

## Organic and Inorganic Fertilisers

A fertiliser is a chemical or natural substance added to soil to increase its fertility. (From *The Concise Oxford English Dictionary*.)

Organic fertilisers are derived from animal or plant remains that decompose on or in the soil, slowly releasing mineral ions. Inorganic fertilisers are manufactured and consist of mineral ions and are usually sprayed onto soil in solution. Fertilisers are needed because in natural ecosystems, decomposition recycles mineral ions whereas with crops the plants are removed at harvest and therefore the minerals are removed and not replaced.

All growing crops require nutrients to stimulate photosynthesis and growth throughout the growing season. (*Arable Handbook* brochure from *Kemira Grow-How*.) Some of which are more important than others. The major nutrients are nitrogen, phosphate and potassium. The secondary nutrients are calcium, sulphur, magnesium and sodium and the trace elements are manganese, iron, selenium, copper, cobalt, boron, zinc and iodine. (*Multi-choice* leaflet from *Carrs Fertilisers*.)

### Proportions of elements required for healthy plant growth

Of the elements required for healthy plant growth, oxygen, carbon and hydrogen account for 96% - 45% carbon, 45% oxygen and 6% hydrogen.

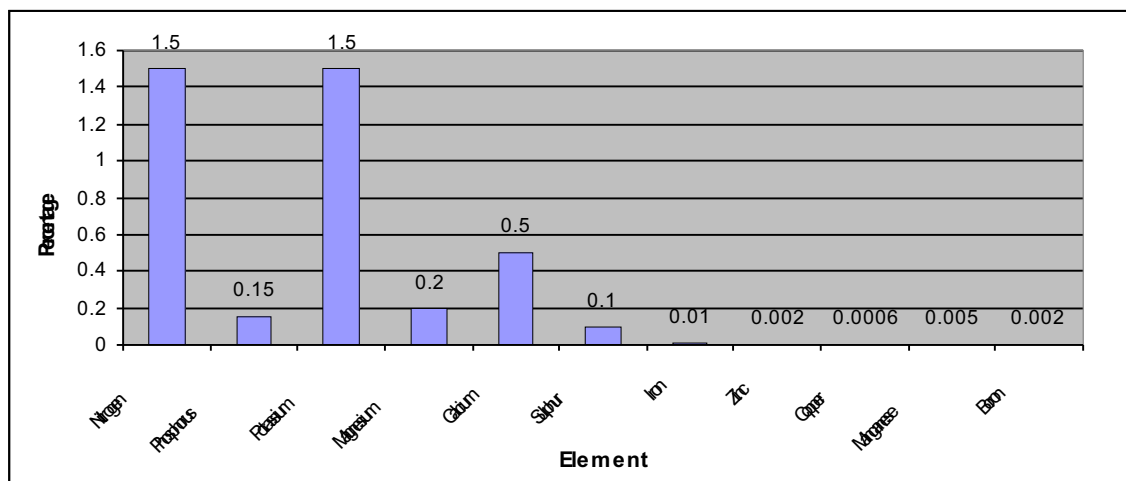


Fig 1: - A graph to show proportions of the elements required for healthy plant growth (*The Organic Garden Book* by Geoff Hamilton)

If plants become deficient in these elements fertilisers can be used to replace them.

If a plant does become deficient in one of these elements it may be best to use an inorganic fertiliser, as there is a fast increase of mineral ions and are therefore immediately available to plants, whereas organic fertiliser must be converted by micro-organisms in the soil before it can be used. This can also be seen as an advantage though as the slow release of mineral ions means that there is a steady supply to plants.

([www.gardenseeker.com/fertilizers](http://www.gardenseeker.com/fertilizers)). Not all organic fertilisers are slow at releasing ions though. For a nitrogen deficiency dried blood is very fast acting and is good at providing a quick-short term boost. (*The Organic Garden Book* by Geoff Hamilton) Some Inorganic fertilisers also release nutrients slowly over time; they are called 'slow-release fertilisers'. Slow release fertilisers are inorganic fertilisers that have been coated in a special resin so that the nutrients are slowly released over time, releasing more nutrients when the soil is warm and moist like organic fertilisers. This seems a good idea but overall costs as with all other inorganic fertilisers are higher. (*Gardening techniques* by Jonathan Edwards.)

Inorganic fertilisers are immediately available to plants because they are soluble in water. This can be a big disadvantage though because the fertilisers can easily be leached from the soil by heavy rains. Nitrates from inorganic fertilisers are very soluble and easily leached; if it is washed below the root zone of the plants, it will not be available for plant use, this is why nitrogen is the most common element lacking and most often needing replacement. (*Gardening techniques* by Jonathan Edwards.) There is very little leaching from organic fertilisers, which is a big advantage as leaching can be a big problem if it leads to eutrophication so it can be said that using organic fertilisers are better for the environment.

