



Greenleaf agronomy

Andrew Harborne Consulting Agronomist
22 Eldon Street, Goulburn NSW 2580
Ph 04012973804 boots@greenleafagronomy.com

Improving Soil fertility with Agri-Ash, Lime and Compost

What is the importance of pH neutrality for pasture growth and development?

Maintaining soil pH at 5.5-6.2 is an essential part of pasture management. Majority of soils on the Tablelands are naturally acidic and will produce low yields in the absence of lime or lime based fertilisers. If the soil is too low certain nutrients required for plant growth are chemically changed to forms that are unavailable to plants. This results in plant deficiencies and poor yields.

What is the optimum pH for microbial activity?

- pH 5.8 - 6.5

Why is soil microbial activity important?

The higher levels of soil microbes, the greater the rate of breakdown of organic matter which means the greater the release of nutrients for plant growth.

Microbes improve soil structure by helping to bind soil particles together which improves aeration and soil water storage capacity.

Clover requires microbes to assist in fixing nitrogen. Therefore the higher the microbial population in the soil, the greater the capacity clover has to fix nitrogen. (Rhizobia provide nitrogen fixing function – reducing the dependence for urea – clover can supply up to 200 kg N/ha).

Why is soil earthworm activity important?

Earthworm activity improves the soil structure through providing:

- Better aeration
- Better environment for root growth (easier root penetration)
- Greater resistance to compaction and quicker return to production after adverse paddock conditions (pugging, flooding, drought etc)
- Influence on increasing organic matter decomposition and the ensuing nutrient availability
- Earthworm counts respond well to calcium and pH increase in a soil where these levels are suboptimal

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

How can I increase /maintain soil pH

You can apply lime or dolomite on its own or you can use **Agri-Ash** (and get P as well).

Is lime required for animal production/growth?

Yes, about 10-15 kg per lime per DSE is required per annum to maintain pH.

What is the difference between the calcium in Superphosphate and Agri-Ash?

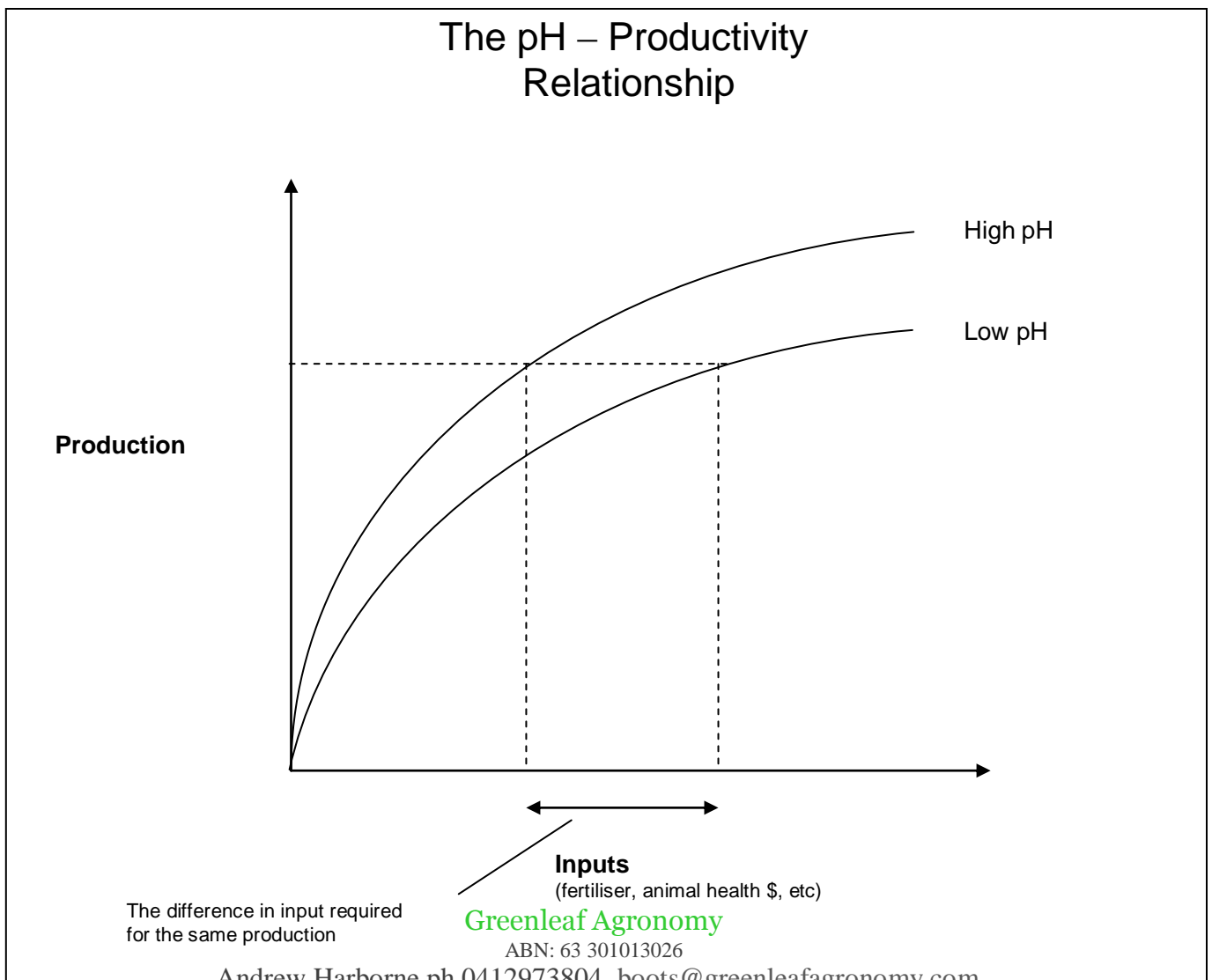
The calcium in superphosphate is in the form of calcium sulphate and calcium phosphate, both of which do not have any affect on soil acidity/alkalinity.

