be applied via the use of high quality biodynamic compost.

2A.10 Prepared 500

Prepared 500 is preparation 500 with the six compost preparations (502-507) described above added to 500 and allowed to work throughout the 500. This process was instigated by Alex Podolinsky in response to the impractical situation of Australian farms to be able to apply biodynamic compost to their soils due to the large acreages and unfavourable compost supporting climatic conditions. **Prepared 500 and the stirring machine** are the two most important biodynamic developments from Alex that have allowed biodynamic agriculture to be practiced on broad acre farms worldwide.

All farmers of the BDAAA and members of BDGA use Prepared 500. Whenever 500 is mentioned in this document we are referring to Prepared 500.

2B STORAGE REQUIREMENTS FOR THE PREPARATIONS

2B.1 Storage of 500

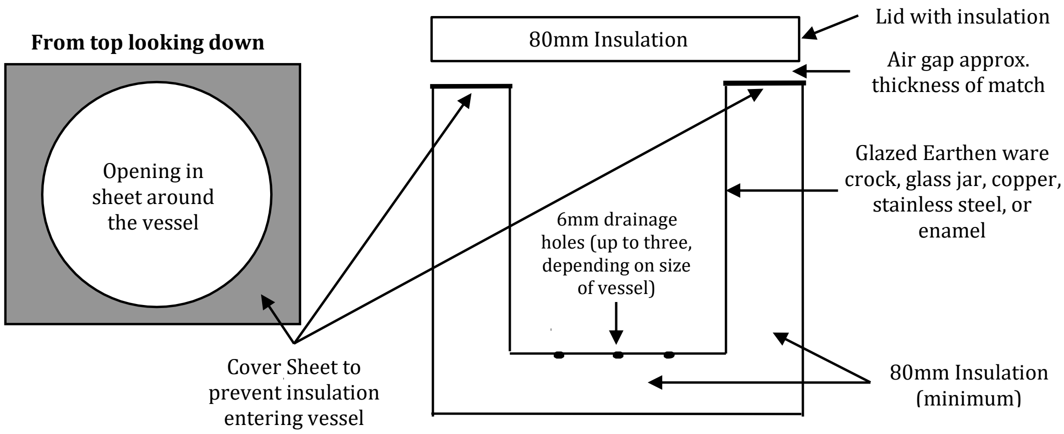
500 is a living substance that must be maintained in the same moist, colloidal humus condition as when first lifted from the ground and as it is sent to you. Any stored 500 must be regularly checked for moisture content as it must not be allowed to dry out. If water needs to be added gently sprinkle a little rain or pure creek/dam water on top of the 500. Check again in a few days as the process may need to be repeated. If the moisture content falls below that of fresh worm casts, then the 500 has been allowed to dry out too much and much of the effectiveness as a dynamic activator has been lost. Over-watering also needs to be avoided.

In cases where a small amount of 500 is left over after spraying has been completed, it should be stored in an open glass jar and placed within the larger 500 storage container. This will help minimise the risk of the remaining 500 drying out.

1. Diagram of 500 storage box for large quantities of 500

Effectively you need to build your box based on the amount of 500 you need to store. You need to find the appropriate 500 container. Each 10 acres of 500 needs about half a litre capacity, so to store 60 acres you need a container of three litres capacity.

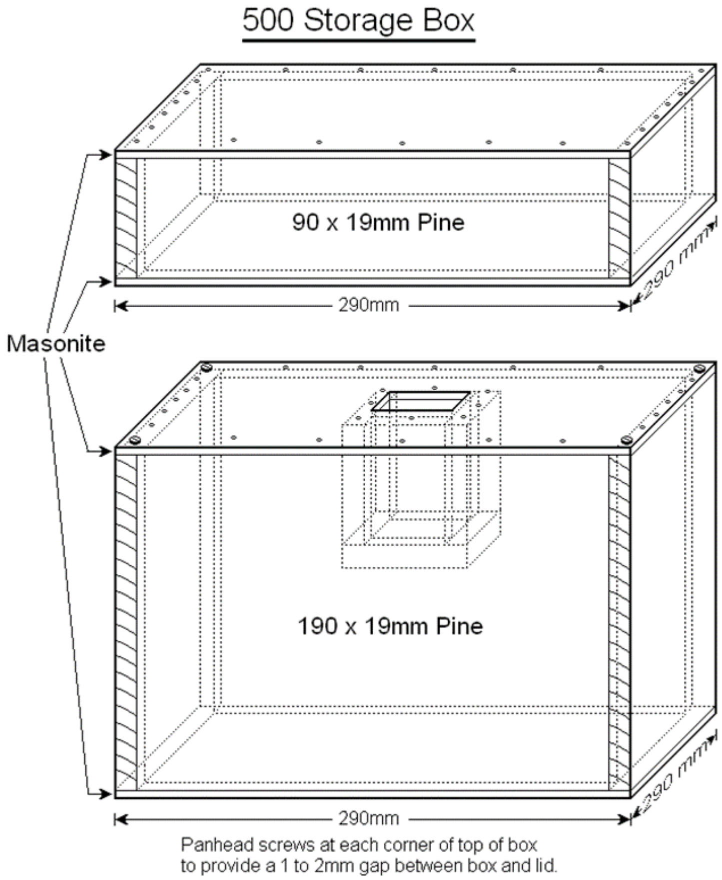
The box dimensions are then determined by the 500 container size and the box is built to surround the container by a minimum of 80mm of insulation material, excluding the timber.



2. Materials to be used

- **The box**: Australian untreated timber. Not chip board, ply, veneer board, MDF, etc.
- **Insulation**: Uncontaminated dry peat, Australian vermiculite, perlite, or sheep wool or rice hulls that are certified to the National Standard. The storage vessel or insulation material must not contaminate the preparations.
- **Actual 500 container**:
  - Can be an earthenware crock (make sure that it has been glazed inside properly with no breaks or cracks), copper, stainless steel or enamel containers (if there are no faults or chips in the surface).
  - Containers are best round but can also be square.
  - Copper containers are best used where large quantities must be stored.
    - Copper must be steel-wooled to as clean as possible.
  - All containers are to have one to three 6mm holes in the bottom to allow the 500 to breathe.
  - Also, a cow horn, cut in half, should be put over the holes to stop 500 falling through.
  - In cases where a small amount of 500 is left over, it is best to store this in an open glass jar placed in the larger 500 storage vessel.

3. Diagram for storage box for small quantities of 500



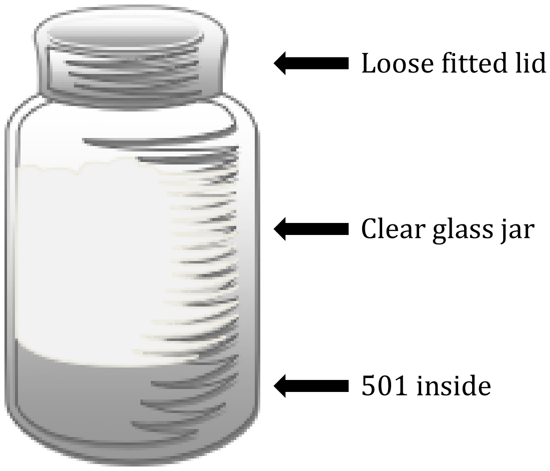
Material	Qty	Material	Qty
Pine 90 x 19 x 290 mm	2	Wood screws or nails	150 to 200
Pine 90 x 19 x 252 mm	2	Panhead screws	4
Pine 190 x 19 x 290 mm	2	Peat Moss	1 firm cubic foot
Pine 190 x 19 x 252 mm	2	Handles and hinges may be added	
Pine 90 x 19 x 55 mm	2		
Pine 90 x 19 x 93 mm	3		
Pine 290 x 290 x 19 mm	4		

Note: 500 is placed in a glass jar with a loose-fitting lid, so air can get in, and the jar is placed inside the cavity in the storage box.

4. Storage site

DO NOT STORE near any electrical wiring, motors, fuels, fumes from farm vehicles or any excessive heat. The ideal storage site is in a separate shed, under the tank stand, in or under a wool shed on the southern side and in each case suitably protected and secured.

5. Storage of 501



- 501 is the only preparation that is stored dry.
- Store in a clear glass container with the lid loosened **at least** half a turn.
- Place the jar where it will receive a lot of light, including some direct morning sun. However, it should not be subject to searing heat. An East-facing window sill is ideal.
- Turn the jar occasionally.
- 501 will store for many years this way.

2C APPLYING THE PREPARATIONS

A range of stirring and spraying equipment is available from the BDAAA and BDGA as well as advice in setting up and using the equipment.

2C.1 Applying 500

(a) Spraying conditions for 500

For 500 to be effective it needs to work with an activity of nature. The activities 500 work best with are root growth and the conversion of organic matter to humus. If there is enough soil moisture and ambient warmth for plant growth, you have root growth and conditions for 500 to work.

Where climatic conditions and acreage permit, 500 is applied twice a year, in spring and autumn. Large acreage dryland farms will usually apply one spray of 500 after the autumn break, when there is the expectation of follow-up winter rain.

500 application needs to be very carefully timed to achieve maximum results. The 500 must contact the soil so pasture will ideally be short, or first grazed low and harrowed with pasture harrows to spread any cattle manure. If pasture has some growth, then 500 may need to be applied the night before a heavy dew or even in the rain, so the 500 works down to the soil. If mulches have been used for weed control in young vineyards or orchards, mulches must either be removed, or be sufficiently rotted down, before 500 is applied.

500 is best applied from late afternoon into the night, once evening moisture begins to draw down towards Earth. An overcast afternoon with reasonably still conditions is ideal. Wind can destroy the droplet produced by the spraying equipment so if you cannot find reasonably still conditions, you may need different nozzles to create a larger droplet size.

The ideal conditions and farm situations may not always present themselves in a given year so it is essential to think practically in order to be able to get 500 out. The main thing is you get the 500 out in the best conditions you can as the application of 500 is fundamental to the Biodynamic system.

(b) Stirring 500

Please refer to the instructional video *Stirring and Stirring Equipment* by Alex Podolinsky to understand the process and tuning of stirring equipment, or the technique to use if stirring by hand. Also refer to the end of Lecture 4 in *Bio-Dynamic Agriculture Introductory Lectures*, Volume 1 and *Living Knowledge* for explanations of required stirring methods.

Stirring must be done outside. The **stirring container** should be made of copper, un-chipped enamel, glazed earthenware, or stainless steel, and if possible, have a concave base. Plastic containers or galvanised steel are not acceptable. Cover the container when not in use as this will help keep it clean and free from dust contamination.

The container must never be used for anything other than stirring of 500, 501, Valerian or Casuarina Tea.

Water should be from the purest source available on your farm. In many cases this will be rainwater, but spring water, pure bore or dam water sourced totally from your farm is actually a more living form of water and therefore may be the better choice.

Heating of the water needs to be from a natural source of heat (e.g. wood or gas), not electricity. Water must be evenly heated to between 28–33°C. Adding cold water to overheated water will reduce the effectiveness of the stirred 500.

