ICL

Turf & Landscape

Product Guide / 2022/23

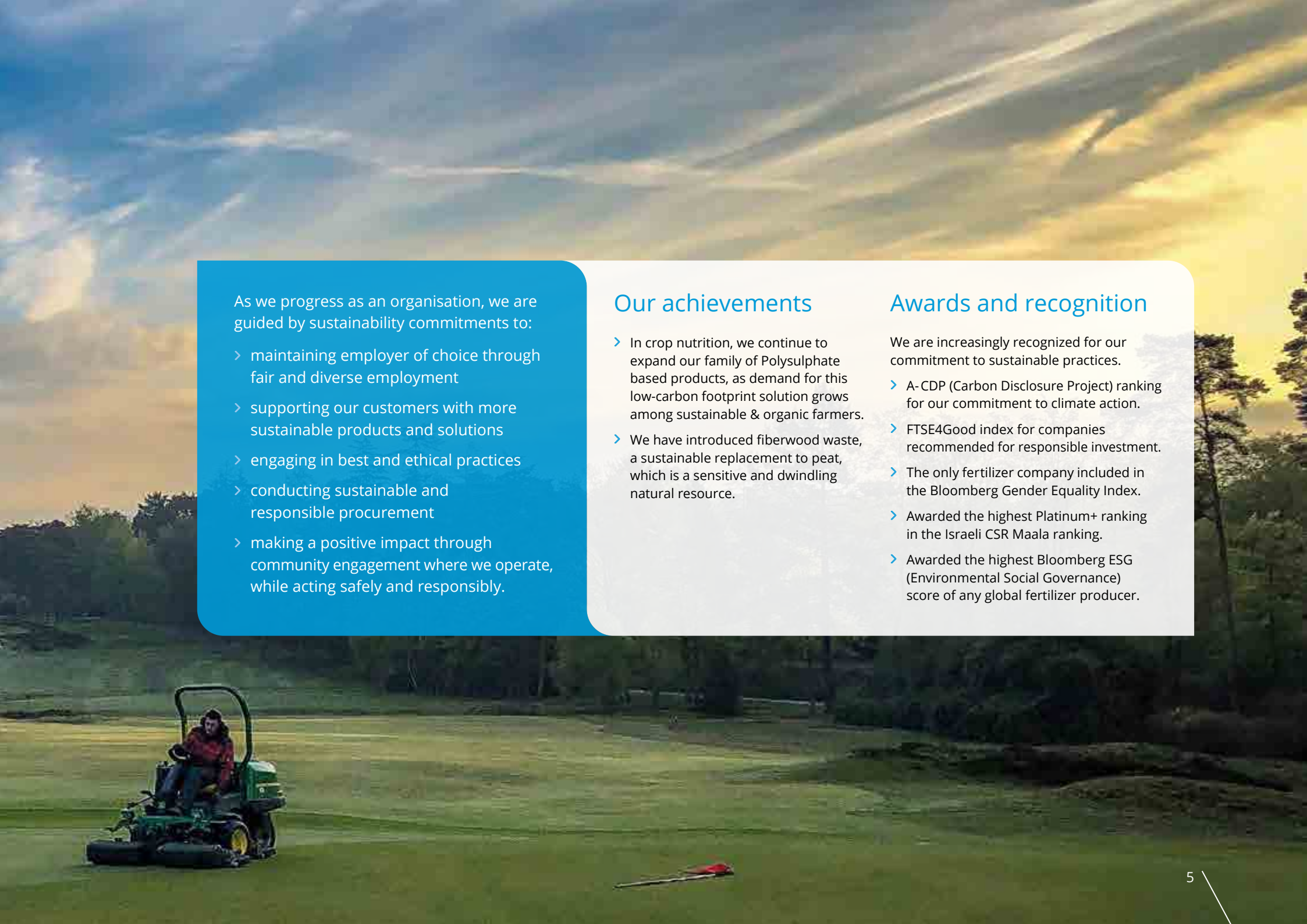
Welcome to ICL

Innovative solutions that help you to grow and manage turf that is stronger, healthier and performs at the highest level.

ICL Turf & Landscape dedicates itself to providing you with outstanding products and solutions for all your needs.

Our commitment to sustainability

As part of our commitment to sustainability, we have set ambitious goals for major global challenges such as climate change, renewable energy, circular economy and contributing to the community.



As we progress as an organisation, we are guided by sustainability commitments to:

- maintaining employer of choice through fair and diverse employment
- supporting our customers with more sustainable products and solutions
- engaging in best and ethical practices
- conducting sustainable and responsible procurement
- making a positive impact through community engagement where we operate, while acting safely and responsibly.

Our achievements

- In crop nutrition, we continue to expand our family of Polysulphate based products, as demand for this low-carbon footprint solution grows among sustainable & organic farmers.
- We have introduced fiberwood waste, a sustainable replacement to peat, which is a sensitive and dwindling natural resource.

Awards and recognition

We are increasingly recognized for our commitment to sustainable practices.

- A- CDP (Carbon Disclosure Project) ranking for our commitment to climate action.
- FTSE4Good index for companies recommended for responsible investment.
- The only fertilizer company included in the Bloomberg Gender Equality Index.
- Awarded the highest Platinum+ ranking in the Israeli CSR Maala ranking.
- Awarded the highest Bloomberg ESG (Environmental Social Governance) score of any global fertilizer producer.

Nutrition technologies designed to maximise turf performance, minimise fertilizer inputs and eliminate waste.

Polyhalite

A high-performing natural source of Potassium, Magnesium and Calcium

Polyhalite is a unique, naturally occurring mineral salt comprised of Potassium, Magnesium, Calcium and Sulphur – essential nutrients for healthy, disease resistant turf.