In **Agri-Ash**, calcium is in the form of calcium carbonate, calcium oxide and tricalcium phosphate and this form has the effect of reducing soil acidity.

This form of phosphate in **Agri-Ash** has to absorb acid before it can be absorbed by plants, which also helps to reduce soil acidity.

Agri-Ash also contains traces of key trace elements such as zinc, copper, cobalt.

Agri-Ash meets the composition standards for Soil Improving Agents under order No. 2001/02 of the Fertilisers Act 1985.



Soil fertility is a part of a dynamic ever changing system. Nutrients are constantly being exported from the farm in the form of plant and animal products.

Nutrients can also be lost by leaching or erosion and in gaseous forms to the atmosphere.

It is for these reasons, that the addition in the form of fertilisers either chemical or organic is necessary to maintain or enhance a soil's productive capacity.

What is compost?

Compost is produced when bacteria, yeast and fungi breakdown organic materials by aerobic (with air/oxygen) decomposition. Composting accelerates the natural biodegradation of organic materials, producing more stable forms of organic matter including humic substances. These are stable products which contain carbon and nitrogen as well as many other nutrients.

As compost decomposes in the soil it binds with the soil (acting like glue) to create a granular structure. The bonds formed provide resistance to wind and water erosion. The more open structure gives better infiltration and plant root growth and increases the ability of the soil to retain added nutrients (cation exchange capacity.)

Quality compost can be the basis of very productive and valuable pasture and agricultural production when used in an integrated nutrient program.

Benefits of using compost to provide key nutrients and build soil fertility.

Organic nutrients supplied from compost help protect soils from water and wind erosion and hard setting surfaces. Managing the pasture cover reduces the impact of the raindrops on the soil surface.

The nutrient in compost varies more than in chemical fertilisers but it has the advantage of having the full range of nutrients required for organic growth.

The OGM (for agriculture) compost contains all the major nutrients nitrogen phosphorus and potassium and key trace element.

The OGM compost is processed for at least 6 weeks. In the first week the material heats up rapidly (50-70 degrees C) as microorganisms rapidly break down the organic matter. During this time the compost requires oxygen for the microbes (aerobic degradation). This process pasteurises the material (all weed seeds and plant pathogens are killed).

OGM No1 compost typical analysis.

Organic Matter Content . Typically 55-70%

1-1.5 % Ammonium Nitrogen.

