

MODULE 1. - Essential knowledge

4. Soil health management

Intensive farming reduces the physical, chemical and biological health of your soil. This fact sheet has information on how to minimise damage to your soil and undertake repair in between crops. **Module 2** (Preparing and Planting) looks in detail at how Phuong works to repair his soil and includes video clips showing how he rips, leaches, applies compost and plants with care. It also has two videos clearly demonstrating major soil and plant benefits resulting from his practices.



Improving soil health has been the main component of Phuong's improved production efficiency and yields. He has made improvements to *physical, chemical and biological soil health*. They are related to each other so that Phuong can care for his soil's biological soil health by caring for its physical and chemical health. Maintaining a high level of organic carbon by regular applications of high quality compost is a key management strategy for achieving this outcome.

Below is a brief summary of Phuong's program and links to additional information providing more detail about improving soil health using compost as a key to success.

Physical health

The physical health of the soil is essential for growing a healthy crop. Good soil structure is vital for easy root penetration and good drainage and aeration. Good structure is open enough to allow good drainage and not too open so that water and nutrients pass through too quickly! Structure is partly determined by the soil texture type, (the proportions and coarseness of sand and clay), by soil chemistry, and how it is cultivated, but mostly by the levels of organic matter.

Soil structure is damaged by excessive and incorrect cultivation that breaks up the soil too finely or into big lumps. This often happens when growers rotary hoe the soil when it is too dry or too wet. If sodium salts (Na) that are left in soil from irrigation of the last crop are not removed by leaching they can lead to dispersive soils. Over-irrigation can also lead to problems with soil structure like water tunnels.

Soil organic matter is a vital source of food for all soil life which helps in turn to glue soil particles together and build structure. So increasing soil organic matter by using compost helps to restore soil structure by restoring soil biology. The organic matter supplied by compost and soil life improves soil moisture and nutrient retention and helps their release and uptake from the soil by plant roots. Improving soil structure will improve moisture and nutrient retention and make it easier to manage soil water levels, drainage and leaching of salts.

This combination of inter-related benefits supports the health and function of the whole plant from the roots up!

Videos in the Resource List under ‘d. Managing Soil Health’ (see link end of this fact sheet) show how Phuong manages his soil structure and physical soil health with the following steps:

- He breaks up the underlying clay every few years by deep ripping which helps with drainage and salt leaching
- He uses overhead sprinklers before planting to leach out salts (excess Sodium) that can lead to dispersion and crusting of the soil
- He avoids cultivating excessively and when the soil is too dry or too moist
- He adds compost to improve particle size and feed soil biology that builds soil structure. Improved structure improves drainage which also makes the leaching more effective

Another video of a soil pit workshop on Phuong’s farm reveals how successful he has been with these practices, in particular improving the structure and drainage of his heavy clay subsoil.

Chemical health

Healthy plants require the right amounts of nutrients to be available to them and this relies on good soil chemistry. Good soil chemical health means achieving balanced levels of major nutrients and trace elements to meet plant requirements. Nurturing a high cation exchange capacity (TEC measured in soil tests) enables soil to readily hold and release trace elements to plants. A high TEC also helps to limit build-up of salinity. Keeping soil pH in a desirable range (not too far from neutral, or pH 7.0) assists with trace element uptake by maintaining them in an available form..

Phuong uses regular soil tests to manage his trace elements and macro nutrients (NPK). Regular applications of high quality compost helps to build good cation exchange making nutrients freely available to plant roots. Compost also assists his salt leaching program to be more effective.

Biological health

Compost provides a rich source of food for soil microbes which increases and diversifies soil biology, including beneficial microbes, worms and invertebrates. These living organisms are all indicators of good soil health. Their activity helps to release plant nutrients contained in organic matter as they break it down. They also help these nutrients to remain available in the soil rather than becoming locked up.

Plants thrive best in soils with abundant life including beneficial mites, insects, worms and nematodes, fungi and bacteria. This soil life provides many benefits including:

- Breaking down dead plants and animals which recycles nutrients making them more available to plants
- Excreting sticky glues that build soil structure and change soil chemistry, making it less suitable for pest organisms
- Improved root health and vigor in a healthier more biologically active soil
- Better nutrient availability helping to improve plant health and resistance to pest and disease problems.
- Out-competing and feeding on soil pests and diseases including fungal diseases, thrips pupae and pest nematodes in the soil

So the physical, chemical and biological benefits of compost work together to greatly improve root health and nutrient and water availability and even pest and disease control, making compost an essential input to managing all aspects of soil and plant health. As organic carbon levels are increased to 4% or more the farming benefits really kick in leading to greatly improved plant health. ***Greater plant health and efficiency improves productivity and can enable growers to reduce plant density and other inputs while maintaining or improving productivity.***

IMPORTANT NOTE:

Before you start using compost there are some things you should know because ***compost will change the way you need to irrigate and fertilise your plants***. This can cause problems if you do not know what to expect and what to do if they occur. Please read the fact sheet under **Soil health management**, called [*Tips for new users of compost*](#) for more information about this.

Costs and Benefits Related to Improving Soil Health

Soil issues (physical, chemical and biological) can greatly increase the cost of inputs, and reduce yields and quality. Achieving optimal soil health was central to Phuong's improved yields. You can track Phuong's changes, what they cost and his estimated benefits and create your own Cost-Benefit estimate for making changes by clicking here for [*Module 4. Cost Benefit fact sheet and 'Capsicum Calculator'*](#).

Additional Fact Sheets And Videos

Videos of Phuong's soil preparation and a wealth of other information can be found in the Resource Index under [*4. Soil health management*](#). This Index section includes two fact sheets on how compost breaks down in the soil and improves soil function called 'Turnover of organic matter in soil' and 'Organic matter and soil function'



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