As a natural product with no chemical processing, Polyhalite is suitable as an organic source of nutrients.

Extensive trials confirm Polyhalite's natural nutrients are fully available to the plant, performing with the same plant-efficiency as standard individual sources.

Low in chlorine, Polyhalite is suitable for use with chlorine-sensitive turf.

PACE Resin coated technology

Resin coating of NPK and trace elements to provide tailored release patterns

PACE is a controlled release technology fertilizer containing more than one nutrient. Our unique vegetable-based resin membrane ensures plants receive a steady dose of Nitrogen, Potassium and Phosphorus.

Nutrient is combined within each granule

Depending on the thickness of the coating, nutrients are released over different lengths of time – from 2-3 months up to 8-9 months.

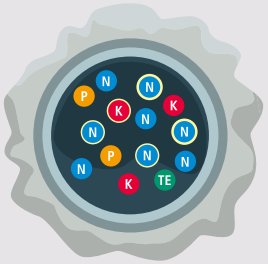
When applied, pressure starts to build up within the granule, forcing nutrients through the semi-permeable vegetable coating.

The release is not influenced by soil moisture levels, pH or bacterial activity, so remains consistent over a wide range of conditions.

MU_2 Extended Nitrogen release in microfine granules

Slow release Nitrogen that can be incorporated with a combination of quality nutrient sources

MU_2 technology ensures the fertilizer provides a uniform distribution of these nutrients when applied, which results in an even and slow growth pattern across the whole grass area, creating a dense sward and a strong rooting system. Fertilizers that contain MU_2 technology are very safe to use. They have extremely low salt levels so turf plants are not burnt or damaged.



SierraformGT contains the correct and most effective combination of nutrients for the grass plant. Every granule has an identical composition.

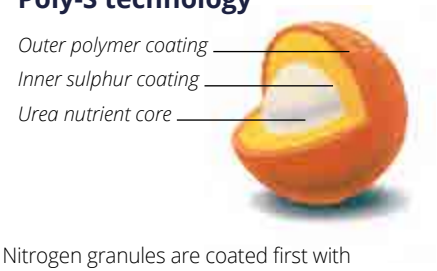
The result is even growth and an even colour all over the entire turf area.

The result is increased longevity of up to 8 weeks (dependent on environmental conditions).

Poly-S Coated granule technology

Polymer and Sulphur coating regulates Nitrogen release to suit plant demand

Poly-S technology



Nitrogen granules are coated first with sulphur (a plant nutrient in itself) and then a unique polymer membrane, which is degradable.

Once moisture permeates this outer polymer membrane and sulphur coating, Nitrogen is released. Depending on the thickness of the coating, this can last up to 6 months.

Major increases in soil temperature and/or moisture do not create severe fluctuations in this release pattern. This ensures that Poly-S provides non-surge growth and a healthy, green turf even in warm, wet conditions.

Because nutrient uptake is so efficient, the risk of leaching is reduced.

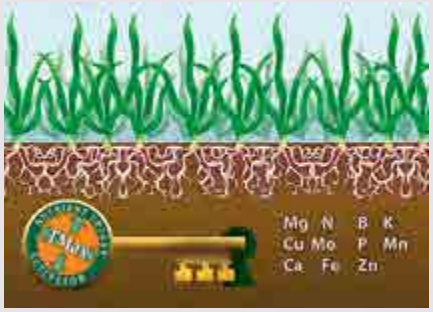
TMax technology

Improves nutrient uptake by plants, both through the roots and the leaves

TMax is a nutrient uptake activator that improves the efficiency of liquid fertilizers. It contains a mix of ingredients to improve foliar uptake including spreaders, stickers and penetrants.

TMax also contains technologies to improve root uptake, including wetting agents and natural chelating agents that increase nutrient availability from the fertilzer and of nutrients previously locked up within the soil.

By maximising leaf and root nutrient uptake, the risk of leaching is decreased and turf health is enhanced.



TMax enables nutrient uptake by plants both through the roots and the leaves.

Pro-Lite technology

Improves Cation Exchange Capacity of soil

Pro-Lite technology improves the Cation Exchange Capacity of the soil – that is the capacity for soils to hold nutrients such as Potassium, Calcium and Magnesium.

Pro-Lite increases the porosity of the soil leading to improved water retention, infiltration and drainage. This extends the longevity and improves the performance of the fertilizer.

3D cage framework of Pro-Lite technology

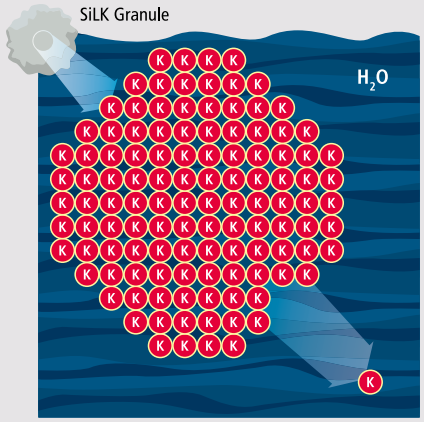
SilK Slow release Potassium

Key ingredient of premium formulations to extend release and minimise leaching loss

Potassium is important for water regulation, protein synthesis, storage of starch, activating enzymes and meristematic growth.

With SilK, a bank of Potassium remains in the rootzone available for plant uptake. Silica improves the structure and strength of cells, helping to protect plants from disease.

Nutrients are released over a period of approximately 8 weeks. Excessive soil moisture does not affect the release mechanism.