0.65 % (as citrate Soluble Phosphorus.)

0.2 % (as citrate Insoluble Phosphorus)

1.0 % Potassium.

3.5 % Calcium

0.3 % Magnesium.

1.0 % Sulfur.

25 % Moisture

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

A base application of OGM Compost @ 5t/ha will supply approximately the following nutrients.

Comparing the cost of compost with conventional fertiliser costs

If the same nutrients were applied using urea, single super, and muriate of potash and gypsum

To convert Rate of nutrient applied to Rate of product use the following equation.

$$\text{Product Rate} = \frac{\text{Nutrient Rate} \times 100}{\text{Analysis (\%)}}$$

Urea equivalent = $\frac{60 \times 100}{46 \%}$
 =130 kg/ha urea.

Superphosphate equivalent = $\frac{28 \times 100}{8.8 \%}$
 = 318 kg/ha of super.

Muriate of Potash = $\frac{40 \times 100}{49 \%}$
 = 81 kg/ha of Muriate of potash.

Gypsum= $\frac{40 \times 100}{15}$
 266 kg /ha of gypsum.

	Nutrient Value	Nutrient applied	
Nitrogen	\$ 1.30	60	78
Phosphorus	\$ 4.00	28	112
Potassium	\$ 1.50	40	60
Sulfur	\$ 0.60	40	24
			\$ 274.00

4 t DM/ha Organic Growth Medium Calcium boosted Compost

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

Current price for OGM Calc boosted is approx. \$33 /t delivered and spread to most areas on the Tablelands.

5 moist tonnes 4 dry tonnes cost = \$165 /ha

This shows that using compost is value against the conventional approach using Single super/Urea /and Muriate of potash.

The Bulk OGM compost is a mixture of household domestic waste from Sydney that goes through a cleaning and purification process that delivers a product that is classified as a pasteurised organic boosted soil conditioner.

Organic compost can be used to fertilise and soil condition all types of high quality pastures and crops.

Managing pasture that has received High quality compost

Pastures that have been fertilised with compost are intended to produce large amounts of quality forage.

Grazing after Compost applications

Do not graze permanent pastures or crops for at least 30 days after spreading any compost, or composted chicken/turkey manure.

Modified document taken from

Protection of the Environmental Operations (Waste) Regulation

2005 –General Exemption under Part 6, Clause 51 and 51A.

The Organic outputs derived from mixed waste exemption 2010

Name.

1.This exemption is to be known as ‘The organic outputs derived from mixed waste exemption 2010’.

Commencement

1 This exemption commences on 5 March 2010.

2 **Duration** This exemption is valid until revoked by the Environmental Protection Authority (EPA) in writing or by notice published in the Government gazette.

Legislation

3 Under the protection of the Environment Operations (Waste) regulations 2005 (the regulation):

4.1 Clause 51 authorises the EPA to grant an exemption in relation to any matter or thing including an activity or class of activities, and

4.2 Clause 51 A authorises the EPA to exempt a person or class of persons from any of the following provisions in relation to any activity or class of activities relating to certain waste that is to be land applied or used as a fuel:

the provisions of sections 47 to 49 and 88 of the Protection of the Environment Operations Act 1997 (the act),

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

the provisions of schedule 1 to the Act, either in total or as they apply to a particular activity, and the provisions of Part 3 and clauses 45 and 47 of the Regulation.

Exemption

5. In this Notice of Exemption :

5.1 The responsible person listed in Column 1 of Table 1 is exempt from the provision/s listed in column 2 of that table but only in relation to activities involving the relevant waste and only where the responsible person complies with the conditions referred to in Column 3 of the table.

5.2 Where a responsible person complies with the conditions of this Notice of Exemption, the activity referred to in Schedule 1 from which the person is exempt is taken to be a non scheduled activity for the purposes of the Act.

Column 1	Column 2	Column 3
Responsible Person	Provisions from which the responsible person is exempt	Conditions to be met by the responsible person
Consumer	section 48 of the act in respect of clauses 39 and 42 of Schedule 1 in the Act section 88 of the Act clauses 47 of the Regulation	All requirements specified in section 7, 9, 10 and 11

Definitions

6. In this Notice of Exemption :

AOAC International 18th Edition means Dr . William Horwitz and Dr. George Latimer, Jr. Editors . “Official Methods of Analysis of AOAC International” , 18th Edition2 (2007)AOAC International , Gaithersgurg, MD, USA.