For in depth information on the vortex and chaos process, read: Chaos and Vortex: *Activating Bio-Dynamic Preparations through Correct Stirring, Alex Podolinsky, 1991*.

For more information on the heating of water:
Warming of Water for Stirring Bio-Dynamic Preparations.

(c) Quantity of 500

Preparation 500 is applied at a rate of 88 grams per hectare with a minimum of 32.7 litres of water per hectare. (35 grams per acre in a minimum of 14 litres of water per acre.) The amount of water used can increase but be no more than double. **The essential is the quantity of 500 per area**.

(d) Duration of stirring

Stirring is performed for exactly one hour and must be undertaken outside. If stirring is done by hand, then the same person is to do the whole hour stirring.

(e) Spraying 500

Spray unit and pump: The spray outfit should be copper, brass or stainless steel – NEVER plastic or fibreglass – with a positive displacement pump, such as a diaphragm or roller pump (no centrifugal pumps).

If spraying by hand, the knapsack must be stainless steel, copper or brass.

The spray equipment should match the stirring machine so the stirred 500 can be applied within one hour.

Stirred 500 increases oxygen content of the water by 60–70%, and it is this oxygen content that supports the 500 activation process. After two hours the stirred 500 has lost much of the added oxygen content, which is a physical carrier of the dynamic impulse of the 500.

Sieve: Sieve the stirred liquid through an 18-lines/inch mesh sieve. A finer sieve should not be used as this prevents the passage of worm eggs.

Spray pressure: Spray the stirred 500 **onto the soil** using low pressure (maximum 10 psi or 70 Kpa), with nozzles that produce a uniform pattern of large-sized droplets.

2C.2 Applying 501

(a) Spraying conditions for 501

Application of 501 is most effective when applied early in a plant's growing period.

It can be applied several times during spring and also summer if irrigation is available. **It is very important that the plant has plenty of available ground moisture if using 501, as the use of 501 increases plant activity, including transpiration.** Under the strong light conditions of Australia using 501 if the soil is too dry may result in plant damage. Lecture 5 of *Bio-Dynamic Agriculture Introductory Lectures, Volume 1* gives detailed information on the light activity and use of 501. You can commence using 501 after 500 has been used to initiate the soil structuring and humus building processes.

With fruit trees or vines, apply either before flowering, when leaves are still small, or once leaves are well established in early to mid-spring and when the fruit is set but flowering has finished. The spray may be applied again later when the fruit is fully grown to aid the ripening/sweetening process.

Pasture should be longer than for 500 applications, with at least 10cm of fresh growth. 501 has also been successfully applied to older pasture that is being saved for 'autumn feeding'. Experienced biodynamic dairy farmers have found when this is done that the butter fat and protein content of the milk increases. Apply 501 ten days before grazing the pasture.

Apply 501 before 10am (earlier in summer)
on a sunny morning with little or no wind.

It is important that 501 is applied as a very fine mist, as high into the air as possible, and allowed to float down onto the plant foliage. **NEVER** apply 501 directly onto the plant.

(b) Stirring 501

Water source and heating requirements are the same as indicated for 500. The same stirring machine and spray tank can be used as that used for 500, however the nozzles and spray out position will need to be changed in order to direct a fine mist as high overhead as is possible.

(c) Quantity of 501

Use 2.4 grams of 501 per hectare in a minimum of 32.7 litres of water for each hectare (1gm in 14 litres of water per acre). The amount of water used can increase but be no more than double. **The essential is the quantity of 501 per area.**

(d) Duration of stirring

Stirring is performed for exactly one hour and undertaken outside. If stirring by hand, then the same person is to do the whole hour stirring.

(e) Spraying 501

Apply with high pressure sprayer, or air pressure (so that a VERY fine mist is produced) high into the air to allow the sprayed 501 to drift down onto the foliage.

(f) Precautions when spraying 501

501 is a powerful and important element in the Australian Demeter Biodynamic method but must be used carefully under the general Australian conditions of strong light and low soil moisture.

501 increases transpiration in the plant so adequate soil water must be present when using this spray. If applied after a dry period where irrigation has not been used, it may bring too much light into the plant, pushing it to seed or drying the plant up.

Avoid spraying 501 on plants that only flower once per season while they are in flower, for example fruit trees and vines.

CHAPTER 3 SOIL: THE FOUNDATION OF THE BIODYNAMIC METHOD

While we are all taught that a healthy soil is teeming with soil life – microflora and microfauna – very few people recognise the soil itself as a living organism. Once this is experienced as a reality our whole approach and activity towards soil cultural practices changes.

Structured soil to ensure correct and healthy plant nutrition is the foundation stone of all our biodynamic endeavours. Structured soil can also be viewed as a sensible 'bodily' organisation of this living entity.

3A CULTIVATION

When first beginning the Australian Demeter Biodynamic method it is important to look at the soil for any signs of compaction. To create the conditions for biology to flourish, to get air into the soil, you might need to consider ripping the soil to relieve the compaction. It is essential to develop soil structure so that the plant roots are able to grow deeply in unison with the 500.

Ripping is better done when the soil is on the dry side. If you picture moist soil as a slab of butter and you drag a knife through it, the knife smears a trench through the butter. This is the same for a ripper going through moist soil, effectively nothing happens. If you picture the same dry soil as a block of ice (dry soil is tightly bound together) and you drag a knife through the block of ice, you get a shattering of that block of ice. This is a similar affect that you need to get with ripping to relieve compaction.

It is very important that after ripping, plant root activity can follow to begin the soil structuring and humus-building process. In a pasture situation this is done by the existing pasture roots; in a cropping or market garden situation this can be done by green manure. Once the soil is structured, any cultivation should be a conscious activity and undertaken with utmost consideration to minimise damage to soil structure and soil biology. Soil cultivation is undertaken when the soil is in the right condition, not necessarily when the farmer is ready. Most cultivation is done using tined implements, with a tractor speed and implement depth that allows the soil to lift and break open naturally. It is important to look at the soil you are cultivating during the process to assess the results as quite often different speeds, depth and even implement are needed to achieve the desired outcome.

Implements that pulverise and de-nature soil structure (rotary hoe, power harrow) or cut (disc and mould board ploughs) through the soil – even the speed of the tractor when using suitable tines or rippers – will result in dusting or sealed-over surfaces and pore spaces.

The initial soft fluffiness of a rotary hoed ground may lead some to think it is nicely structured. An experienced biodynamic practitioner, however, will quickly recognise the overly fine dust that will pack down hard with rain, resulting in even more compacted soil that needs to be ripped up and then mechanically smashed down again – a vicious perpetuating cycle.

Implements that pulverise and cut through the soil may also create a compacted hard pan underneath the soil in heavier soil types. These types of implements should not be considered as primary cultivation tools but have a role if used shallowly to chip hoe weeds or prepare seed beds.

In soils where cultivation has dusted the soil, the air cannot get into the soil, plant roots struggle to grow and soil structure and biology are denuded. In situations where a lot of rain is received after such cultivation, water either gathers on the hard pan underneath or pools on the soil surface. Eventually the water must move somewhere, taking the soil with it – the beginning of soil erosion.

LEFT: Dusted soil 'cakes over' when wetted, preventing essential air from entering the soil.

BELOW: Disced soil often has a shiny, glazed-over surface preventing air from entering the soil clod.

Typical for disced soil (see above right), there is often a shiny surface sealed off to air or further microbial activity. It also shows 'chipped' lumps that are more like broken cement.

A well cultivated soil is one that has been allowed to 'break' along the natural joints of the soil to reveal open pores with interesting soil crumb sections of varied sizes. The following photos from Alex Podolinsky's lecture "*Bio-Dynamics: Agriculture of the Future*" show Agrilatina (below left), a biodynamic farm near Rome, immediately after a rain event following prolonged drought - its humus-rich, crumbly, well-drained soils open and responsive to further microbial and climatic activity; compared to a neighbouring conventional property (below right) on the same day – ploughed, eroded and colourless.

Essential information regarding soil cultivation is contained within the instructional videos *Soil Cultivation and Horse Paddock to Living Soil*, both available via www.demeterbiodynamic.com.au.

3B USE OF INPUTS

Biodynamic farms should consciously use the minimum inputs possible, in a medicinal fashion. Application of major or minor elements should be made via the soil at an appropriate time in the farm operation/rotation, ideally using non-water-soluble inputs, so as not to artificially push crops. In all situations where inputs are used the quality of the input should be considered.

3C SHEET COMPOSTING

Sheet composting is an essential biodynamic management tool. The principle behind this activity is to allow a dynamic interaction between plant leaf, roots, and soil.

For most farms the making and application of high quality compost is not practical under Australian conditions. In such situations biodynamic management is centred around creating conditions which allow an 'in-situ' development of humus to occur. This system allows for manures and other inputs to be spread onto the land prior to the appropriate biodynamic management, rather than making traditional compost, hence the term 'sheet composting'.

For 'life' to exist there must be continual activity:
a dynamic interaction of all aspects of nature.

1. Sheet composting pasture

(a) Biodynamic management of pasture revolves around dynamic rotational grazing, including the harrowing of cattle manure after each grazing. This activity forms the foundation for pasture sheet composting activity.

(b) Within orchards or vineyards correct and regular slashing of permanent pasture forms the foundation for sheet composting in these systems.

2. Sheet composting via use of green manures

In cropping and horticultural activities development of deeply structured soil is essential for crop health. Application of raw manure and growing at least two green manure crops along with the use of Prepared 500, will achieve a deep rooting 'in-situ' composting activity. (Refer to *Bio-Dynamics Agriculture of the Future*, the article *Cosmo Earthly Ecology & Green Manure* and the *Horse Paddock to Living Soil* video.)

3D DYNAMIC PASTURE MANAGEMENT

Biodynamic management of pasture revolves around dynamic rotational grazing with livestock. Rotations should be adapted to particular soil, climate/weather and livestock conditions on individual farms and based on pasture growth rather than a fixed time period, as is often advocated under 'cell grazing'-type practices. Animals should never remain on a given area longer than six days as they will nip new shoots as they emerge, weakening recovery and regrowth of pasture.

Grazing period and rotation length will be longer for a sheep-only enterprise due to the relatively picky nature of sheep grazing, whilst cattle, being much less selective, will produce fairly uniform grazing of pasture across a paddock and can be rotated more quickly. Raising sheep can be complemented by the inclusion of cattle to allow shorter, more effective grazing rotations (sheep following cattle) and better control of internal parasites due to the species specific nature of these organisms.

Cutting meadow hay every few years on each paddock forms part of this dynamic pasture management allowing some opportunity for weed control and nutrient redistribution across the farm. In a high rainfall environment with highly acidic soils small additions of rock phosphate can be useful to promote nitrogen-fixing legumes, which drive pasture productivity.