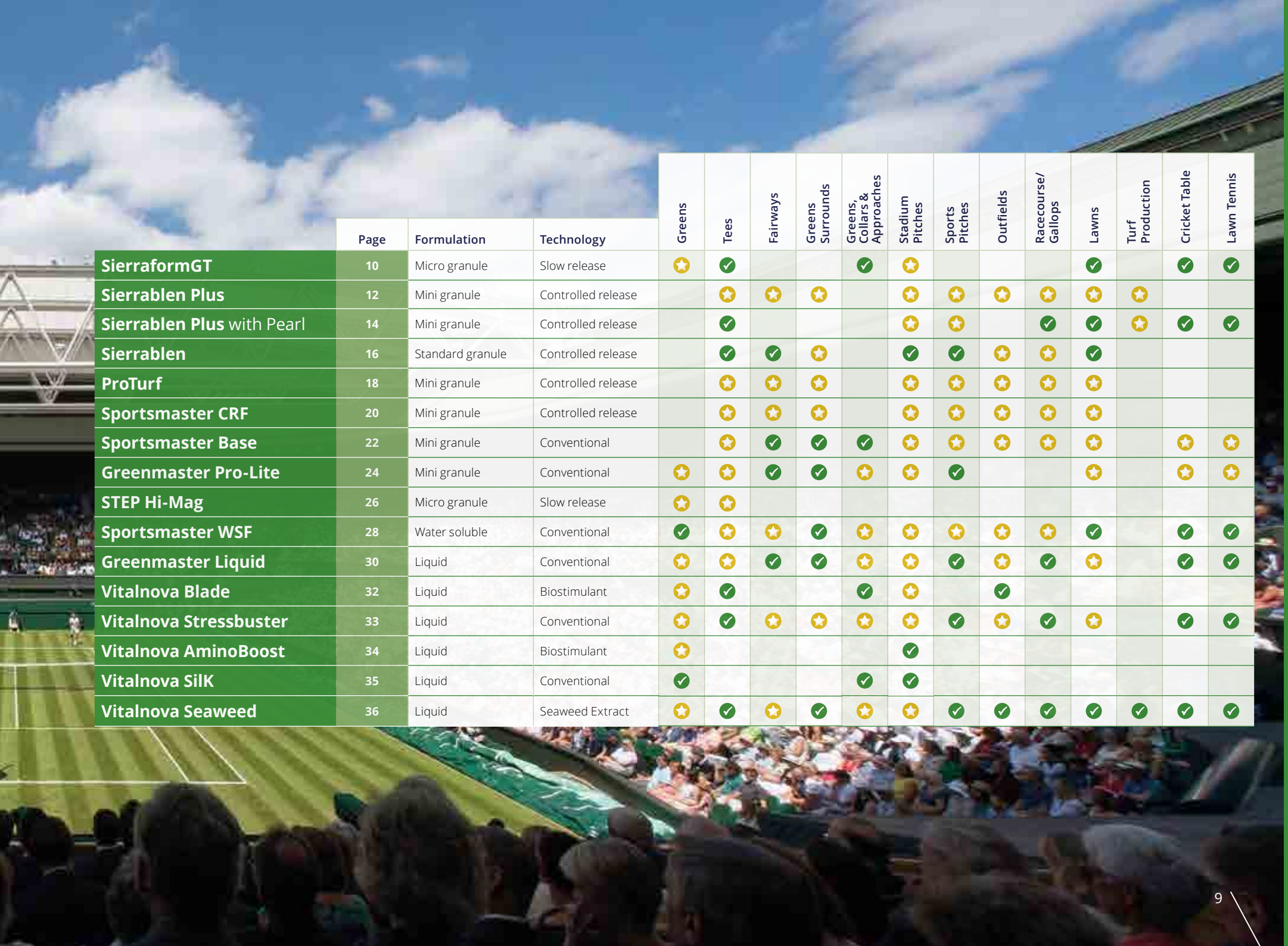


Slow release Potassium has been shown in trial work to improve drought tolerance.

Nutrition

Turf managers across the globe trust ICL products to deliver outstanding results

Our comprehensive range of turf, amenity and landscape fertilizers provide the highest quality nutrition for turf – that performs well, is healthy, resilient and looks good. Our unique, cutting edge, controlled release and slow release technologies deliver nutrients accurately and efficiently.



	Page	Formulation	Technology	Greens	Tees	Fairways	Greens Surrounds	Greens, Collars & Approaches	Stadium Pitches	Sports Pitches	Outfields	Racecourse/ Gallops	Lawns	Turf Production	Cricket Table	Lawn Tennis
SierraformGT	10	Micro granule	Slow release	★	✓			✓	★				✓		✓	✓
Sierrablen Plus	12	Mini granule	Controlled release		★	★	★		★	★	★	★	★	★		
Sierrablen Plus with Pearl	14	Mini granule	Controlled release		✓				★	★		✓	✓	★	✓	✓
Sierrablen	16	Standard granule	Controlled release		✓	✓	★		✓	✓	★	★	✓			
ProTurf	18	Mini granule	Controlled release		★	★	★		★	★	★	★	★			
Sportsmaster CRF	20	Mini granule	Controlled release		★	★	★		★	★	★	★	★			
Sportsmaster Base	22	Mini granule	Conventional		★	✓	✓	✓	★	★	★	★	★		★	★
Greenmaster Pro-Lite	24	Mini granule	Conventional	★	★	✓	✓	★	★	✓			★		★	★
STEP Hi-Mag	26	Micro granule	Slow release	★	★											
Sportsmaster WSF	28	Water soluble	Conventional	✓	★	★	✓	★	★	★	★	★	✓		✓	✓
Greenmaster Liquid	30	Liquid	Conventional	★	★	✓	✓	★	★	✓	★	✓	★		✓	✓
Vitalnova Blade	32	Liquid	Biostimulant	★	✓			✓	★		✓					
Vitalnova Stressbuster	33	Liquid	Conventional	★	✓	★	★	★	★	✓	★	✓	★		✓	✓
Vitalnova AminoBoost	34	Liquid	Biostimulant	★					✓							
Vitalnova SilK	35	Liquid	Conventional	✓				✓	✓							
Vitalnova Seaweed	36	Liquid	Seaweed Extract	★	✓	★	✓	★	★	✓	✓	✓	✓	✓	✓	✓

Sierraform® GT

High performance long-lasting micro-granular fertilizers

SierraformGT is a high performance range, designed for use on high quality, fine turf throughout the year. Each granule contains conventional and slow release nutrient sources for consistent and sustained release patterns.