Application to land includes application by any of the following methods:

- (a) spraying, spreading or depositing organic outputs on the land,
- (b) ploughing or mixing organic outputs into the land, or
- (c) filling ,raising reclaiming or contouring the land.

Biological stabilisation means a process whereby mixed waste undergoes a process of managed biological transformation for a period of not less than a total of 6 weeks of composting and curing, or until an equivalent level of biological stability can be demonstrated.

Biologically stabilised means the mixed waste that has undergone biological stabilisation.

Broad acre agricultural use means application to land where the land is used for agriculture. This does not include the keeping and breeding of poultry or pigs , food root

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

crops , vegetables or crops where the harvested parts touch or are below the surface of the land.

Consumer means a person who applies , causes , or permits the application to land of organic outputs. The consumer is responsible for the land to which organic outputs are applied. Where a person responsible for transporting the organic outputs to the land application site is also the party applying the organic outputs , this person must also meet the responsibilities of the consumer.

Mixed waste means a mixture of:

- a) Residual household waste that contains putrescible organics,
- b) Waste from litter bins collected by or on behalf of local councils ,
- c) Commercial kerbside waste collection services provided by or on behalf of councils,
- d) Commercial kerbside waste collection services provided by or on behalf of councils,
- e) Commercial waste sourced from restaurants , clubs , pubs, hotels, motels , resorts , offices schools and shopping centres that is similar in composition to household waste (but may include a higher proportion of food waste),
- f) Manure
- g) Animal waste,
- h) Grit or screenings from sewerage treatment systems that have been dewatered so the grit or screenings do not contain free liquids,
- i) Up to 29% source separated household garden and food waste .

Organic outputs means the pasteurised and biologically stabilised organic outputs produced from the mechanical biological treatment of mixed waste

Pasteurisation means a process whereby the mixed waste is treated to significantly reduce the numbers of plant and animal pathogens and plant propagules. At a minimum, the mixed waste must have undergone:

- a) (in the case of treatment by windrow composting) appropriate turning of outer material to the inside of the windrow so the whole mass is subjected to a minimum of 3 turns with the internal temperature reaching a minimum of 55 * C for 3 consecutive days before each turn, or
- b) an alternative process that guarantees the same level of pathogen reduction as required by the Biosolids Guidelines, and the reduction of plant propagules.

Pasteurised means that the mixed waste that has been subject to a process of pasteurisation.

Pathogen means a living organism that could be harmful to humans , plants or living organisms.

General conditions

7 This Notice of Exemption is subject to the following conditions:

7.1 The chemical concentration or other attribute of the organic outputs listed in Column 1 of Table 4 must not exceed the absolute maximum concentration or other value listed in Column 2 of Table 4.

7.2 The organic outputs can only be applied to land as a compost or soil amendment material for:

7.2.4 Broad acre agricultural use until June 2013.

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

8.0 The processor must provide each consumer with a copy of this exemption excerpt and inform them of the consumer responsibilities contained within this exemption.

Consumer responsibilities

9. The following conditions must be met by the consumer for this exemption to apply: For each load of organic outputs received the, the consumer must keep a written record of the following for a period of five years:

9.1.1 The **quantity** of organic outputs received by the consumer,

9.1.2 The **name** and address of the supplier of each delivery of organic outputs ,

9.1.3 The **location(s)** where the organic outputs are applied including the address and paddock identification.

9.1.4. The **rates** at which the organic outputs are applied to the land at each location as defined by 9.1.3.

9.1.5. The **dates** upon which the organic outputs are applied to the land at each location as defined by 9.1.3,

9.1.6 The **land owner** has received a copy of this exemption and accepts the application on the land.

9.2 The consumer must land –apply the organic outputs within a reasonable period of time.

9.3 The consumer must ensure that no windblown litter leaves the premises as a result of the application to land of organic outputs..