The principle at work here is again one of *status nascendi* (refer to *Living Agriculture*) – a constant dynamic interaction between root and upper plant. After grazing, a proportion of the plant roots are shed, becoming available as organic matter for the soil biology to convert to humus. It is best to harrow manure at this stage when the pasture is short. As the pasture is allowed to regrow, new root growth also extends downwards, structuring the soil a little deeper each time. As the soil improves over time it will allow different species to grow, creating a diverse pasture of mixed species.

Under a well-managed biodynamic system, depending on soil types, pasture roots can be found extending to a depth of around two metres or more. Combined with the use of 500, this root activity ensures well-structured soil to this depth or even greater.

If inputs such as rock dusts are needed, the best time to use these is at the end of the dry season, before rains are due.

Pasture plants should not be allowed to stagnate. Where plant stagnation occurs, root activity (growth and penetration) also greatly reduces, resulting in reduced soil structure activity.

In pasture management situations where stock is unable to be used, the pasture should be topped with a sharp bladed implement, such as a hay mower or slasher with sharp blades to ensure quick regrowth. The same underground activity happens as the pasture begins to grow and there may also be some benefit from the green organic matter if conditions are present for this material to break down and become available to the soil biology, rather than dry out immediately.

3E GREEN MANURE

Green manures are mixed species crops that are grown with the specific purpose of ploughing back into the soil to provide organic matter for the soil biology, from 500, to convert to humus. It is important to use mixed species as each plant has something different to offer to the soil. Choose species that grow well in your area – a mix of grasses, grains, and legumes is a good base mix – and any volunteer weeds are welcomed. Indeed, in the beginning of green manuring weeds may predominate. You could say that we are just presenting a mix of species and allowing the intelligence of our soil and nature to decide which are needed most.

Green manures are a very important tool for the development of in-situ humus development. It is prior to sowing of green manures that any inputs that are required are spread, so the biodynamic sheet composting process can occur. Any water solubility of the inputs is taken up by the green manure crop and given back to the soil as organic matter when the crop is worked in.

There are several considerations for successful green manuring to be undertaken. Correct cultivation to allow deep root development is essential. Sowing rate should not be too heavy so as the individual plants and roots can achieve their own expression and root growth. Sowing too heavily causes too much competition and overcrowding. The crop is forced to stretch for light, yellowing off at the bottom and affecting the quality of the green manure. It is important to recognise that the organic material mass supplied by the roots is as important as what is on top and that it is the plant roots that supply the deep organic matter for conversion to humus.

LEFT: A healthy green manure of grasses, grains and legumes sown at a rate that allows individual plant and root expression and growth.

ABOVE: Legume species coming in to flower. Time to mulch and cultivate before the crops send their energy into producing seed.

Green manure crop should be chopped up with a mulcher rather than being slashed, as the smaller pieces are converted to humus by the soil biology more easily meaning that land is ready for production sooner. Conditions permitting, you look to work the green manure in when the legumes in the mix begin to flower as they have peak nitrogen availability at this stage. Or at least try to work the green manure in before the crop becomes too old and stagnant. Most farmers growing green manure crops don't have water to irrigate the crop and are reliant on seasonal rainfall. It is important that if you are in an area that can become dry, you work the green manure into the soil with enough moisture to allow the biology to convert the organic matter to humus.

It is essential that 500 works with an activity, such as root growth or the conversion of organic matter to humus. In the system of sheet composting via green manure it is desirable to spray 500 when you sow the green manure, soil moisture conditions permitting, and again when you work the green manure crop into the soil.

ABOVE: Mulched green manure ready to be worked into the soil

ABOVE: first working in of the green manure with a tyned implement to leave the soil open and structured

3F WEED MANAGEMENT

3F.1 Cropping and horticulture

If you have a deficiency in your soil, then a weed that can help overcome that deficiency will grow well. If you use the biodynamic method effectively, you can harness existing weeds to overcome the deficiency and remove the reason for that weed to grow.

Harnessing weeds to overcome deficiencies

Different plants take up different elements in different concentrations. Most plants that are considered weeds are there to do a job, mostly to gather deficient elements or change a soil condition. For example, Heliotrope 'potato weed' is very high in copper. In low copper soils this will grow prolifically over summer, taking up copper with deep roots that penetrate the subsoil. If this plant is ploughed in as it starts to flower, or before it dries off, then your topsoil can be enriched with copper. Capeweed is similar with calcium.

Conventionally these weeds are chemically sprayed and left to wither and dry out in the sun, which means virtually all of the plant's goodness is lost. When ploughed in they naturally break down in the soil releasing all of the minerals held within it and we get a large nutrient gain and big increases in organic matter levels, eventually becoming humus.

The ideal way to do this would be to sow other mixed green manure species and incorporate this with the weeds as part of the green manure. By using weeds in this way along with 500 you are harnessing what the weeds are offering, changing the soil conditions and the necessity for the weed to grow.

Nutrient gain - how is it possible?

Firstly, the deep tap roots of these plants extract the nutrients your topsoil needs from the subsoil. Also, these plants take in nutrients from the atmosphere. Just as legumes take in atmospheric nitrogen and fix it in nodules forming on the roots. All plants take in Nitrogen and other nutrients from the atmosphere and use it to grow. This is why they are best ploughed in, because the nutrients are in the leaf and stem, not only fixed in nodules on the roots. If they are left to dry off the nutrient is concentrated in the seed and the rest is just evaporated back to the atmosphere. Only a small portion remains in the residue on the topsoil. Early ploughing in results in the greatest benefit.

3F.2 Pasture

Different weeds and plant species will grow in pasture based on the level of soil structure and fertility. To use the principles above, you can use dynamic pasture management, mulching the weeds into small pieces gives the best chance for soil biology to incorporate the organic matter. This method will take longer to achieve results than ploughing in and some inputs used in a medicinal fashion may help.

3G RENEWING THE LAND AFTER DROUGHT

Past tests have shown that after a drought – which has affected the holding capacity of humus colloids – elements, in particular potash, have moved down the soil profile.

Sub-clover may germinate and then indicate deficiencies. Soil testing to 30cm depth showed no deficiency of elements, but plants did, as the elements were lower down than their young roots reached.

Depending on stocking rate during drought, on type of stocking, on “dusting” caused by stock, even Nitrogen may be low, but Nitrogen would be the least affected element.

For “improved pastures”, especially in soils below pH 7, an application per hectare of the following would help the re-establishment of pasture and the recycling of the displaced elements:

- 25kg rock phosphate;
- 100-200kg of lime;
- 2.5kg of Sulphate of Potash; and
- perhaps, 100kg gypsum.

Biodynamic pastures that did not have to be grazed to dusting should have sufficient pasture roots left, depending on soil type. Otherwise, a light over-sowing with a wide range of pasture species followed by even only a heavy harrowing would be beneficial.

For grazing pastures with a stronger component of native species, only a little phosphate, possibly potash and lime should suffice, especially on clay soils, which will not have become dusty.

On hilly country, measures would have to be taken to avoid run-off of manures in a heavy opening rain. For instance, light tyning along the contour or harrowing of manure after soft opening rains. On large acreages rip marks on contour every 7 to 10 meters.

As soon as the soil is reliably moist (even only to 75 to 125mm deep) apply prepared 500 and the soil and plants will soon be back to normal performance.

CHAPTER 4 PLANT CARE

With the range of crops grown by our farmers in different climatic and geographical areas it is difficult to cover crop-specific problems in this document. For guidance with this talk to your mentor or contact BDAAA to be put in touch with an experienced BD farmer that may have faced a similar situation.

During the 'Agricultural Course' the question of plant disease was raised. Steiner responded by saying: "If a plant is sick, look to the soil". That is why we, as biodynamic practitioners, put much effort into creating a well-structured, humus rich soil. Achieving this produces the requisite conditions for optimum plant health.

The healthier and more active the soil life (microfauna and flora) the more resistant to pest and disease your plants are. Seasonally plant problems can occur, and it is desirable to take a biodynamic approach if action is needed.

There may be no need to react immediately if you see this or that pest on a plant. Observe whether the pest is actually doing any harm and what numbers the pests are in. If it is an annual plant, you must consider the age of the plants as well. Most fungi and insects have a rightful place in a balanced system of nature and are actually performing a useful task.

4A USING THE BIODYNAMIC SPRAYS FOR PLANT CARE

The biodynamic preparation 500, along with the six compost preparations, lays the foundation for establishing a healthy and dynamic farming system. Plants grown in a humus rich, well-structured soil are offered fullest potential for expressing health, disease resistance, and finest sensitivity in their nutritional uptake. As farmers we work hard to support our developing soil structure by adopting many and varied management practices that keep this end in view.

But the plant is totally influenced by the environmental conditions surrounding it. Our structured soil allows the plant its greatest potential to respond to sun warmth, light and moisture. But what happens when it is cold and cloudy, or hot, humid, and cloudy for long periods, or even endless drizzle for weeks?

As biodynamic practitioners, we also have management tools that can be used to help support the plant from the leaf down. Depending on the climatic conditions that cause the plant 'upset' we have three possible choices for strengthening and aiding plant recovery.

4A.1 Lack of light

Preparation 501 can be used to address a lack of light, as occurs when we have weeks of overcast cloudy weather, with or without rain. Due to the very strong light intensity in Australia, this is not often a problem, and in non-irrigated areas it is seldom required. There is a role for 501 in Australia where warm yet cloudy conditions occur – mainly in the tropics, or in coastal areas of the subtropics. It is an important tool in keeping disease at bay where such conditions exist, and it is important to note that 501 is a preventative spray, not a curative spray. It is important to start using 501 before the conditions for disease present and this requires the farmer to be aware of local weather patterns.

The prevailing conditions that determine use of 501 are **warmth**, **humidity**, and **low sunlight**. This is because the plant responds to sun warmth by sending out its white feeder roots to take up soil nutrients. When it is warm and **cloudy**, however, the plant does not have the sun **light** to fully engage photosynthesis. Under these conditions the plant is taking in nutrients, but not able to fully assimilate those nutrients. If this process continues over a longer period of time, the plant becomes susceptible to disease and/or pest attack, much as an artificially fed plant is.

See Chapter 2 for information on the application of 501. Refer to Lecture 5 in *Bio-Dynamic Agriculture Introductory Lectures* Vol I, for a greater understanding of 501 activity.

4A.2 Lack of warmth

Some Biodynamic orchardists employ a Valerian (Preparation 507) spray to help trees overcome the sap 'shock' which can occur in early spring when cold weather comes after trees have already gone through swelling buds or bud burst. Cold shocks at this time may leave the trees susceptible to different rots. Ideally the Valerian spray is applied hours before the onset of cold weather, but it can also stimulate and support the plant if applied the next morning after heavy frosts. Observations have shown that deciduous fruit trees, berry plants (especially strawberries), grape vines, and citrus trees are very responsive to the stimulation provided by Valerian.

Vegetables also benefit from Valerian in situations of unseasonal cold or in situations where cool weather induces certain diseases.

It takes a considerable amount of time to pick the flowers to make Valerian. So, while this is a useful tool, it isn't possible for the BDAAA to supply the amounts needed. If farmers wish to use Valerian the BDAAA can provide guidance on how to make quality Preparation 507.

