Darren Aitken started growing Biodynamic vegetables about 14 years ago. He started with an area of only 300 square metres on a vacant block next to his home in Inverleigh, just north-west of Geelong, Victoria. He and wife Danni took a big step up with the purchase of a one acre block (4000m$^2$) soon after, and, following a period of soil development, gained Demeter Biodynamic certification.

Darren gained much experience here, not just with growing vegetables, and using machinery to assist with the workload, but also with the considerable vagaries of marketing. A few years ago, a nearby 5 acre block came on the market and Darren saw the chance to leave his day job and grow vegetables full time. He and Danni bought the block. With the experience gained on the smaller block, the BD conversion process proceeded smoothly. The block had been a horse paddock – the top 100mm was dust and underneath was compacted, like concrete. Moisture and roots could not penetrate the compaction. Darren took possession of the block in May 2009 and immediately ploughed with a Rehabilitator plough, which gently broke the soil, and relieved the compaction to a depth of 600mm. He grew two green manures in succession, spraying prepared 500$^1$ each time he sowed or worked the crop into the soil. By the time the second green manure had been worked in and allowed to break down, the soil structure and fertility had improved so much that he could start growing vegetables.

Darren’s plan now is to use the one acre block for asparagus and also to grow greenhouse vegetables: tomatoes and cucumbers in summer, and salad mix over winter. The five acre block will be mostly under green manure every winter, and then grow spring peas and summer vegetables such as zucchinis, cucumbers, beans, celeriac, salad mix and beetroot. Broad beans and garlic are planted in autumn. The main harvest on the large block will be from October to May.

$^1$ BD preparation 500 with the 6 BD compost preparations incorporated, the proven most effective form of 500.
**Green Manuring**

Winter green manuring is the basis of soil fertility development here. Ideally Darren would like to spread 3 tonnes of cow manure to the acre in autumn, work it in with the Rehabilitator plough, sowing green manure at the same time from the seedbox on the Rehabilitator. If he can’t get manure, he might just apply a bit of lime. The green manure takes up the water solubility of the raw manures and, when worked in deeply, becomes the food source for the soil biology to convert into humus. By sheet composting in this way you get a very deep composting development, and it works very well if you have enough room to green manure in rotation. BD compost could be made as well, and Darren says it would be good for the greenhouse, but does not make it because it is a lot of extra work, and good sources of cow manure in this area are not easy to find.

Darren says that sheet composting via green manure is better and results in the plant roots, soil structure and humus formation going deeper down than when compost is worked in. The green manure, with 70% legumes, will provide more than enough humus-held nutrients for the vegetable season, even if Darren hasn’t been able to source manure. Green manure species for winter crops include dun peas, faba beans, vetch, lentils, oats, rye corn, and wheat. Darren sprays prepared 500 as soon as the first green of the germinating green manure is showing. He finds that the grains tend to outgrow the legumes, so, sometimes during the winter he cuts the tops off the grains with a mulcher. This allows the legumes to come through and compete, and results in a new push of root growth.

In early spring, about a month after topping the crop, Darren chops the green manure into small pieces with a mulcher. He finds that the material pushed down by the tractor tyres is not mulched and can later get caught on the tynes of other implements, so, a day or so after the first mulching (by which time the pushed down material is standing up again), he mulches again, in the same direction, but offset so the tractor tyres follow a different path and all the pushed down material is mulched. Immediately after this mulching, he ploughs slowly (medium revs, 2½ km/hr) with the Rehabilitator. The Rehabilitator has two rows of tusk rollers at the back that very effectively push the cut material into the soil. Prepared 500 is sprayed to accelerate the break down of the green manure. Two weeks later, Darren ploughs again (at right angles) with the Rehabilitator. This working sees most of the remaining material incorporated in the soil. Prepared 500 is sprayed again.
Darren doesn’t like summer green manures because they take all the moisture out of the soil, making it hard to establish subsequent autumn sown green manures.

