

# A BIODYNAMIC CATHEDRAL

## ... in a plastic bag



Photo: Lucy Cockram

Above: Poraiti's greenhouse demonstrates orderly rows, cover crops, protected walkways, mulch and glowingly healthy plants.

Opposite page: Lucy Cockram, a long-term wwoofers at Poraiti Farm, harvests tomatoes in the greenhouse.

Andy Black gave a wonderful presentation at last May's annual Biodynamic Association Conference about growing great biodynamic food "in a plastic bag" (a greenhouse) at Hohepa's Poraiti Farm between 2009 and 2016. His presentation was called "The biodynamic greenhouse: A desert or a cathedral of life?"

It started when we put up a second-hand greenhouse over an existing garden plot in 2009. It was of the twin-skin plastic type, with controls only for ventilation and wind direction. We had no way to control humidity or provide heating.

Although I was quite experienced in growing field vegetables, I had no formal training or experience in greenhouse management and had to work things out as we went along. This greenhouse was much the same as one you'll find in an urban backyard – nothing clever or sophisticated. Everything I discuss can be done at home as well as on a farm.

We started out on a journey to adapt our field growing methods to this new environment. Right at the beginning, a colleague made the essential observation that we had potentially created a little desert, where hot, dry conditions would deplete our life-giving humus very quickly, and the soil would become mineralised.

As greenhouse gardeners, we have an almost god-like ability to nourish or destroy. We control the environment infinitely more than in a field or back garden.

The farm had used some simple greenhouses over the past 30 years in order to grow out-of-season food for the community, including an unheated glasshouse and two plastic poly-tunnels. The protected environment inside the poly-tunnels became fiercely hot in summer, almost impossible to work in.

Those original greenhouses were built by Grant Hughes. He was growing considerable quantities of field vegetables for the Hohepa community, but wanted to extend the supply into the autumn and winter months. Early and late season tomatoes became his speciality.

The soils inside those glasshouses, despite all best efforts and regular applications of biodynamic compost, had become mineralised. Over time, there was a build up of persistent weeds and soil diseases, and yields dropped.

I was well acquainted with tractor and plough, although never a friend of the rotary hoe. Slowly I began to recognise the damage being caused by cultivation, especially during Hawke's Bay's hot summers. I tossed the plough into the corner and began to work the land from the top down.

Over some years, going back to my time working at Weleda, I had begun to notice the vastly improved life and structure of soil left under undisturbed green crops. The same was apparent even in the soil in the pathways under weed mat or plastic sheets. Protecting the soil from the summer heat and light enabled life to flourish.

So with all of this background, I started to grow crops in the new greenhouse. The soil was all churned up after putting the glasshouse up during 2009's wet spring. The goal was to grow cash crops to support Hohepa – mainly tomatoes and cucumbers but also capsicums, eggplant, runner beans and salad crops.

I soon learned that things were not quite as simple as field cropping. Different plants need quite different conditions; trying to grow tomatoes and cucumbers in the same house was quite mad! But we had little choice, and so simply had to get on with it. The house was huge, measuring 30 by 12 metres, but the opportunities and constraints were the same as in any backyard greenhouse.

### Core principles

Over the years, we learned some guiding principles that would help create a cathedral of life instead of a desert:

- **Keep the soil covered.**  
Protect the soil as much as possible, whether by growing green crops or using mulch or weed mat. We used ryegrass as a green crop, legumes for longer rests and sometimes mustard.
- **Create good pathways.**  
Whatever scale you're working on, keep paths clear and orderly.
- **Avoid soil compaction.**  
Stay on your paths, and never walk on bare soil.
- **Regularly apply biodynamic compost.**  
Each year, we made more than 100 cubic metres of biodynamic compost on site, a third of which was destined for the greenhouse. This was possible because we collected cow manure and bedding from the deep litter yards where, for part of the year, the cows spent the night.

Poraiti Farm is part of a broader community organism, which is Hohepa Homes, a community for curative education and social therapy. It is a stunningly beautiful farm, with warm, north-facing slopes. It grows Demeter-certified vegetables on one hectare of intensive gardens.

Poraiti was also the site for the biodynamic courses offered by Taruna College several times a year.

Hohepa is not just about farming. Its residents have a range of intellectual disabilities, and mostly Hohepa is about these people living their lives on a farm. Many of them also work on the land. This shaped the approach to farming at Poraiti. Care for people versus care for crops can be a constant tension, but makes for a dynamic and very flexible environment.

In a biodynamic farm, nothing exists in isolation. A greenhouse is a tiny organism enclosed in ever larger ones – like the inside of an onion surrounded by its layers. So this 'plastic bag' in the valley is enclosed inside the wider biodynamic farm, which runs cows that produce compost that allows our plants to grow. Poraiti Farm in turn is surrounded by the Hohepa community of care, and a community of sharing and learning.



Photo: Lucy Cockram



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• **Regularly use the biodynamic field sprays and cow pat pit.**

Use these more often in a greenhouse compared to growing outside. Both 500 and 501 are applied twice yearly to our whole farm. In the greenhouse, we tried to do a monthly spray of each during the main growing season (September-April).

• **Make use of foliar feeds.**

Liquid feeds prepared from either nettle, comfrey or cow manure are easy to make and very effective. Be careful about foliar feeding crops like tomatoes, where it might promote mildew.

• **Take great care with watering.**

Some plants love water on their leaves, but tomatoes definitely don't. It's better to direct water to the soil (either by hand or automatic watering systems), then give an extra spray to the leaves of those plants that like it.

• **Irrigate with air-temperature water.**

We used a lot of drip irrigation. This was gravity-fed from water tanks inside the glasshouse, so the water was the same temperature as the air. At home, you could use a barrel or cans to store water in the glasshouse before use.