MU2 SiLK

Benefits

- Slow release nitrogen and potassium for consistent and sustained results
- Even spread at ultra-low application rates
- Granules break down and disperse quickly
- Slow release nitrogen and potassium benefits root development and stress tolerance

Characteristics

Formulation type:	**Micro granule**
Technology:	**Slow release**
Granule size:	**0.7mm–1.4mm**
Granule dispersal*:	**2–3 days**
Longevity*:	**6–8 weeks**
Typical turf response*:	**7 days**

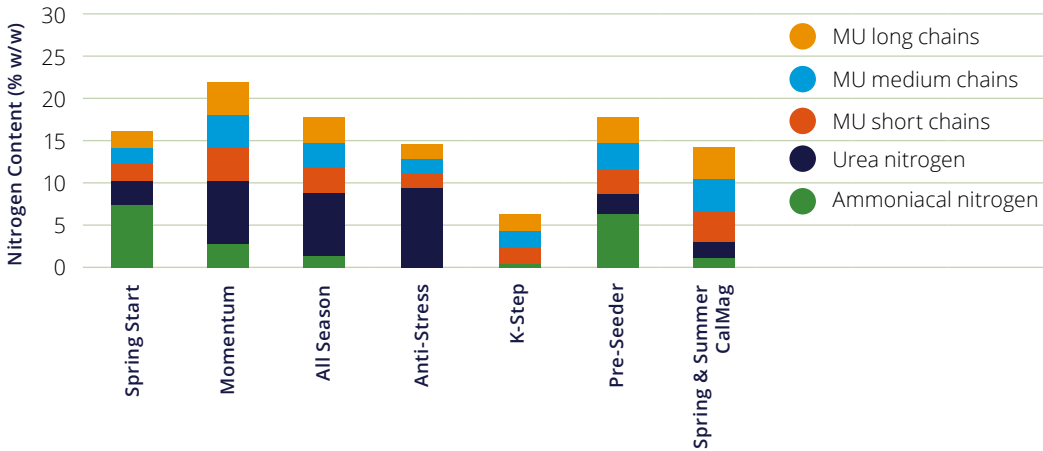
*depending on environmental factors

Areas of use

Greens	★
Tees	✓
Greens Collars & Approaches	✓
Stadium Pitches	★
Lawns	✓
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