However preliminary findings from research by the Royal Agricultural College of Kemira GrowHow investigating the effects of straw incorporation on nitrate leaching under wheat crops have found that the amount of Nitrogen lost through leaching was reduced when incorporating straw. This is because the microbes in the soil use Nitrogen to break down the carbon in the straw, so rather than being leached it was diverted into microbes. So even though inorganic fertilisers are easily leached, there are methods of reducing it. (*Arable Handbook* brochure from Kemira Grow-How.)

Another way for minerals to be lost is if inorganic fertiliser sprays are blown into other areas, this is a disadvantage of using sprays but being a spray makes applying the fertiliser onto fields easy which is a big advantage. Many organic fertilisers are difficult to spread, but there are organic liquid fertilisers available such as liquid seaweed. The main reason that many farmers use inorganic fertiliser sprays is because of the ease of use. On a large scale it can be very difficult to spread organic fertilisers, which means that more manpower would be needed which would mean higher labour costs. By using an inorganic spray, although they costs more to buy may save money because pesticides can be applied at the same time, costing the farmers less in labour costs as the work is much easier and takes less time.

Significant loss of nitrates can also occur through ammonia volatilization; this is when nitrogen is lost into the atmosphere as ammonia gas. Losses often occur from organic manures and where urea has been applied, especially when there is warm, dry weather as this provides the ideal conditions. (*Arable Handbook* brochure from Kemira Grow-How)

For most arable farmers Nitrogen fertiliser is the best way of ensuring that crops have the Nitrogen they need. This is because unlike organic manures, the exact Nitrogen content

is known and application rates can therefore be more accurately calculated to produce optimum yields whilst minimizing environmental pollution in the form of nitrate leaching to water. (*Arable Handbook* brochure from *Kemira Grow-How*). I found three different sources, which gave percentages of Nitrogen, Phosphate and Potassium in organic fertilisers, and the figures given were different which shows that it would be difficult to calculate how much should be applied and how frequently.

Source	www.doir.wa.gov.au/documents/ccwa/Fertilisers.pdf			www.fisheries.nsm.gov.au		The organic garden book by Geoff Hamilton		
Nutrient	N%	P%	K%	N%	P%	N%	P%	K%
Sheep manure	1-3	0.1-1.0	0.3-1.5	0.77	0.39	Liquid animal manures N=1%, P=1%, K=1.5%		
Cow manure	0.2-2.5	0.1-0.4	<0.1-2.0	0.43	0.29	Dried animal manures N=1%, P=1%, K=1.5%		
Horse manure	0.5-2.0	<0.1-4.0	0.5-1.5	0.49	0.26			
Blood and Bone	4.5-6.0	5-7	<0.1-2.0			(Blood) 12-14	Small amount	
						(Bone) 3.5	22	
Fish wastes	4-10	1-4	0.5-1.0			9	2.5	
Potassium chloride#			52					

# Potassium Chloride is also available as an inorganic fertiliser as well as an organic fertiliser.

Fig. 2: - A table to show how it can be difficult to give accurate figures for the amount of nutrients found in organic fertilisers.

Although by using inorganic nitrogen fertiliser you can calculate the amount you need it is very difficult. This is because the optimum amount of nitrogen fertiliser needed depends on a number of factors, which cannot be controlled: The yield of the potential crop, soil type and rainfall. There are also other factors such as previous cropping, the amount of nitrogen already available in the form of soil mineral Nitrogen and variability across the field, particularly in soil type and yield potential. (*Arable Handbook* brochure from *Kemira Grow-How*.) If there is too much nitrogen in the soil or a nitrogen imbalance there can be a delay in flowering, fruiting and seed set. (<http://www.gardenseeker.com/fertilizers.htm>)

A big disadvantage of inorganic fertilisers is that they may harm the soil or its inhabitants, especially if repeatedly used. Organic fertilisers actually benefit soil micro-organisms as well as plants. (*The Organic Book by Geoff Hamilton*) Organic fertilisers add to the structure of soil as humus. Humus is a dark brown organic substance resulting from particle decay of plant and animal matter. It improves soil by retaining moisture and increasing mineral and nutrient content and bacterial activity.

In my opinion I think that most of time it is better to use organic fertilisers because there are more advantages than disadvantages of using it whereas I feel that there are more disadvantages than advantages of using inorganic fertilisers. I do agree that sometimes it may be better to use an inorganic fertilisers if the plant is deficient in many nutrients but I think its better to use organic fertilisers when used on a regular basis to maintain a high level of nutrients in the soil because of the beneficial effects it has on the soil structure,

its slow release of nutrients, cost and especially because there is little leaching and is therefore not threatening the environment. If an inorganic fertiliser is used on a regular basis as well as being expensive can damage soil structures, and can easily leached which puts a threat on the environment.

### Bibliography

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- [www.doir.wa.gov.au/documents/ccwa/fertilisers.pdf](http://www.doir.wa.gov.au/documents/ccwa/fertilisers.pdf)
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