4A.3 Valerian application

Liquid Valerian is added to the water to be stirred so that the scent is just noticeable. (The scent is the deciding factor but as a rough guide, use around 5 to 10ml of Valerian extract per 14 litres.) The water is warmed to 16–18°C and stirred for 20 minutes using the same stirring technique as used for 500. The stirred liquid is then applied directly onto the plants as a fine mist, lightly covering them with the solution.

IT IS ESSENTIAL TO NOTE THAT EACH SPRAY HAS A DIFFERENT PURPOSE, AND A DIFFERENT APPLICATION METHOD. THEREFORE, WHERE MORE THAN ONE SPRAY IS APPLIED IT MUST BE DONE IN SEPARATE APPLICATIONS.

4B TREATING PLANT PROBLEMS

4B.1 Pasture and crop protection from insect attack using 500 and 501 in combination

The following method has been found effective when Red Legged Earth Mite (*Halotydeus destructor*) is attacking the very early growth of pasture or lucerne. It has also had some success where vegetable plants were being attacked by sucking pests.

The principle to be applied when considering this treatment is the activity/vitality of the plants, since pests attack plants with low vitality as part of the decomposition/recycling activity of nature. Using 500 and 501 together can help to invigorate the vitality of the plant.

Procedure:

- Use 88 grams per hectare with a minimum of 32.7 litres of water per hectare. (35 grams per acre in a minimum of 14 litres of water per acre.). Stir for one hour and spray in the evening. The next morning use 2.4 grams of 501 per hectare in a minimum of 32.7 litres of water for each hectare (1gm in 14 litres of water per acre) and stir for one hour. Spray over the area previously treated the night before with 500.

Or if working on wet or very large areas only, modify the above process as follows:

- Use 88 grams of 500 and 2.4 grams of 501 in 32.7 litres of water per hectare (35 grams of 500 and 1 gram 501 in 14 litres of water per acre), stir both substances together for one hour in the same manner as is done for either substance on its own. Spray out in the morning over the plants at a pressure of 30-40psi. This combined spraying will not be as effective as that indicated above, but it is a compromise which allows larger areas of crops or pasture to be treated which would not otherwise be possible.

The procedure can be repeated again in the following days; however, experience has suggested that if the initial spray does not produce results, further applications are unlikely to be effective.

4B.2 Casuarina tea for fungal diseases

Casuarina is a specific tool used to counter fungal outbreak due to an overabundance of the watery element. This often occurs at a time in early spring, when plant growth is slow due to cool temperatures, or later in summer when it is also humid and cloudy. For full effect it is used in alternation with 501, which strengthens an over lush plant. The herbal tea is used as a prophylactic, mild anti-fungal agent against mildew, rust, etc. It should be used frequently in green houses.

Casuarina is very high in silica content and is the Australian alternative to Equisetum. The male Casuarina tree must be used due to its much higher silica content. Look for a middle-aged tree to make sure its sex is known. Do not use a tree with large cones, as these are certainly female. Occasionally a male tree will develop cones of an inferior size due to external stress such as drought or isolation, which prompts it to attempt to reproduce.

- ¾ fill a vessel, made from copper, brass, enamel or stainless steel, with Casuarina foliage and cover with pure water. Heat to simmering point, but do not boil. Simmer for a few hours.

Once Casuarina has been brewed it can be strained and bottled and this solution will store for a few weeks in a dark and cool environment. Better results have also been produced if the simmered liquid is kept for 3 days before stirring.

4B.3 Casuarina application

The application of Casuarina is only practical for horticultural operations. The Casuarina solution is diluted to the strength of an average tea colour and the diluted mixture is stirred for 20 minutes in the same manner as Valerian. The water does not need to be warmed and three lots can be stirred before applying. You can add ½% potassium silicate to help stick to the leaf. In this case the whole plant is sprayed with the liquid ensuring top and underside of leaves are well saturated. In orchard and vineyard situations blower or an air mister can be used with just enough airpower to wet top and underside of leaves and the bark without "thrashing" the leaves.

4B.4 Treating Phytophthora or Pythium

To treat *Phytophthora* or *Pythium*, use alternate sprays of 500 and Casuarina. When applying the Casuarina solution, spray the whole plant including the root area if possible.

In the first week apply the two sprays 3 or 4 times. In the second week apply them twice, and in the third week once to finish the procedure.

Normal tree care such as removal of long grass at the base of the tree trunk and adequate space and light need to be adhered to. Trees must be provided with very good drainage.

4B.5 Treating Black Spot (*Marssonina sp.*) or Brown Rot (*Sclerotinia sp.*)

Use Casuarina tea: Dilute the solution to an average tea colour. Stir as for 500 for 20 minutes, before applying. Saturate the whole plant including root area with the solution.

4B.6 Treating Curly Leaf (*Taphrina deformans*) and Shot Hole (*Stigmina carpophila*)

Spray peaches and nectarines for leaf curl and apricots for shot hole with ¾% potassium silicate as soon as these diseases appear. Use ½% solution only if the leaves are young.

4B.7 Black Scale (*Saissetia oleae*) on Citrus Trees

Instead of using petroleum based white oil, a spray made of Kaolin clay and potassium silicate can be used. The purpose of this spray is to close off the oxygen supply to the scale.

Another effective old remedy is to blow lime over the entire tree.

4C BIODYNAMIC TREE SPRAY AND ROOT DIP

4C.1 Tree spray

The biodynamic tree spray has been developed in conjunction with the biodynamic method of managing soils, with the aim of reducing insect and disease infestations in orchard or vineyard situations.

Underneath the protective film formed by the tree spray the cambium will develop a new healthy bark. This nurturing property also makes the spray of great benefit for painting onto large pruning wounds, in grafting and for injuries on all woody plants.

The mixture is made of natural compounds, which seal off all tiny and larger scars on the epidermis of the bark of all branches and the trunks of trees, or shrubs and berries. Due to the colloidal nature, the spray will cover the tree or bush with a thin film, which also protects the tree against certain pests. This same film seals off winter eggs of some aphids and suffocates mites.

The basic ingredient of the tree spray is a Kaolin clay which has the property of flowing into all small cracks and crevices. The main purpose of the biodynamic tree spray is to enliven the cambium during winter dormancy. To lower pest numbers is only a secondary consideration. The biodynamic tree spray itself contains no lasting poisons and leaves no residue on fruit or in the soil.

If properly applied the biodynamic tree spray will cover the tree or bush with a lasting protective coat that is visible as a fine whitish grey cover. The late autumn/winter application should be applied fairly heavily especially in the temperate zone so that it will hold through winter rainfall.

Biodynamic tree spray recipe – small scale

(Quantities will vary according to the number of trees to be treated)
Percentages indicated below based on weight.

Fresh cow manure
Fresh water
7% kaolin clay
2% potassium silicate
2 % microtomic or wettable sulphur (only if necessary)

Put the fresh cow manure in a hessian or open weave bag. Put the bag into a large container, such as an old washing copper (well cleaned), with some pure water poured in it and dunk the bag like a teabag. Mix clay in sufficient water to make a thin soup. Add liquid from soaked cow manure until a greenish colour is obtained. Add potassium silicate at a rate of 2%, and, if necessary, the microtomic or elemental sulphur.
Strain well before use. Cover the entire tree/vine with the spray immediately after pruning and **well before bud burst**.

Biodynamic tree spray recipe – large scale

20 litres fresh cow manure mixed in 200 litres water and allowed to steep for a few days. Decant the clear supernatant and add 10 litres/100 litres of spray.
Add potassium silicate if close to bud burst at 0.7%
(or up to 2% if spraying earlier).
Kaolin 1kg/100 litres. Mix well first in 2 litres water/kg
and allow to soak for a few hours/days.
Wettable sulphur at 250g/100 litres spray

Spray thoroughly to run-off completely wetting plant.

Important notes

1. The kaolin clay is very abrasive so rubber diaphragm pumps and ceramic nozzles are required. Agitate the tank during the spraying process to prevent the kaolin clay settling to the bottom.
2. Potassium Silicate can severely irritate the eye, use protective goggles and due care when handling the tree spray.

4C.2 Time of application

There are three kinds of application of the tree spray for fruit trees or vines.

(a) Late autumn or winter application for deciduous plants:

After the fruit has been harvested and the leaves have fallen, or after they have dried, a somewhat heavier spray is applied to cover the trunk, branches and twigs of the entire tree for winter protection.

THIS DORMANT SPRAY IS MOST IMPORTANT OF ALL. It keeps the tree/vine clean and the bark healthy.

(b) Pre emergence spray:

Apply in late winter or early spring **well before buds of leaves and blossoms open**. This is only done if a winter application has not been possible. **The amount of potassium silicate used must be reduced if applied at this later time**. For vines, application of sulphur at bud swell controls blister mite and the tree spray has been found to provide additional protection against fungal disease during spring, as well as promoting cambium integrity.

(c) Foliage sprays:

This is a much weaker solution of the tree spray **and does not contain any potassium silicate.** It can be applied after the fruit has set and should cover mainly the leaves and fruit. Even though the leaves are thoroughly covered with the whitish film of the spray, this will not interfere with the natural breathing process provided the solution is weak enough. This spray may be repeated several times over the growing season.

4C.3 Method of application

For winter protection: Use 10kg of tree spray per 400 litres of water.

For pre-emergence and foliage sprays: Use 6kg of tree spray per 400 litres of water.

These seasonal applications can be made on any day that will provide several hours in which the spray may dry. Use a spray rig that produces a relatively low pressure of the mixture and a high volume of air.

The European Red Mite has been kept in check by this method of spraying. This may be due either to the spray or due to the fact that its predators have not been destroyed. The clover mite and Aphids have been significantly reduced after several sprays. It has also been found effective against Tent Caterpillars and Red-banded Leafrollers and Scale.

4C.4 Modification of the tree spray for specific purposes

Tree paste for trunk wounds

Apply the following paste on trees or vines where bark is splitting or damaged or where there are severe pruning cuts. It should also be used after cutting tree galls back to clean bark. (Quantities will vary according to amount of paste required.)

After scraping away any loose dead bark, mix:

- Equal parts of clay and fresh cow manure together
- 1% Casuarina tea that has been stirred for 20 minutes (refer below) OR use 2% potassium silicate if no Casuarina is available (However, the potassium silicate does not possess the healing qualities of the Casuarina tea.)
- Apply strips of cotton "bandage" over the paste for large wounds. Ensure that the tree paste, and bandage remain moist at all times during the healing of the wound.

4C.5 Apple Scab

A 2 ½% solution of potassium silicate used in the tree spray mix has been found to be effective. This spray is primarily a protectant. It should be applied well before the buds have burst and well before the tender tissues are exposed to scab infection. The subsequent sprays for primary and secondary scab infection should be applied at the times indicated by local weather conditions. This spray forms a fine transparent coating over the trees, reducing the impact for the fungus to do harm.