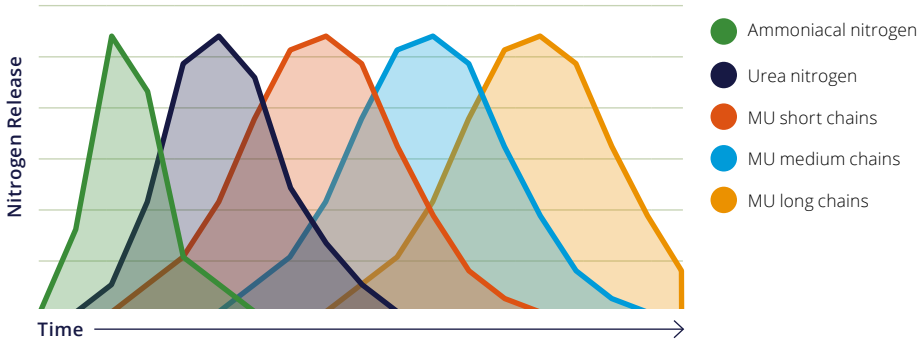
Nitrogen content



The SierraformGT range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown																Application Rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage per m²
			Nitrogen					Total P	Total K	S	Ca	Mg	Cu	Fe	Mn	Mo	Zn	Si		N	P	K	
			Total N	$N\text{-}NO_3$	$N\text{-}NH_4$	N-Urea	$N\text{-}MU_2$																
Spring Start 16-0-13.3 +Fe +Mn	Quick reaction in cooler conditions, ideal for spring application.	20	16	0	7.9	2.4	5.7	0	13.3	14.9				1	0.3			1.5	15 20 25 30	24.0 32.0 40.0 48.0	0.0 0.0 0.0 0.0	20.0 26.6 33.3 39.9	1,333 1,000 800 667
Momentum 22-2.2-9.1 +1.2Mg +TE	For use in spring and summer, with magnesium and TE for turf colour.	20	22	0	3	7.5	11.5	5	11	5.1		1.2	0.02	0.5	0.1	0.001	0.02	1.5	15 20 25 30	33.0 44.0 55.0 66.0	7.5 10.0 12.5 15.0	16.5 22.0 27.5 33.0	1,333 1,000 800 667
Pre-Seeder 18-9.6-4.1	Ideal for use during over-seeding period or when laying turf.	20	18	0	6.4	2.7	8.9	9.6	4.1	3								0.9	15 20 25 30	27.0 36.0 45.0 54.0	33.0 44.0 55.0 66.0	6.2 8.2 10.3 12.3	1,333 1,000 800 667
K-STEP 6-0-22.4 +1.2Mg +TE	High potassium content to harden turf in autumn and winter.	20	6	0	0.7	0	5.3	0	22.4	9.4		1.2	0.02	0.7	0.1	0.001	0.02	3.9	15 20 25 30	9.0 12.0 15.0 18.0	0.0 0.0 0.0 0.0	33.6 44.8 56.0 67.2	1,333 1,000 800 667
Anti-Stress 15-0-21.6 +Fe	High potassium content to harden turf in stressful summer or autumn conditions.	20	15	0	0	7.2	7.8	0	21.6	8.6				1				4.0	15 20 25 30	22.5 30.0 37.5 45.0	0.0 0.0 0.0 0.0	32.4 43.2 54.0 64.8	1,333 1,000 800 667
All Season 18-2.6-14.9 +1.2Mg +TE	Ideal for use after aeration to stimulate root growth.	20	18	0	1.3	8.2	8.5	2.6	14.9	5.7		1.2	0.02	0.5	0.1	0.001	0.02	2.6	15 20 25 30	27.0 36.0 45.0 54.0	9.0 12.0 15.0 18.0	22.4 29.8 37.3 44.7	1,333 1,000 800 667
NK Greens 19-0-15.8 +1.2Mg +TE	Balanced NK fertilizer for use from spring to autumn.	20	19	0	0	9.8	9.2	0	15.8	6		1.2	0.02	0.5	0.1	0.001	0.02	2.6	15 20 25 30	28.5 38.0 48.0 57.0	0.0 0.0 0.0 0.0	23.7 31.6 39.5 47.4	1,333 1,000 800 667
Spring & Summer CalMag 14-0-5.8 +5.7Ca +3Mg +TE	Calcium and magnesium and trace elements for turf growth and all-round plant health.	20	14		1.3	2.9	9.8	0	5.8		5.7	3.0	0.02	0.5	0.1	0.001	0.02		15 20 25 30	21.0 28.0 35.0 42.0	0.0 0.0 0.0 0.0	8.7 11.6 14.5 17.4	1,333 1,000 800 667

Nitrogen release



Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
15	6	3.7m	K	H
20	6	3.7m	L	I ½
25	6	3.7m	M	J ½
30	6	3.7m	M ½	K
35	6	3.7m		

Sierrablen® Plus

Premium technology controlled release mini-prill fertilizers

Contains Poly-S and resin coated PACE technology with conventional nitrogen sources to provide the best long-term nutrient release patterns.

NPK PACE

N Poly-S

Benefits

- The mini-granular formulation allows even coverage at low rates
- 3+, 3-4 months and 5+month longevities available
- Extremely cost-effective at low application rates

Characteristics

Formulation type:	**Mini granule**
Technology:	**Controlled release**
Granule size:	**1mm-2.5mm**
Granule dispersal*:	**7 days (visually dispersed from surface)**
Longevity*:	**3+months, 3-4 months, 5+months**
Typical turf response*:	**< 7 days**

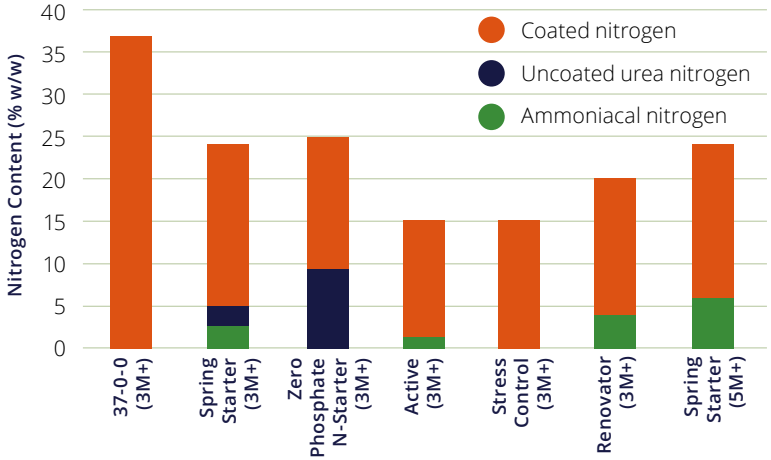
*depending on environmental factors

Areas of use

Tees	★
Fairways	★
Greens Surrounds	★
Stadium Pitches	★
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	★
Turf Production	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