• **Dig as little as possible.**

We began to cultivate the soil only once a year, using a fork to remove the roots of creeping couch, convolvulus and mallow.

• **Keep it clean.**

Good hygiene is very important. Don't allow any build up of debris. Take all decaying plant material out to the compost yard. Regularly remove diseased or infected material.

• **Ensure good air movement.**

This is especially important at the top of the greenhouse. We used fans along with the greenhouse's top vents in order to move air continually. Be careful not to produce downdraughts. Adequate ventilation is critical.

• **Harvest carefully.**

Don't drop or discard any damaged fruit on the ground. It's a source of further infection.

• **Invite life.**

Allow insects to enter (just not psyllids! – see sidebar). Bumblebees are very useful, and can be encouraged by planting flowering plants like phacelia, lobelia and buckwheat. If you find the greenhouse all abuzz on a sunny morning, you're on the right track. We found honeybees less keen to visit.

• **Rotate crops and keep careful records.**

Greenhouses can produce many crops per year from the same soil, so it's very important to move crops around. Tomatoes are an exception; they seem to enjoy growing in the same place.

• **Choose crops suited to greenhouses.**

Also grow seedlings with care, and only plant out the strong ones.

• **Refrain from harmful sprays.**

For a home gardener, there is little, if any, need to kill insects. Even lower-impact sprays that leave little residue can still harm beneficial insects. The environment inside a commercial greenhouse is less flexible; see opposite page for ways to handle specific pests.

• **Give enough room.**

Don't be greedy and try to squeeze more plants in. Plant crops at spacings that allow for a good airflow. You can make use of different levels too, like tomatoes above and basil below.

Above all, create a space in which you can work comfortably and happily. Cultivate an attitude of quiet and careful husbandry. You are working in your own cathedral of life and carry huge responsibility for the welfare of all plants, insects and animals.

*Andy Black has decades of experience in field-scale biodynamic vegetable and herb growing. Born in England, raised in Northern Ireland (where a -20° C winter discouraged his first efforts at growing food), he was first educated in biodynamics at the famous Emerson College in Sussex, England. He and his family have called Hawke's Bay home since 1987.*

## Responding to pests and disease

In a good season – and where all goes well with greenhouse controls, watering, hygiene, careful harvesting and mostly importantly, the attention of the gardener – there may be few problems.

However, things do go wrong, and we can assist the plants when it does. In a greenhouse at home, we could be more relaxed, but intervention is often required when a commercial crop is at stake.

Let's briefly look at what problems you are most likely to come across and what you can do.

Try and catch powdery mildew before it get advanced. Regularly walk through the greenhouse, carefully observing your plants. Regular sprays of 501 and 508 certainly help. So does quick removal of infected leaves.

In such an intensive growing environment, despite careful rotations, it is almost inevitable that harmful fungi, bacteria and even viruses will build up in the soil. To remediate this, we grew dense stands of giant red mustard, which were then desiccated and incorporated into the soil before being covered with a plastic sheet for three days. This method, called bio-fumigation, is widely used in organic soil management.

We encouraged a diverse insect life inside our greenhouses, but some insects reproduce very quickly and can overwhelm any predators that make their home in our carefully planted companion planting strips. When pest populations explode, you can populate a greenhouse with specific biological predators.

• **White fly**

White fly is very fast to breed, and very unwelcome in the greenhouse. We used a biological control, buying in colonies of *Encarsia formosa*, a tiny parasitic wasp that lays eggs in the white fly nymph. This was a very effective control when we introduced the wasps every two weeks.

• **Aphids**

Sap-sucking aphids are another common visitor that can quickly disturb the balance. Ladybirds fight them on our behalf. If we spray to control aphids, even using our homemade nettle leaf spray, we hurt the beneficial insects as well. So we imported another parasitic wasp, *Aphidius spp.* These arrive in a plastic dish and are simply let loose inside the greenhouse. They lay an egg inside the aphid, and the hatchling eats its way out – a drastic but effective result. A single introduction of *Aphidius* can provide aphid control for a whole season. We added a hundred of them to each greenhouse.

• **Slugs and snails**

They have a vital role in disposing of weak plants and decaying material. However, especially in spring, they can have a disastrous effect on plants in the greenhouse. Often they are unwittingly brought in with the compost. There are a number of remedies. You can feed them with a mulch of grass around each plant. This very successfully protected cucumbers and tomatoes. Some people use ash. Beer traps proved quite successful. So did physical barriers, like the rabbit sleeves used to protect small trees or planting bags partially buried around each tree.

• **Psyllid**

The biggest challenge in any greenhouse is the tomato psyllid (*Bactericera cockerelli*). It arrived in New Zealand in 2006 and has had a devastating effect on the whole Solenaceae family – exactly the crops we were growing.

I battled this insect from November to May each year. I tried everything I could, even resorting (with great regret) to a restricted broad spectrum insecticide made from neem. Even that offered only partial control. I heard about trials of a very fine mesh (0.6mm) on field-grown organic potatoes; the mesh acted as a physical barrier to the psyllid. I began to wonder: could we adapt this to make an internal exclusion zone within the greenhouse?

The BHU Future Farming Centre, which had carried out the research trials, began making small quantities of the mesh available for sale. My time at the Hohepa greenhouse had come to an end before I could implement this, but my successor Jenny Lyons successfully grew tomatoes, capsicum and eggplants inside the netted area.

I bought some mesh to use at home, where tomatoes had been impossible to grow for several years. They managed well inside a little frame.

Read more about the trials of very fine anti-psyllid mesh here: [bit.ly/GYO-spuds](http://bit.ly/GYO-spuds)



Photo: Jenny Lyons

The anti-psyllid enclosure constructed inside the greenhouse.