**Bed Forming and Early Weed Control**

About 6 weeks after the second ploughing, Darren forms up beds with a three tyne cultivator that has bed formers on the sides, and a set of Lilliston rollers at the back. The tynes lift the middle a bit, the bed formers shape the beds, and the Lillistons crumble the top a bit. This implement can handle a certain amount of still decomposing green manure. The final stages in the breakdown of the green manure occur after bed forming. It is very important to set up the beds as straight as possible, and with every subsequent working, follow exactly the same line. Otherwise mechanical weeding does not work very well. Once the beds are formed, Darren performs all operations with a high clearance tractor. The engine is offset so the operator can see ahead easily, particularly useful when cutting weeds with the underbelly-mounted duck’s feet blades. When all the green manure has been converted into humus, Darren runs through two or three times over a period of weeks to kill newly germinating weeds with a set of S-tynes (triple Ks), which also have bed formers at the sides (to push back any soil that falls out of the beds into the furrows), and a crumble roller at the back. The crumble roller is lifted right up or removed if the weeds get ahead a bit because it pushes the tickled weeds back into the soil and they keep growing. It gives a level, smooth surface when used on the final run before seeding or transplanting, and gives a 1200mm wide flat top on the bed.

After the last weeding, Darren goes through with an old Massey Ferguson implement to cultivate and weed the furrows between the beds, and the difficult to get at shoulders of the beds. He has found it best to wait until just before planting to do this operation. The implement can be widened or narrowed, so that one tyne will tickle each shoulder of a bed. A small hiller on each side follows to re-shape the edge of the bed.
Sowing/Transplanting

Darren has a three row tractor-drawn seeder with a variety of seed box discs that will handle seed sizes from rocket to broad beans. The seeders are spaced 360mm apart to suit his 1200mm bed width and tractor “track width” of 1625mm (64 inches). This is the distance from centre of tyre to centre of tyre (when beds are formed it is centre of furrow to centre of furrow), and all the implements are set at the same distance. The front wheels of the seeders have a cog that drives four brushes in the seed box that rotate and push the seeds through. With the seeder, Darren can sow in 30 minutes what it used to take him 6 hours to sow by hand! He is currently building a mini “rotary hoe” with very small blades, that will shallowly cultivate three 150mm wide strips of soil to create a fine seed bed for direct sowing of small seeds. The seeder will follow behind the tractor, sowing straight into the newly cultivated strips. Darren uses some conventional, untreated seeds as he finds it hard to source good quality organic seeds in the varieties he wants. He has an exemption from the Bio-Dynamic Research Institute for using these seeds.

Darren buys seedlings from Boomaroo Seedlings, a local company. They grow conventionally but without chemicals, and a derogation is obtained from the Bio-Dynamic Research Institute. The nearest organic seedling supplier who could supply enough seedlings is in New South Wales, and they used to arrive in a very bad condition. Darren needs 5000 to 7000 seedlings every month from October to March. He flushes the seedlings well with water for a week before planting. He has a seedling transplanter that takes a lot of the work out of planting. He used to spend a whole day with one helper, planting four 80 metre beds, 3 rows per bed and laying out dripper lines. Now with the transplanter, he can plant and lay dripper lines for four beds in less than 3 hours.

Two people feed seedlings into the three rotating feeders. A furrow maker makes a 50-75mm furrow, a cup opens, a seedling drops down the chute into the furrow, a “kicker” pushes the seedling into the furrow, and two wheels put the soil back around it and slightly press it down. Seedlings can be spaced from 150mm to 600mm apart (from salad mix to cauliflowers). The seedling planter can also be used to sow larger seeds at wider spacings than is possible at present with the seeder (Darren needs to find some other brush combinations – two brushes or three - to allow wider seed spacings on the seeder).

Irrigation Lines

After sowing or transplanting, Darren lays out dripper lines (one line to each row of plants) on top of the soil. He uses Toro Aquatrak dripper line, which has holes spaced at 100mm. Watering with drippers spaced close together seems to wet the whole root area, while leaving most of the bed surface and furrows dry, thus restricting weed germination. Drippers also use much less water than overhead sprinklers. The tape lasts for three or four seasons.