9.6. For broad acre agricultural use , no more than 10 tonnes /hectare dry weight) of organic outputs may be applied in total to a given location.

9.7. Organic outputs must not be applied to land with a slope in excess of 18% (10 degrees) unless used for mine site rehabilitation where all practicable measures have taken to control stability and prevent runoff.

9.8 The organic outputs must not be applied to:

9.81 soil having a pH less than 5.0 when measured in 1:5 soil water extract, or

9.8.2 Land that is within the buffer zones for the protected areas specified in table 2.

Table 2 Buffer zones for protected areas.

Column 1	Column2	Column3	Column 4
Protected Area	Flat (< 3% Or 2 degrees slope)	Downslope (>3% or 2 degrees slope)	Upslope
Surface waters	50	100	5
Drinking water bores	250	250	250
Other bores	50	50	50

Chemical and other material property requirements

This notice of exemption only applies to organic outputs where the chemical and other attributes listed in Column 1 of Table 4 comply with the chemical concentrations and other values listed in Column 2 of Table 4, when analysed according to test methods specified in Column 3 of Table 4. Note that while the limits are not included for chemicals and attributes 16-21, these must be tested in each sample and records kept of results.



Eastern Creek Operations Compost Information Sheet April 2010 Product: OGM (for Agriculture)

Product Classification: Pasteurized Soil Conditioner

Beneficial Properties

Total nitrogen	>0.6%, typically 1.5-2%
Phosphorus (as P ₂ O ₅ [†])	typically 0.5-1.5%
Potassium (as K ₂ O [†])	typically 0.7-1.2%
Magnesium	typically 0.15-0.3%
Calcium	typically 2.0-3.5%
Sulfur	typically ~0.1%
Water holding capacity	typically 75-200%

Physical Properties

pH	5-8.5, typically 7.0-8.0
Electrical conductivity (EC)	<12 mS/cm [‡] , typically 6-10 mS/cm
Moisture content	25-65%, typically 25-40%
Organic matter content	>25%, typically 55-70%
Particle size	>80% passing 16 mm, typically >99%
Bulk density	600-800 kg/m ³ , typically 640 kg/m ³
C:N ratio	typically 15-20

Chemical Contaminants

Arsenic	<20 mg/kg dry matter, typically <9 mg/kg
Cadmium	<3 mg/kg dry matter, typically <2 mg/kg
Chromium	<100 mg/kg dry matter, typically <70 mg/kg
Copper	<375 mg/kg dry matter, typically <200 mg/kg
Lead	<300 mg/kg dry matter, typically <250 mg/kg
Mercury	<4 mg/kg dry matter, typically <1 mg/kg
Nickel	<60 mg/kg dry matter, typically <30 mg/kg
Selenium	<5 mg/kg dry matter, typically <2 mg/kg
Zinc	<700 mg/kg dry matter, typically <500 mg/kg
Total DDT / DDD / DDE	<0.5 mg/kg, typically <0.2 mg/kg
Aldrin	<0.2 mg/kg
Dieldrin	<0.2 mg/kg
Chlordane	<0.2 mg/kg
Heptachlor	<0.2 mg/kg
HCB	<0.2 mg/kg
Lindane	<0.2 mg/kg
BHC	<0.2 mg/kg
PCB	<0.2 mg/kg for each individual PCB Arochlor

^{*} Divide by 2.293 for phosphorus as P.

[†] Divide by 1.205 for potassium as K.