4C.6 Codling moth spray

Use the tree spray mixed with the natural insecticide *Ryania speciosa* and wettable phosphate.

4C.7 Root Dip made with Preparation 500

It has already been said that the Biodynamic Preparation 500 fosters the formation of a strong root system which is the basis of vigorous growth and sturdy plants. This activity can be made use of by preparing a root dip. It is composed of equal parts (by volume) of cow manure and subsoil loam, all stirred with Casuarina tea (1 part Casuarina in 20 parts water) and stirred Preparation 500.

The resulting liquid has a soupy consistency. Roots of bare-rooted trees, vines, and berries will benefit when dipped into this material before they are replanted.

CHAPTER 5 LIVESTOCK MANAGEMENT

Biodynamic livestock management centres on the use of Prepared 500 and dynamic pasture management techniques to build soil heath and a diverse pasture. Once a farm has undergone the transformation of soil structure and plant health, biodynamic livestock are less prone to health problems. Any issues that do arise within a functioning biodynamic system are usually the result of a climatic imbalance to the finely tuned farm ecosystem.

It is important to ensure your stocking rate is suitable to your land and climate and not overtaken by a desire for maximum production. Be aware of the condition of your soils and identify any mineral deficiencies that may affect your livestock, providing appropriate mineral licks based on stock, pasture and soil health, and seasonal conditions.

It is a constant challenge to determine the weakness as a result of the imbalance and then support the system until it can regain health.

5A BREEDING

Selection is important for general health in a biodynamic system. While line breeding has been shown to improve desirable traits in most domestic livestock, care must be taken not to accentuate weaknesses.

Natural breeding is preferred but if breeding stock is sourced from a conventional farming system, it should be noted that the introduced stock can take time to adjust to a biodynamic system and will need careful observation as they are 'weaned' off the conventional inputs they may previously have relied on.

5B TREATING LIVESTOCK PROBLEMS

With the diversity of climatic and geographical areas in which our farmers manage livestock, it is not possible to cover all livestock problems in this document, however we have attempted to cover the main, widespread issues below. For guidance with specific challenges talk to your mentor or contact BDAAA to be put in touch with an experienced BD farmer that may have come across similar issues in comparable conditions.

In a biodynamic farming system, prevention of animal health issues is key. Animals that are stressed or lacking in nutrition or specific minerals in their diet are more prone to health issues.

Running an optimal stocking rate for your land, the provision of high-quality biodynamically grown feed, carefully timed paddock rotation and access to mineral licks should keep pathogens at bay. Selection for worm/ailment resistant stock is probably the most effective preventative measure.

Stock rotation

The timing and order of stock rotation needs to be considered to help break the breeding cycle of worms and other pathogens. (For example, alternating sheep and cattle can also help manage the other species' worm eggs on the pasture, as they can assist in killing the worm eggs when digested. Run young sheep behind cattle or mature wethers, which leave relatively clean pasture for grazing.) This is easily achieved with effective rotation, matching rotation to seasonal growth rates (see 3D Dynamic Pasture Management, p21) but may require further subdivision of paddocks.

Good aerobic soil conditions that are conducive to good soil health will also reduce conditions favourable to pathogens.

Information on the breeding cycle of parasites particular to your animals and climate can be obtained from your vet or researched on the internet.

Homeopathic solutions and the use of vitamins and minerals to treat and prevent animal health problems naturally are not specific to biodynamic farming and information is widely available online.

5C DROUGHT FEEDING PRECAUTIONS

Under drought feeding conditions longer-term diets consisting mainly of cereal grain may result in calcium deficiency in some stock. To reduce this possibility, add finely ground agricultural lime (calcium carbonate) to cereal grain at 1.5% weight of the ration (i.e. for every 100kg grain add 1.5kg of limestone). The lime is spread onto the grain when filling the feed out bin.

Do not use builder's lime, burnt lime or slaked lime. If the stock water does not contain salt levels, then 0.5% coarse salt should also be added to the grain diet.

APPENDIX A DEMETER BIODYNAMIC CERTIFICATION

For the rights to use the Australian Demeter Biodynamic trademark an operator must satisfy the requirements of the *National Standard for Organic and Bio-Dynamic Produce* and show soil structure development and farm management as detailed in the *Australian Demeter Biodynamic Standard* (available from the Bio-Dynamic Research Institute).

The Bio-Dynamic Research Institute owns and issues the right to use the Australian Demeter Biodynamic trademark. Being a farmer of the BDAAA or a member of BDGA does not give the right to use the Demeter trademark or the 'Biodynamic Produce of Australia' Triangle.

Demeter Biodynamic certification is not limited to farmers of the BDAAA or members of BDGA. It is available to any farm and its owner/operator that satisfies the requirements of *The Australian Demeter Biodynamic Standard*. The *Biodynamic Standard* also details the requirements for processors, wholesalers, retailers, importers and exporters of Demeter Biodynamic produce.

An operator must apply to the Bio-Dynamic Research Institute for registration as a user of the Demeter Bio-Dynamic trademark.

APPENDIX B BIODYNAMIC COMPOST

For information about building large scale compost heaps please refer to the "Compost Making" video produced by Mark Petersen available via the Australian Demeter Biodynamic website.

Choosing a site

The compost making area should be protected from excessive winds, which can hinder bacterial action and humus formation. The heap should be built North to South for warmth, and not too near trees that will rob the compost. The site should be accessible, reasonably flat, but not prone to water logging.

The first step is to dig-off any pasture/plant cover from the area where the compost heap is to be built and loosen the soil. The dug area should be larger than the heap itself to prevent roots from robbing the compost material.

Choice of materials

A thorough mixing of materials gives the best result, rather than layering. Any dry material, such as spoilt hay, will need to be thoroughly wetted before use. Where green vegetative material is used, it should be wilted first, and roughly chopped. Grass clippings can be stock-piled beforehand provided they are mixed with drier material to prevent them burning out or becoming silage. Thoroughly wet materials as you build. This moderates temperature gradient and prolongs digestion.

Manure: Fresh cow manure is best. Make the effort to get it if you can. If this is in limited supply, supplement with other manures.

With regard to the mixing of materials your own experimentation and experience is essential in determining the final result. The fresher the manure you use, the more straw and vegetable matter you will need to add to the mix.

A little soil or mature compost can be added. This mellows the digestion and helps to prevent overheating.

Rock dusts and lime: can be added in small quantities. Dolomite lime is best.

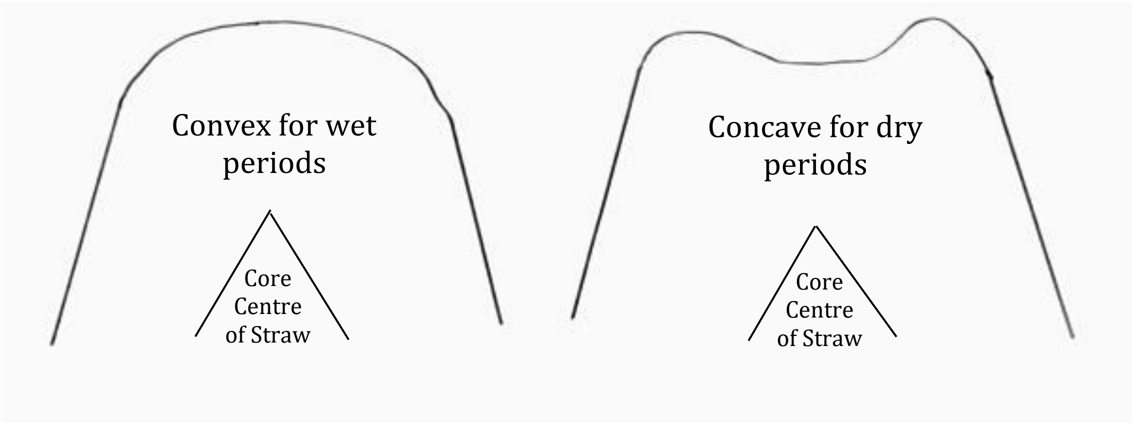
So-called 'weeds': These are a desirable ingredient unless you fear running the risk of spreading the tougher species, like couch.

Organic household waste: You can use a compost-style bin to accumulate and partially digest them, then mix the contents into your heap when building.

Leaves: Care should be taken that leaves do not become compacted and thus fail to decompose. Use leaves sparingly together with other materials but avoid the tougher leaves like eucalypt or oak.

Building the heap

First make a central core using books of straw in an 'A' frame pattern, so that they poke out the ends of the heap. This helps air circulation during the early phases of digestion. The heap is built so that it tapers towards the top, which will allow the covered heap to shed heavy rain. The top of the heap should be built **convex** going into **wet periods** and **concave** when conditions will be **dry**, or to allow the addition of water to the heap if it threatens to overheat.



Size of heap

Obviously the size of the heap will vary with the amount of material available. The width should never exceed 5 meters, with 3 meters being a good width for larger sized heaps.

Small heaps should be at least 1.5m high, 1.5m wide and 3m long. Heaps smaller than this will not readily produce good quality colloidal compost, and it will be much harder to regulate temperature fluctuations. Heaps can be longer than the dimensions given if enough material is available.