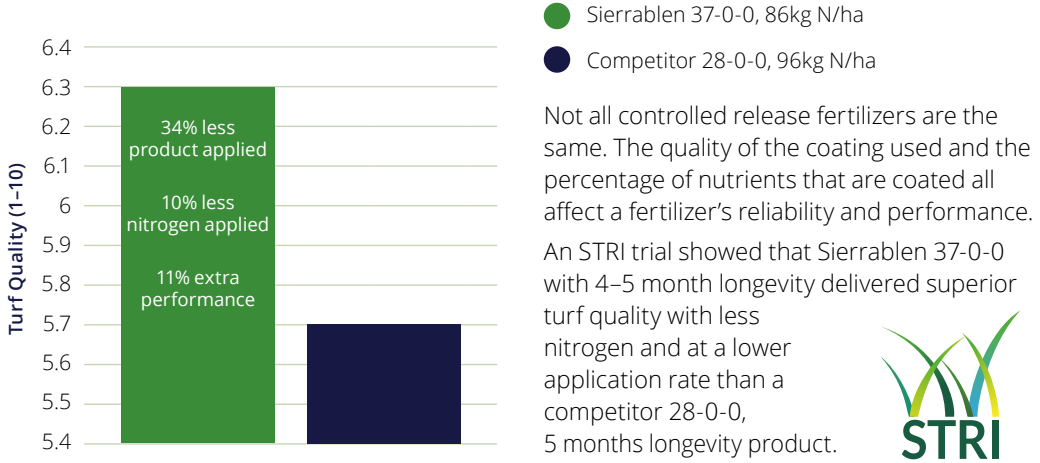
Nitrogen content



The Sierrablen Plus range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown: Nitrogen: Total N (% Coated)	N-NO_3	N-NH_4	N-Urea	Total P (% Coated)	Total K (% Coated)	S	Mg	Application Rate (g/m^2)	Nutrient Levels Applied (kg/ha): N	P	K	Bag Coverage per m^2
Spring Starter 24-2.2-6.6 +1.2Mg (3 months)	Encourages healthy balanced turf growth at start of season.	25	24 (79%)	2	3	19	2.2	10.8 (27%)	10.8		25 30 35	60 72 84	5.5 6.6 7.7	27 32.4 37.8	1,000 833 714
Active 19-2.2-14.9 +1.2Mg +TE (3 months)	Full trace element package to enhance turf health plus magnesium to improve turf colour.	25	19 (95%)		1	18	2.2	14.9	12	1.2	25 30 35	47.5 57.0 66.5	5.5 6.6 7.7	37.3 44.7 52.2	1,000 833 714
Renovator 20-8.7-6.6 (3 months)	Controlled release base feed that is ideal for new stadium constructions to give fast re-establishment.	25	20 (80%)		4	16	8.7	6.6	8.4		25 30 35	50.0 60.0 70.0	21.8 26.1 30.5	16.5 19.8 23.1	1,000 833 714
Stress Control 15-0-23.2 +1.2Mg (3 months)	High potassium content strengthens cell walls and aids water regulation in plant.	25	15 (100%)			15	0	23.2	13.6	1.2	25 30 35	37.5 45.0 52.5	0.0 0.0 0.0	58 69.6 81.2	1,000 833 714
Active 18-2.2-14.9 +1.2Mg (4-5 months)	Balanced NK fertilizer with phosphorus for use from spring to autumn. Magnesium content helps to improve turf colour.	25	18 (74%)	4	5	9	2.2 (35%)	14.9 (17%)	9.6	1.2	30 35 40 45	54.0 63.0 72.0 81.0	6.6 7.7 8.8 9.9	44.7 52.2 59.6 67.1	833 714 625 556
N 37-0-0 37-0-0 (3+ months)	Controlled release nitrogen matches plant requirements to give continuous growth for over 3 months.	20	37			37			14.8		15 20	55.5 74.0	0.0 0.0	0.0 0.0	1,333 1,000
Mini NPK 25-2.2-10 (2-3 months)	Rapid visual response with fewer applications.	20	25		1.2	23.8	2.2	10	6.8		20 25 30	50.0 62.5 75.0	4.4 5.5 6.6	20 25 30	1,250 1,000 833
Mini Hi K 0-0-32.4 (3-4 months)	Hardens the turf and makes the plant more resistant to stresses.	25	0				0	32.4	13.4		20 25 30	0.0 0.0 0.0	0.0 0.0 0.0	64.8 81.0 97.2	1,250 1,000 833

Turf Quality, 5 Months After Application



Not all controlled release fertilizers are the same. The quality of the coating used and the percentage of nutrients that are coated all affect a fertilizer's reliability and performance.

An STRI trial showed that Sierrablen 37-0-0 with 4–5 month longevity delivered superior turf quality with less nitrogen and at a lower application rate than a competitor 28-0-0, 5 months longevity product.

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m^2)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
25	4	4.8m	O	L
30	4	4.8m	P	M
35	4	4.8m	R	M ½

Rotary spreader (SR-2000)				
Rate (g/m^2)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
40	4	4.8m	S	N
45	4	4.8m	T	N ½

Sierrablen® Plus with Pearl

Improved rooting with recycled phosphorus

Pearl® Technology blends a unique, recycled, slow release phosphorus into our premium controlled release fertilizers. Providing significantly increased rooting and more efficient nutrient use over traditional phosphorus sources.

Benefits

- Controlled release Poly-S nitrogen with 3+ month longevity for strong turf response
- Root activated, slow release phosphorus for increased rooting
- Contains Polyhalite with K, Ca and Mg
- Includes recycled nutrients N, P and Mg
- Earlier harvest time when used in turf production

Characteristics

Formulation type:	**Mini granule**
Technology:	**Controlled release**
Granule size:	**1mm–2.5mm**
Granule dispersal*:	**7 days (visually dispersed from surface)**
Longevity*:	**3+ months**
Typical turf response*:	**< 7 days**

*depending on environmental factors

Areas of use

Tees	✓
Stadium Pitches	★
Sports Pitches	★
Racecourse/Gallops	✓
Lawns	✓
Turf Production	★
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
25	4	4.8m	O	L
30	4	4.8m	P	M
35	4	4.8m	R	M ½
40	4	4.8m	S	N
45	4	4.8m	T	N ½