Ongoing Weed Control

After seeding or transplanting, weed control must be a much more precise operation. Even if the beds are not perfectly straight you always have to follow exactly the line of the beds. 50mm out either way can spell disaster as the vegetables can be cut along with the weeds. Darren’s initial post-planting weeding implement consists of duck’s feet blades mounted under the tractor. With the offset engine he can easily see the line of vegetables, and as long as he follows this line exactly, the other lines will also be in the right position (provided the rows were precisely spaced originally!). With experience, the blades can be mounted in different ways to create a different effect. For instance, they can be angled slightly upwards so that, if you drive at an appropriate speed, as the blades cut the weeds between the vegetable rows, a little soil is also pushed into the vegetable row, smothering any newly germinating weeds there. This has to be done when the weeds are very small, almost before you can see them.
Duck’s feet mounted under high clearance tractor

Broccoli – weed control has been done entirely with the tractor. Darren has not had to touch it by hand!

Biodynamic Preparations
Darren has two stirring machines to activate the Biodynamic preparations, a one and a two acre machine. He warms rainwater for stirring with a three ring gas burner under a copper vessel. When the water is cold it takes about 20 minutes to heat 6 gallons (27 litres) for the two acre machine to 35°C. He sprays the stirred preparation with a copper knapsack sprayer.

Making 500
Darren is a retailer of Alex Podolinsky’s Biodynamic preparations to Biodynamic Gardeners Association members in Australia and each year makes the Biodynamic soil biology activator preparation 500. He uses this to encase each of the five solid compost preparations in for posting (the sixth compost preparation, valerian, is a liquid and is sent in a glass vial). Each solid compost preparation weighs only 2 grams and would quickly lose its colloidal humus nature and therefore its effectiveness, if posted without its protective ball of 500 (or BD compost). Darren only uses his 500 for this purpose and the Prepared 500, 501 and compost preps are obtained from Alex.

Greenhouse
Darren built the 320m² greenhouse himself. He can wind up the end panels for access and for temperature control. He has a fold down roll bar on the tractor, enabling him to cultivate the soil, using a chisel plough and a finer tyned cultivator. He grows cherry tomatoes and Lebanese cucumbers over summer, and salad mix and rocket over winter. The 2010/2011 summer was very difficult, being so wet, and he had trouble with downy mildew in the cucumbers. He used casuarina frequently, and was able to regularly send some to market. Even the local conventional growers, using chemical fungicides were unable to market many cucumbers.

In between seasons, Darren grows a green manure in the greenhouse, spraying with prepared 500 at sowing and when cultivating in.

Picking and Marketing
In summer, Darren picks from 6am till all picking for the day is done, and then washes and packs the produce. He picks beetroot and celeriac once a week, beans and salad mix twice a week, cucumbers about four times a week and zucchinis every day. The 2010/2011 season was the first season Darren grew vegetables on the five acre block, and for five months he produced 100 boxes of salad mix and 1-1½ tonnes of other mixed produce a week. The 1.8X3metre coolroom was filling up twice a week. Most of the produce is sold to the Biodynamic...
Marketing Company at the Footscray wholesale market.

In future, Darren plans to green manure nearly the whole 5 acre block each autumn/winter, and grow vegetables over spring, summer and autumn. The greenhouse will supply winter salad mix and rocket, and the asparagus will come in late winter/early spring.

Darren has produced a DVD showing the process of conversion of the five acre horse paddock to a productive Biodynamic market garden soil, including a ten minute talk by Alex Podolinsky who came a few months after the first green manure was sown to see how the soil was progressing. I highly recommend it to anyone who is contemplating starting a Biodynamic market garden. It is available through Biodynamic Growing magazine (see page 40 to order, or go to www.bdgrowing.com). Darren will soon produce another DVD showing the steps undertaken for Biodynamic vegetable production.
Greenhouse. The salad vegetables are cut off completely at about 50mm from the ground, and Darren gets four picks over the season. Everything is washed before marketing.