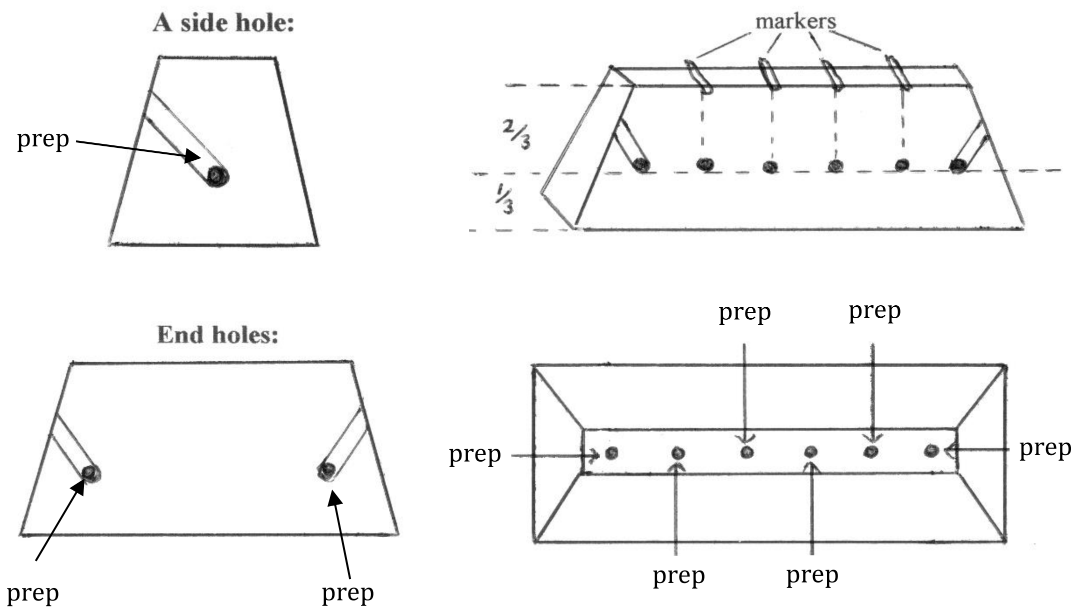
Inserting the compost preparations

***Important note**: The preparations are ideally inserted within one week of assembling the heap.*

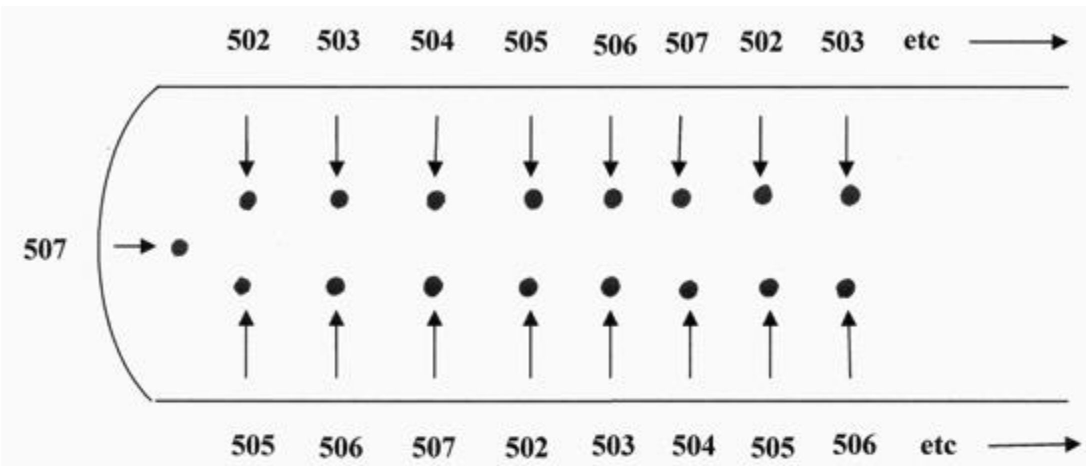
The compost heap should develop its own inner life. There is only one desirable goal, and that is the formation of neutral colloidal humus, which benefits the nutrition of plants. To guide the decomposition towards the formation of colloidal humus the biodynamic compost preparations are inserted into the heap. Their effect can be likened to that of a special yeast culture upon dough. An even, quick fermentation is promoted through the contact of these preparations with dead organic material. Experiments by Dr E Pfeiffer have shown that the preparations are also rich in plant hormones and growth-stimulating substances. As a result, the raw organic material is efficiently transformed into an odourless humus mass, which can be quickly absorbed and digested by the soil.

Space preparations evenly around the heap. Holes go in at a 45º angle towards the lower third of the heap. The hole is made by using a thick stick or crowbar.

The preparations are inserted by first ensuring they are protected from any overheating. This is done by gently adding good soil or old compost into the hole just made, rolling in the preparation and then adding soil again until the hole is full. Be sure there are no indentations where the holes were, to avoid water collecting there.



For large compost heaps with multiple sets of preparations, they need to be placed as far away as possible from the same numbered preparation. The diagram below gives an example of the pattern required.



One of the preparations (507) is liquid Valerian. In 7 litres of warmed water, stir the Valerian in the same manner as for 500, only in this case it is stirred for exactly 20 minutes only. Pour half of the liquid into the hole prepared for it and sprinkle the remainder over the top of the heap. (Remember to refill the hole afterwards.)

Protecting the heap

After the preparations have been added the heap is covered with books of straw – in the manner of tiles – over the whole of the heap. This acts as a skin under which the heap will begin to develop its own inner life. The straw tiles will protect the heap from dry winds and reduce the growth of plants on the side of the heap.

If heavy or prolonged rain is to be expected the heap may need temporary extra protection. Corrugated iron, a tarp or plastic can be used, then removed as soon as possible.

Compost heaps should never be allowed to become overgrown with weeds. Grass also makes a thick mat with its roots and hinders decomposition. Through transpiration plants draw out of the heap an enormous amount of water. Therefore, it is essential to keep the heap weeded.

Monitoring the heap

The composting process involves several different stages. The heap heats up to between 45 and 50°C within a week and may hold this temperature for several weeks before gradually declining in temperature. As the temperature declines, active fungal growth and microbial activity occurs. Finally, the heap is thoroughly worked by compost worms – these worms do not need to be added, they come when the situation is right.

A well-made heap WILL NOT REQUIRE TURNING. It will need to be regularly monitored for temperature and moisture content. Compost temperature should not exceed 60°C, otherwise nitrogen loss could occur, and the added biodynamic preparations could be damaged. If the heap is getting too hot, water needs to be added along the top of the heap a little at a time to arrest, not reverse heating. The lesson here is to adjust the manure/plant matter proportions next time. Manures and fresh plant material are heat generating, old plant material, and soil are moderating. Of the manures, poultry and horse create the most heat. Old manures that have been sitting around some time have less heating potential than fresh manures.
If moisture needs to be added to the heap this can be done by adding liquid manure or dissolved cow manure instead of water. Liquid manure should be diluted with about 2 parts of water, while cow manure should be dissolved in 12 times its volume of water.

Using the heap

The compost is ready when it is 7/8th digested. At this point you cannot identify individual ingredients and it will look a bit like 500. Well-made compost will not smear the hands and has a colloidal (putty-like) texture. Worms will still be active in the heap.

The length of time a heap takes to be ready will vary according to the season and ingredients used. Ideally it should take between 3 to 6 months.

- When spreading compost onto cultivated ground, immediately incorporate it into the soil to prevent it from drying out.

- When applying compost to pasture, ensure that there is at least 10cm of pasture growth to provide shade and prevent the compost from drying out. The paddock may be harrowed after application to ensure all compost is adequately shaded.

If the heap is not used all at once do not leave the heap face exposed after removing compost. Re-cover the heap with straw until next time.

Liquid Compost

*It is **important** to note that liquid compost is not a foliar spray and is to be used on the soil.*

Large scale

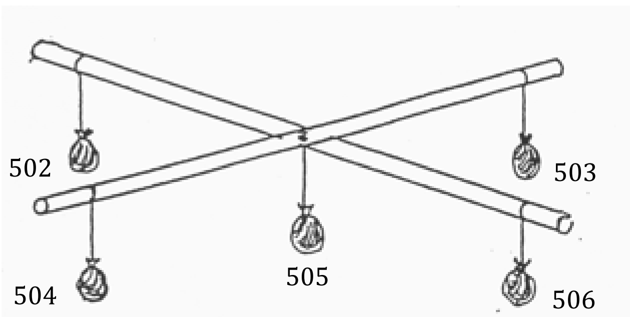
- For large scale use, use an old commercial milk vat or similar. Fill the vessel with water, place cow manure into hessian sacks and hang in the vessel. Insert the preparations as below, it is fine if they hang in a straight line. Give the hessian sacks a good agitation each day. When the water is quite green from the manure remove the hessian sacks as they may rot and release the manure into the mix. This is not desirable in a practical sense of using the liquid compost due to the sludge caused by the manure.

Small scale

- For small scale use fill a container (old bath tub, clean 44 gallon drum etc.) one tenth full of manure. Again, cow is best.
- Fill the container with water, Mixing the manure and water thoroughly as you do so.

Inserting the compost preparations

- Make a wooden cross and tie a set of compost preparations in weighted muslin bags from the cross as shown below:



- Sit the cross over the container so that the bags are about 1/3 of the way down in the liquid.
- Stir the valerian, as you would 500, in 7 litres of lukewarm water for 20 minutes. Pour it into the liquid manure.

Monitoring the liquid

Stir the container every two days, with a strong plunge action up and down to mix well.

In large scale production use a pump to cycle the water.

Using the liquid

Use the liquid compost when it turns into a black, oil-glazed looking liquid (1 to 4 months depending on time of year). In this state it will not force-feed plants as it has a somewhat colloidal nature.

Dilute it 1:10 before use. As a guide for large scale use, use 20l of the concentrate per acre onto the soil, or through fertigation for heavy feeding crops in horticultural situations.

APPENDIX C BIODYNAMIC SOWING CHART

Another tool available to the biodynamic practitioner is the use of the 'Sowing Chart', available to all farmers of the BDAAA and members of the BDGA each year.

As with any tool, the sowing chart has the potential to be used wisely, and should not be used bureaucratically to determine day-to-day farming activities, especially when to spray the biodynamic preparations. Soil conditions, local knowledge and understanding of weather patterns should always be the ultimate decider in all matters. Please refer to *Bio-Dynamic Agriculture Introductory* Lectures, Vol 1 Chapter 4 for further information on the use of the sowing chart.

BDAAA Sowing Chart

The information recorded in our sowing chart has been translated from data provided in the *Sterncalender* published each year by the Gotheanum, Dornach, Switzerland.

The chart maps out the different rhythms of the moon over the course of each month and these are displayed on each page. It provides the time and which key points or changes occur. For example:

- Apogee (or when the moon is furthest from Earth) is shown by using the code Ag
- Perigee (moon nearest to Earth) is shown by the code Pg
- Full moon (FM) and New moon (NM) as well as the point at which the moon is Fully Ascended (FA) i.e. reaching the highest point above the horizon and Fully Descended (FD) i.e. lowest point of transition across the equator
- The time the moon moves into a new constellation (star sign)
- Ascending and Descending Nodes i.e. the point where the Moon crosses the Sun's path

From the early work of Maria Thun, we know that when the moon is in:

Taurus Virgo Capricorn	i.e. The **EARTH** signs	A plant's development is directed more to the **ROOT**
Cancer Scorpio Pisces	i.e. The **WATER** signs	A plant's development is directed more to the **LEAF**
Gemini Libra Aquarius	i.e. The **AIR** signs	A plant's development is directed more to the **FLOWER**
Aries Leo Sagittarius	i.e. The **FIRE** signs	A plant's development is directed more to the **FRUIT/SEED**

It is important to note that:

- Any seeds planted require **at least 36 hours** under the influence of the given sign. This 36-hour period should not overlap with the Node influence period. (Refer to the lecture: *Living Knowledge*.)
- The Node (when the moon crosses the sun's path) has a negative effect on seed development, so sowing should not occur during the period of a full day before and after the Node occurring.

Some general principles to keep in mind when using the sowing chart are as follows:

- Whatever requires growth or new development – start during the waxing moon phase. For example, sowing of seeds should be done during a waxing moon, preferably near full moon, but not later than two days before it.
- The activity of growth is also enhanced by sowing during an Ascending period (i.e. time from Fully Descended towards Fully Ascended).
- Greater soil fermentation and root activity occurs
    - in the afternoon,
    - at waning, and
    - during descending moon period.

Therefore, these periods can enhance the activities of cultivation, spreading compost and transplanting. Cultivation will then be followed by less weed regrowth, manure will be more readily incorporated in the soil and roots will 'take' sooner – especially if the plants have been lifted in the morning and kept in a cool place, thereby having been slightly 'starved'.