The Sierrablen Plus with Pearl range

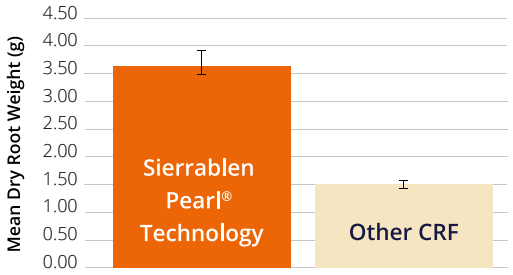
Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown: Nitrogen: Total N (% Coated)	N-NO_3	N-NH_4	N-Urea	Total P (% Coated)	Total K (% Coated)	Mg	Application Rate (g/m^2)	Nutrient Levels Applied (kg/ha): N	P	K	Bag Coverage per m^2
Pearl Renovator (3+ months) 11-4.8-4.1 +2Ca +4.8Mg	Balanced NPK to support germination and establishment of new seedlings.	25	11 (61%)		2.1	8.9	11	5	8	35 45	38.5 49.5	38.5 49.5	17.5 22.5	714 555
Pearl Turf Starter (3+ months) 5-12.3-0 +9.6Mg	Companion seedbed fertilizer to encourage seedling root development.	25	5		5		28		16.5	35 45	17.5 22.5	98.0 126.0	0.0 0.0	714 555
Pearl Turf Spring & Summer (3+ months) 17-2.2-4.2 +1.2Ca +3Mg	Blended with Ca and Mg for healthy plant growth. Use from early in growing season, or to support growth in the summer.	25	17 (62%)		2.9	14.1	2.2	4.2	3	35 45	59.5 76.5	7.7 9.9	14.7 18.9	714 555
Pearl Autumn & Winter (3+ months) 10-2.2-12.5 +1.4Ca +3Mg	Higher potassium maintains turf health leading into winter and increased disease pressure. Lower N levels for steady growth.	25	10 (62%)		2.1	7.9	2.2	12.5	3	35 45	35 45	7.7 9.9	43.8 56.3	714 555

The Pearl® Process

Sierrablen Plus with Pearl® Technology incorporates Ostara's Crystal Green. Crystal Green is sustainably produced and is the first continuous-release fertilizer to provide Root-Activated™ phosphorus. Crystal Green is recovered from wastewater utilising a unique process that allows recovery of a pure struvite granule 5-28-0+16MgO. Crystal Green's unique mode-of-action releases phosphorus, nitrogen and magnesium, only in response to organic acids produced by growing roots. As the roots produce organic acids, the granules release phosphorus, fertilizing the plant on demand, all-season long. As plant demand increases, phosphorus demand increases. This reduces the environmental impact caused by excessive leaching and run-off of nutrients into adjacent waterways.

Significantly increased rooting

Independent trial data has shown significantly increased rooting when Sierrablen Plus with Pearl® Technology is used as a fertilizer during turf-laying. There was a 2.5 x increase in rooting when compared to another existing high-performing product.



Sierrablen Plus with Pearl® Technology

Other high performing fertilizer

Sierrablen®

Premium quality controlled release fertilizers for use on tees and outfields

Contains Poly-S and resin coated controlled release fertilizer granules. The coating technology provides product longevity to suit individual requirements.

N Poly-S

Benefits

- Long-standing brand with proven performance in various climatic conditions
- Coated granules provide extended longevity for up to 8–9 months
- Provides a consistent nutrient release pattern that reduces leaching

Characteristics

Formulation type:	**Standard granule**
Technology:	**Controlled release**
Granule size:	**2mm–4mm**
Granule dispersal*:	**10 days (visually dispersed from surface)**
Longevity*:	**4–5 months** **5–6 months** **8–9 months**
Typical turf response*:	**10 days**

*depending on environmental factors

Areas of use

Tees	✓
Fairways	✓
Greens Surrounds	★
Stadium Pitches	✓
Sports Pitches	✓
Outfields	★
Racecourse/Gallops	★
Lawns	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

The Sierrablen range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown									Application Rate (g/m²)	Nutrient Levels Applied (kg/ha)			Bag Coverage per m²
			Nitrogen					Total P (% Coated)	Total K (% Coated)	S	Fe		N	P	K	
			Total N (% Coated)	N-NO_3	N-NH_4	N-Urea	N-MU_2									
Sierrablen Turf Starter 16-10.9-10 (2-3 months)	Ideal when laying new turf or over-seeding.	25	16 (100%)		6	10		10.9	10	6.8		30 35 40 45	48 56 64 72	32.7 38.2 43.6 49.1	30 35 40 45	833 714 625 556
Sierrablen Sportsturf + Fe 24-2.2-8.3 +2Fe (4–5 months)	Controlled released Nitrogen matches plant requirements to give continuous growth over 4-5 months.	25	24 (100%)		1	24		2.2	8.3	13	2	30 35 40 45	75 87.5 100 112.5	3.9 4.6 5.2 5.9	24.9 29.1 33.2 37.4	833 714 625 556

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
30	4	4.7m	R ½	N
35	4	4.7m	T ½	O
40	4	4.7m	V	O ½
45	4	4.7m	X	P
50	4	4.7m	N/A	Q
55	4	4.7m	N/A	R
60	4	4.7m	N/A	R ½

ProTurf®

High impact fertilizers for tees, surrounds, fairways, sportsfields and lawns

A range of high quality blended fertilizers with controlled release technology. They are formulated to give a strong immediate response, combined with 2–3 month longevity.

Poly-S

Polyhalite

Benefits

- Quick release portion gives immediate response
- Controlled nutrient delivery sustains growth for 2–3 months
- High quality blend in cost-effective formulation
- Contains polyhalite (with K, Mg, Ca)

Characteristics

Formulation type:	**Mini granule**
Technology:	**Controlled release**
Granule size:	**1mm–2.5mm**
Granule dispersal*:	**8 days (visually dispersed from surface)**
Longevity*:	**2–3 months**
Typical turf response*:	**7 days**

*depending on environmental factors

Areas of use

Tees	★
Fairways	★
Greens Surrounds	★
Stadium Pitches	★
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Polyhalite, a new naturally occurring mineral

A component part of the ProTurf range, Polyhalite is a new naturally occurring mineral fertilizer containing potassium, magnesium and calcium. Deposited over 200 million years ago it is a complex crystal product that has been discovered at a depth of 1300 metres in the Cleveland Potash mine in the UK. Polyhalite is an exciting new addition to our fertilizer portfolio.