[‡] Units: mS/cm ≡ dS/m

Table 4 Chemical and other material properties

Column 1	Column 2	Column 3 OGM agricultural product. Analysis.	Qualified assessment
Chemicals and other attributes	Absolute max. concentration (dry weight in mg/kg unless otherwise specified.)		Yes
1.Mercury	4	<4mg/kg drymatter typically 1	Yes
2.Cadmium	3	<3 mg/kg drymatter typically 2	Yes
3. Lead	300 for plantation forestry use, non contact agricultural use and broad acre agricultural use until 31 December 2011 250 for plantation forestry use , non contact agricultural use and broad acre agricultural use from Jan 2012 until 30 June 2013	<300 mg/kg drymatter typically <250 mg/kg.	Yes
4. Arsenic	20	<20 mg/kg drymatter typically <250 .	Yes
5.Chromium(total)	100	<100 mg/kg drymatter typically <70	Yes
6. Copper	375	<375 mg/kg drymatter typically <200	Yes
7.Nickel	60	<60 mg/kg drymatter typically < 30.	Yes
8.Selenium	5	<5 mg/kg drymatter typically <2	Yes
9.Zinc	700	<700 mg/kg drymatter typically <500	Yes
10.DDT/DDD/DDE	0.5	<0.5 mg/kg drymatter typically <0.2	Yes
11. Other pesticides (3)	0.2	<0.2	Yes
12.Total Polychlorinated Biphenyls (PCBs)	0.3(4)	<0.2 for each individual arachlor	Yes

13. Glass, metal and rigid plastics > 2mm	5% for for plantation forestry use, non contact agricultural use and broad acre agricultural use until 31 December 2011 1.5% for plantation forestry use , non contact agricultural use and broad acre agricultural use from Jan 2012 until 30 June 2013(as % drymatter on weight /weight basis)		Yes
Yes Yes 14. Plastics – light flexible of film >5 mm	0.25% for for plantation forestry use, non contact agricultural use and broad acre agricultural use until 31 December 2011 0.2% for plantation forestry use , non contact agricultural use and broad acre agricultural use from Jan 2012 until 30 June 2013(as % drymatter on weight /weight basis)		Yes
15 Maximum particle size	16 mm (particle size)	Typically >99% passing 16mm sieve	Yes
16. other metals(5)	NA		Yes
17 Total polycyclic Aromatic Hydrocarbons(PAHs)(6)	NA		Yes
18. Phthalates (7)	NA		Yes
19 Pesticides (non-scheduled)(8)	NA		Yes
20. Monobutyltin	NA		Yes

Notes and Definitions for the purposes of Table 4:

1. A general exemption will be extended beyond 30 June 2013. Containment levels will be set after considering the outcomes of trials that are to be conducted in the interim and after considerations outlines in the notes to this Notice of Exemption.
2. The effectiveness of mechanisms, programs, and reviews implemented by each facility in clauses 8.4, 8.5 and 8.6 in reducing the levels of lead present in the organic outputs will be evaluated , The maximum lead concentration may be amended following this review.
3. **Other pesticides** means Aldrin, Dieldrin, Chlordane, Heptachlor , Hexachlorobenzene(HCB) ,Lindane and Benzene Hexachloride(BHC).
4. No detected PCBs at a limit of detection of 0.2 mg PCBs/kg.
5. **Other metals** means antimony, beryllium, boron, cobalt, manganese, molybdenum, tin, and vanadium.
6. **PAHs (look up original document)**
7. **Phthalates(look up original document)**
8. **pesticides(non –scheduled)(look up original document)**

FERTSPREAD

Paul Wyer Fertiliser Contracting Pty Ltd Trustee for the Wyer Trust
"Darrilee" Lade Vale Rd, PO Box 88 GUNNING NSW, 2581. Ph. 02 4845 8288 Fx. 02 4845 8236
ABN: 17 086 236 184

PURCHASE CONFIRMATION

No. OGM

Date:

To:

Fax No:

From: Paul Wyer **FERTSPREAD**

Product	Amount/tonne		Reference	Pick up date	Unit price ex/gst
OGM					

Comments:

I have recieved a copy of the General Exemption under Part 6, Clause 51 and 51A for the OGM being suplied to me by Fertsread and I accept application of this product on my land.

Customer Signature	
--------------------	--

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com

This report has been prepared on behalf of and for the exclusive use of specific clients and is subject to and issued in connection with the provisions of the agreement between Andrew Harborne of Greenleaf Agronomy and Paul Wyer Fertspread. Andrew Harborne of Greenleaf Agronomy and Paul Wyer Fertspread accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

The content of this report is based on the best available information at the time of preparation. It is based in part on various opinions, assumptions and predictions. Conclusions should be interpreted in the light of the latest information available.

Greenleaf Agronomy

ABN: 63 301013026

Andrew Harborne ph 0412973804 boots@greenleafagronomy.com