- Whatever needs to dry, cure, or decrease without decay – perform during the Waning Moon phase. Just before New Moon – at the "dark of the Moon" – was said to be especially favourable for these activities.

Considering these general observations, we can understand why historically the planting of crops, picking of grapes for wine and shearing of sheep were carried out during the Waxing Moon, while general harvesting of crops, felling of timber and castration of stock was undertaken during the Waning phase.

Other traditions indicate that grafting and planting should be performed during Waxing Moon, because raising sap is said to aid the formation of new shoots or establishment of new grafts.

As to **sowing** around Full or New Moon to improve crop growth – opinions vary. While germination and growth rate increase around Full Moon, there seems no conclusive evidence that sowing at any particular point in the lunar phase cycle will influence **final yield**. However, **harvesting** crops according to the phase of the moon has been used since antiquity.

- Crops required to be stored dry or preserved are harvested near New Moon.
- Crops to be eaten fresh are harvested at Full Moon.

It makes a difference if one wants to store a crop or put it directly on the market. For example, grain increases in bulk when the Moon is waxing.

Rudolf Hauschka, in his book *Nature of Substance*, undertook studies with plant germination and growth, looking at the weight gain and loss of the young plants which were grown in hermetically sealed vials. He reported that, “measurements clearly showed both increases and decreases in weight, to a degree far exceeding the determined margin of error.”

“Increases and decreases” in weight – or, to put it another way, the emergence and disappearance of matter occurred in rhythmic sequences where the lunar factor appeared the determining cause. The experiments consistently gave evidence of weight gains during waxing moon and losses every waning moon period respectively.

APPENDIX D USE OF PEPPERS AS A MANAGEMENT TOOL

Many of the so-called 'common' weeds will reduce as soil structure improves under biodynamic management practices. Similarly, plants and animals will be healthier and less susceptible to pests and diseases. As a result, reliance on or use of, 'antidotes' will cease to be part of a healthy, functioning biodynamic system.

In some cases, there may be particular pests, such as rabbits or mice, that remain a problem under your given climatic or geographical region. In such a case use of 'peppers' may aid in that pest's control.

Note that the use of this method requires a responsible attitude towards the whole farm functioning as part of a greater system of both the local environment and Earth. Also, each element of the farm has a function and purpose in the overall 'health' of the farm. Your direct interference in this balance must be undertaken with understanding of the consequences for such.

The results of 'peppering' do not occur overnight. Rather it is a gradual changing of the environment where the pest occurs, to conditions less favourable to the pest's reproduction. The general cycle of changes takes about four years to show a result – with the application of the 'peppers' required every year during this time.

General points:

- The term 'pepper' is used as this describes the manner in which the **dry ash** of the pest is distributed. The ash is lightly dusted around the area you want free from the pest in question.
- The pest part to be burnt is placed with **charcoal** on a sheet of iron/tin, which is used to collect the resulting ash.
- The ash remaining after burning can be diluted by mixing with fine sand or clay powder to assist with the dusting-out process

  Note: Peppers are applied as a **dry** dusting.

Weed peppers:

- Collect the seed of the problem plant and burn the seed as detailed above. Spread the ash very sparingly over the area you want free from the weed.
- Weed pepper has also been successfully applied during grain planting by incorporating the ash with the seed in the seeder.

Vertebrate peppers:

- Collect the **skins** of young animals of the pest you wish to discourage.
- The skins may be dried and kept until the specific date.
- The period to burn the skin is when **Venus is in Scorpio** (this date is recorded in our sowing chart).

- The ash needs to be dusted over the whole area travelled by the pest. (For this reason, pests with wide roaming areas such as Kangaroos, are less successfully deterred by this method.)

Insect peppers:

- Collect the insects you wish to deter and burn the insects when the **sun is in the sign of Taurus.**
- It is possible to keep the dried insect bodies until the correct time.
- The ash needs to be dusted over the whole area travelled by the insect. (Again therefore, pests with wide roaming areas, for example locusts, are less successfully deterred by this method.)

APPENDIX E SEED-RAISING MIX AND RAISING SEEDLINGS

The following is based on commercial experience propagating vegetable seedlings using methods and inputs certified to or allowable under the *National Standard for Organic and Biodynamic Produce*. It is not biodynamic in nature but rather a practical resource for growers, particularly market gardeners that have a need to grow seedlings for their farm operation.

The importance of air

The addition of well-made BD compost or worm castings beyond 5–8% of the growing medium **IS NOT** recommended when starting off vegetable seedlings in plugs or small cells. The particle size is too small and retains too much water in the medium reducing oxygen supply to newly developing roots. This stops root growth, and the uptake of nutrients is severely reduced especially calcium, potassium, and phosphorus.

Underneath natural soils are subsoils; underneath seedling trays there is air. This leads to a big difference in the amount of water held within just-drained containers. The air space below trays (the atmosphere) lacks the suction ability to draw water from the medium like a natural soil would. The pores within the medium itself hold the water with forces of attraction that gravity cannot overcome. Only when additional water from above creates a head of saturated media can water be forced out of the medium.

For any given soil, compost or growing substrate, the percentage of air it contains **is always reduced** when placed into a container that sits above ground. For this reason, the medium we use in containers must have a higher proportion of large pores than natural soils if the roots of plants are to get enough oxygen.

Selecting containers to grow in

For any given volume of seed raising mix the height and angle on the sides of containers will influence the percentage of air available to roots. Higher sides increases air to roots; the more tapered towards the base, the greater the air to roots; wider and lower containers reduce the percentage of air and increase the percentage of water. For most vegetable seedlings, 105 cell trays are a good choice with a height of 48mm and a cell volume of 30ml. Smaller cell volumes than this are not recommended for field planting. Open flat trays hold more water and less air than a plug tray of similar height because of the shape made by individual cells.

Suitable growing medium

For propagating vegetable seedlings, the following medium is suitable:

- 90% course composted material screened 0-5mm (pine bark, hoop pine fines or woodchip)
- 5% well-made BD compost or worm castings screened 0-5mm
- 5% natural zeolite

Per 50 litres of medium add:

- 10g Fused Calcium Magnesium Phosphate (FCMP) or rock phosphate
- 40g natural gypsum
- 400g blood and bone

Coco peat is methyl bromide treated prior to entering Australia and does not comply with the *National Standard*. Although a useful material it is best avoided for this reason. Peat moss can also be treated or contaminated depending on source. We recommend Australian produced renewable materials for the bulk organic material contained in growing mediums.

Perlite is often added to mixes, which is very irritating to the eyes, throat and lungs and experience shows it to be unnecessary if a variety of particle sizes in the 0-5mm range are included in the bulk organic material.

50% vermiculite (grade 3) and 50% growing medium make a good mix for covering seeds. This is preferred to covering with straight vermiculite. Mixing vermiculite allows for better visual indication of changes in surface moisture and creates less humidity around young stems reducing disease.

Filling trays

Dry medium lacks adhesion and will pack down into the tray reducing air. Wet medium is heavy and will also pack down into trays reducing air. Moist medium placed into trays will provide the best conditions for root development. The common practice of lifting or dropping just-filled trays to settle medium reduces air within the cells. Firming or pressing down on the medium to create depth for sowing pushes out the air spaces that roots need to occupy as the seedling develops. To create depth for sowing seeds lightly brush over the tray flicking out the top layer of medium.

Soluble salts

The addition of nutrients to the medium is necessary as humus has to be restricted to create enough oxygen for plant roots to function properly. This difference between container growing and growing in natural soil is important.

The addition of blood and bone (not exceeding the rate recommended) is preferred over poultry or feedlot manures. The smell of these materials in the medium attracts fungus gnats whose larvae feed on the roots of many vegetable seedlings. High levels of sodium, potassium and other soluble salts cause problems in seedling production. Ammonium toxicity can occur particularly under cool conditions.

Low soluble salt levels are important for germination. Excessive salts (above EC values of 1.5dS/m) can cause the radicle to burn off as it emerges from the seed, reducing germination rates. The seedlings feeder roots burn off as soluble salts increase (above 2dS/m).

Water uptake becomes restricted as soluble salts and EC increase around the seedling's root system. A plant uses suction measured in kPa to extract water from the medium. In a medium saturated with pure water a plant needs to overcome a negative potential of around -10kPa to extract water. At an EC of 3dS/m the plant has to overcome -110kPa to extract water, effectively 11 times the work or effort required than if the salts were not present. As medium dries the salt concentration increases as does the force required to extract available moisture. Salts dissolved in water make its potential more negative. This is why seedlings reach wilting point much faster when the water in the growing medium contains high (above 2dS/m) levels of soluble salts.

Moisture management

Germinating trays are best watered light and often, maintaining a high level of both air and moisture.

As the seedlings emerge with true leaves, watering frequency is reduced but the application is increased to match an increase in water use as the plant roots develop.

Once seedlings begin to fill out the tray and form a second set of true leaves, frequent watering will increase disease risk significantly and create nutrient deficiencies through leaching of the medium.

Watering in the heat of the day **WILL NOT** burn leaves, it is necessary to frequently water seedlings during extreme summer heat or they will wilt, suffer burn damage and perish.

Light and air flow

Seedlings do best emerging under high light conditions. This is important to prevent early stretch and so the cotyledon leaves open close to the surface of the medium.

Air movement is important as the seedlings begin to grow. The air flowing past small seedlings creates movement in the plant, thickening the stems and shortening the internode length, reducing the risk of disease developing in trays.

Common seedling problems

Most problems occur when:

- The medium does not contain enough air for roots to develop and function properly
- Lime, dolomite, rock phosphate, poultry or feedlot manures are added to the medium at levels that drive the pH too high, interfering with nutrient uptake
- Seedlings emerge into low light conditions and stretch
- Air movement is restricted causing stretching, soft growth, and disease
- Soluble salt levels are too high causing soft sappy top growth, poor root development, reduced germination, wilting under warm conditions and ammonium toxicity under cool conditions

APPENDIX F SUGGESTED MINERAL INPUT LIST

General conditions of use:

- Derived from a natural source and in its natural form, free of chemical treatment to increase water solubility.
- Free of contamination that would conflict with the Australian Demeter Biodynamic Standard.
- Applied at the time of sowing green manure crop or correct phase of dynamic pasture management.

Common name	Mineral name and chemical formula	Application and source
White Mica or Potash Mica	MUSCOVITE KAl2(AlSi5O10)(F,OH)2	Non-water-soluble potassium source found naturally in Granite.
Black Mica	BIOTITE K(MgFe)3(AlSi3O10)(F,OH)2	Non-water-soluble potassium/magnesium source, also found naturally in Granite alongside muscovite.
Greensand or Glauconitic Sandstone	GLAUCONITE (K,Na)(Fe3+,Al,Mg)2(Si,Al)4O10(OH)2	Slow release potassium source. Alternative to sulphate of potash. Very High CEC. Large commercial deposits in Western Australia.
K-Feldspar or potassium feldspar	ORTHOCLASE KAlSi3O8	Non-water-soluble potassium source found in Granites, mostly in the salmon-pink coloured rock.
Natural Calcium magnesium silicate	MONTICELLITE CaMgSiO4	Can be used as a source of silica.
Wollastonite	WOLLASTONITE CaSiO3	Natural plant available source of silica.
Magnesium iron silicate	OLIVINE (Mg,Fe)2SiO4	Releases silica, magnesium carbonate and iron oxide into the soil. Contains 25% Mg. Olivine is found in basalt.

Common name	Mineral name and chemical formula	Application and source
Zeolite	CLINOPTILOLITE $(Na,K,Ca)_2$-$_3Al_3(Al,Si)_2Si_{13}O_{36}.12H_2O$	Natural source of potassium. Absorbs potassium, ammonium NH_4, and phosphate from fertiliser and raw manures. Prevents volatilisation of NH_4 and ammonium toxicity. Prevents leaching of nitrate, phosphate, and potassium.
Talc	TALC $Mg_3Si_4O_{10}(OH)_2$	Can protect fruit from sunburn and useful in seed coating. Talc is inert and hydrophobic in nature so can prolong the life of stored seed and grain.
Kaolin clay	KAOLINITE $Al_2Si_2O_5(OH)_4$	Lowers leaf surface temperatures and protects against sun damage. Can prevent fungal spores from developing on plants and suppresses wide range of insects that feed on crops including beetles and codling moth.
Bentonite clay	MONTMORILLONITE $(Na,Ca)_{0.33}(Al,Mg)_2(Si_4O_{10})(OH)_2.nH_2O$	High CEC swelling clay, capable of holding and absorbing large volumes of water. Useful in purification of liquids and as a binder mixed with kaolin to pellet seeds.
Attapulgite clay	PALYGORSKITE $(Mg,Al)_2Si_4O_{10}(OH).4(H_20)$	Has unique colloidal properties and very high exchange capacity. Will not shrink and swell like other clays and can act as a carrier for many substances.

Common name	Mineral name and chemical formula	Application and source
Rock dust from granites and rhyolites	GRANITE AND RYOLITE (ORTHOCLASE, QUARTZ, PLAGIOCLASE, MICA, APHIBOLE)	Contain mostly K-feldspar, quartz, biotite, muscovite, and some plagioclase. They are high in potassium (4% K_2O) and silica (72% SiO_2). They are low in calcium (1-2% CaO), magnesium (0.4-0.7% MgO), iron (1-2% FeO), manganese (0.5% MnO) and phosphate (0.7-1.2% P_2O_5)
Rock dusts from diorite and andesite	DIORITE AND ANDESITE (PLAGIOCLASE, AMPHIBOLE, MICA, QUARTZ, PYROXENE)	Contain mostly calcium feldspar, amphibole, mica with less quartz and some pyroxene. Compared to granite they are higher in Iron (4-5% FeO), manganese (0.12-0.14 % MnO), calcium (6.7% CaO), magnesium (3.7% MgO) and phosphate (0.21-0.29% P_2O_5). They are lower in silica (58% SiO_2) and potassium (1.7% K_2O).
Basalt dust	BASALT (PYROXENE, PLAGIOCLASE, OLIVINE, AMPHIBOLE, MICA)	Contain mostly pyroxene, calcium feldspar and olivine. Compared to granite, rhyolite, diorite and andesite they are high in calcium (9.47% CaO), iron (7.1% FeO), magnesium (6.73% MgO), manganese (0.2% MnO) and phosphate (0.36% P_2O_5). They contain less silica (49% SiO_2) and potassium (1.1% K_2O).
Diatomaceous earth	DIATOMITE SILECIOUS SEDIMENTARY ROCK	Source of silica and used widely as a pesticide.
Natural Magnesium oxide or magnesia	PERICLASE MgO	60% magnesium, high pH adjusting value.

Common name	Mineral name and chemical formula	Application and source
Zinc oxide	ZINC OXIDE ZnO	Natural zinc source that is insoluble in water but soluble in dilute acids and bases. Slow release alternative to zinc sulphate.
Natural magnesium carbonate	MAGNESITE $MgCO_3$	Contains around 28% magnesium. High pH adjusting value.
Calcium magnesium carbonate	DOLOMITE $CaMg(CO_3)_2$	Contains 12% magnesium and 22% calcium. High pH adjusting value.
Natural lime	NATURAL LIME $CaCO_3$	37-40% calcium. High pH adjusting value.
Natural gypsum	NATURAL GYPSUM $CaSO_4$	Contains calcium 24% and sulphur 18%.
Calcium magnesium boracite	HYDROBORACITE $CaMgB_6O_8(OH)_6.3H_2O$	Natural rock mineral that contains water insoluble boron 10%, calcium 16% and magnesium 6%.
Bone meal	HYDROXYAPATITE $Ca_5(PO_4)_3(OH)$	Natural mineral form of calcium apatite: produced biologically in bone which is 70% hydroxyapatite by weight. Contains 12-20% phosphate. Unlikely to contain cadmium, fluorides, or chlorides. Renewable alternative to rock phosphate. Higher acid solubility than rock phosphate.
Rock phosphate	APATITE $Ca_5(PO_4)_3(F,Cl,OH)$	Phosphorite or rock phosphate is a sedimentary rock containing 80% apatite used to produce 95% of phosphorus fertiliser worldwide. Cadmium, chlorides, and fluorides can be present in high levels.

Common name	Mineral name and chemical formula	Application and source
FCMP	FUSED CALCIUM MAGNESIUM PHOSPHATE	Apatite heated and fused with calcium and magnesium silicates. Contains 8% phosphorus and supplies calcium and magnesium. Non-water-soluble, low (<0.5ppm) cadmium sources available in Australia.

FURTHER RESOURCES

RECOMMENDED READING AND TRAINING VIDEOS

Many of the following resources can be accessed via the Biodynamic Marketing Co at *https://biodynamic.com.au/organic-products/media-and-merchandise/*
Phone: *03 9212 0000*
Email: *admin@biodynamic.com.au*

Bio-Dynamics: Agriculture of the Future

A lecture presented to Demeter International in Italy in 1999 for farmers and home gardeners – an excellent introduction to the biodynamic method. It also provides consumers with a comprehensive, yet easily readable explanation of the difference between organic and biodynamic farming and product quality.

Living Agriculture

The sequel to *Bio-Dynamics: Agriculture of the Future*, with reference made to this throughout the book. Pictorially shows reclamation of salt-affected farming land under biodynamic management; humus vs organic matter and their qualitatively differing effects on soil and plant feeding; living-dynamic farm processes; farm and individual are intertwined; education and training of farmers; advisory and extension method used in the Biodynamic Agricultural Association of Australia.

FiBL Lecture 2004

This lecture was presented to the staff of FiBL (Swiss Research Station specialising in organic research). It provides very succinct coverage of a number of topics which have been explored in more detail in other publications. A good overview and general introduction for newly enquiring farmers. Discussion on the practical application and understanding of modern biodynamic farming.

Bio-Dynamic Agriculture Introductory Lectures Volume 1

Eight sections covering a wide variety of farming topics including: soil ripping; soil humus–plant dynamics; pests; soil testing; composting; product quality testing methods; Schwenk water testing; planting using moon rhythms and zodiac influences; plant forms and planet influences; the vortex; stirring method; 500 and 501; plant nutrition; permanent pasture.

Bio-Dynamic Agriculture Introductory Lectures Volume 2

Continuing on a number of themes established in Volume 1 as well as new topics: natural-organic-biodynamic farming; root and upper plant expression under differing fertiliser regimes; building activity of 500; light activity of 501; crystallization tests showing quality assessment; transmutation of elements; etheric liquidity; real knowledge from monism vs theoretical knowledge from dualism; farm individuality; the modern biodynamic farmer; soil compost; the long question – the earth's surface is a diaphragm.

Bio-Dynamic Agriculture Introductory Lectures Volume 3

Topics include: organic industry overview 1995; the farmer as the most important item on a farm; nutrition; disease; purpose of existence; soil structure; organic matter and humus; sick plants mean sick soil; biodynamic preparations; living–breathing earth; sustainability of humus.

Living Knowledge

Topics include: Agricultural materialism is destroying living Earth; Classic Natural Science vs Hypothetical Science; 500 activating activity occurs with correct stirring method; Kepler's 3 Laws reflected in correct stirring process; life implanting action of *chaos*; *chaos* in seed allows new individuality to form; three types of viewing – imagination, intuition, inspiration.

Ad Humanitatem

Important work from a human perspective, using biodynamic farming activities as examples. Begins by developing further the objective–subjective viewing described in *Active Perception*; discusses formative forces including super-physical, physical and sub-physical; phylogenetic and ontogenetic development; individual expression; biodynamic agriculture needs holistically imaginative farmers; expands on theme of inspiration, imagination and intuition as method of knowledge introduced in *Living Knowledge*; the human endeavour of crossing from personalised *self* to *ego-individuality*.

Active Perception (updated and revised 2nd Edition)

This book acts as a training tool for developing a holistic viewing method. Subjective–objective one-sidedness are brought together using *will* activity to create a monistic approach to knowledge. Etheric forces are discussed with examples of how these can be worked with and experienced.

Soil Conversion (video)

A 1hr 23min video documenting changes in soil structure and colour on a number of soil types, including changes from long-time organic farming to biodynamics.

Soil Cultivation (video)

A 1hr 32min video looking at a number of commonly used agricultural implements and their effect on soil. Also shows how to evaluate and change tractor speed, implement angle etc. to support soil development rather than destroying the changes biodynamics brings.

Stirring and Stirring Equipment (video)

A 1hr 13min video introducing the technique of stirring by hand, including the strong activating activity of the chaos. This technique is then transferred to a number of larger-sized, mechanically operated machines.

Five Biodynamic Farms (video)

A 1hr 32min video documenting biodynamic soil development on five very different farms:

- Wheat and sheep on red sandy loam near Culcairn, NSW
- Sugarcane on the alluvial Burdekin River soil, Qld
- Grain and grazing on sandy loam near Barham, NSW, including discussion on nursery propagation of own trees for tree lines – an ongoing activity begun 50 years earlier
- Rice farming on a formerly salinity affected farm near Barham, NSW
- White sand grain and grazing property near Esperance, WA, including discussion on direct seeding of local trees as part of cropping program.

Compost Making (video) by biodynamic dairy farmer Mark Peterson

Covers the essential technique of constructing compost heaps on a commercial dairy using available farm equipment. Quality of materials, adequate aeration and temperature control are all-important factors in obtaining the essential colloidal quality of the end product.

Cosmo-Earthly Ecology and Green Manure (video)

Approx. 50 minutes: Includes an introductory lecture explaining cosmic ecology and how to harness the sun power to create a farming system that is truly a closed farm unit. Shows the design working of the special biodynamic ripper both at Agrilatina, and on Australian drought affected pasture country.

Vortex Vegies – Horse Paddock to Living Soil (video)

35min. Shows the process of developing market garden soil. Includes relieving soil compaction, improving soil structure using 500 and green manure.