Extensive trial work has confirmed that the principal nutrients of potash, magnesium and calcium in polyhalite are fully available to the plant, performing in trials with the same plant-efficiency as standard individual sources of potassium and magnesium sulphate.

ICL Group Boulby Mine (Cleveland, UK), source of multi-nutrient compound

The ProTurf range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown									Application Rate (g/m²)	Nutrient Levels Applied (kg/ha)			Bag Coverage per m²
			Nitrogen				Total P (% Coated)	Total K (% Coated)	S	Ca	Mg		N	P	K	
			Total N (% Coated)	N-NO_3	N-NH_4	N-Urea										
ProTurf Hi N 20-0-5.8 +2.1Ca +1.8Mg (2–3 months)	Strong initial boost coupled with longevity is ideal for in-season applications.	25 500	20 (25%)			20	0	5.8	11.6	2.1	1.8	20 25 30 35	40.0 50.0 60.0 70.0	0.0 0.0 0.0 0.0	11.6 14.5 17.4 20.3	1,250 1,000 833 714
ProTurf Hi K 12-2.2-16.6 +1.4Ca +1.2Mg (2–3 months)	Designed to sustain, strengthen and harden turf through autumn and winter.	25 500	12 (25%)		1.3	10.7	2.2	16.6	8.4	1.4	1.2	20 25 30 35	24 30 36 42	4.4 5.5 6.6 7.7	33.2 41.5 49.8 58.1	1,250 1,000 833 714
ProTurf NPK 15-2.2-12.4 +1.4Ca +1.2Mg (2–3 months)	Delivers a quick reaction, promotes healthy, balanced growth at start of the season and improves turf colour.	25 500	15 (25%)		1.3	13.7	2.2	12.4	9.2	1.4	1.2	20 25 30 35	30 37.5 45 52.5	4.4 5.5 6.6 7.7	24.8 31 37.2 43.4	1,250 1,000 833 714

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
20	6	5.0m	M ½	J ½
25	6	5.0m	N ½	K ½
30	6	5.0m	O ½	L ½
35	6	5.0m	P	M

Sportsmaster® CRF

A combination of controlled and conventional release technology

The Sportsmaster CRF contains a combination of controlled release technology with conventional granular fertilizers to provide a consistent growth response for up to 3 months.

NPK PACE

N Poly-S

Benefits

- Instant response and consistent nutrient release over 3 months
- Proven longevity
- Highly uniform blend for application and performance
- Ideal granule size for even spread and dispersal

Characteristics

Formulation type:	**Mini granule**
Technology:	**Controlled release**
Granule size:	**1mm–2.5mm**
Granule dispersal*:	**8 days (visually dispersed from surface)**
Longevity*:	**2–3 months**
Typical turf response*:	**7 days**

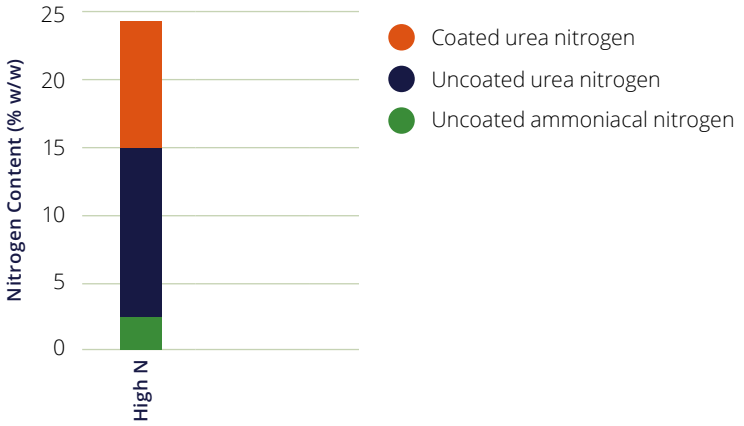
*depending on environmental factors

Areas of use

Tees	★
Fairways	★
Greens Surrounds	★
Stadium Pitches	★
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Nitrogen content in Sportsmaster CRF



Sportsmaster CRF

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown														Application Rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage per m²
			Nitrogen					Total P (% Coated)	Total K (% Coated)	S	Mg	Cu	Fe	Mn	Zn			N	P	K	
			Total N (% Coated)	$N\text{-}NO_3$	$N\text{-}NH_4$	N-Urea	$N\text{-}MU_2$														
High N (2-3 months) 26-2.2-9.1-1.2Mg +TE	Combined CRF & compound granular fertilizer. Ideal first CRF application of the season.	25	26 (30%)	1	2	23	5.7	2.2 (30%)	9.1 (30%)	6.4	1.2	0.01	0.15	0.05	0.015		20 25 30	52 65 78	4.4 5.5 6.6	18.2 22.8 27.3	1,250 1,000 833

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
20	3	5.0m	Q	M ½
30	3	5.0m	Y ½	O ½

Sportsmaster® Base

High quality mini-granular fertilizer for sports and amenity turf

The industry standard fertilizer for turf mown above 6mm. The various analyses are designed to maintain turf performance throughout the year.

Polyhalite

Benefits

- High quality ingredients within each granule
- Uniformity of mini-granule allows even spreading at low rates
- Quick breakdown of granule for fast response

Characteristics

Formulation type:	**Mini granule**
Technology:	**Conventional**
Granule size:	**1mm–2.5mm**
Granule dispersal*:	**4–5 days**
Longevity*:	**6 weeks**
Typical turf response*:	**< 7 days**

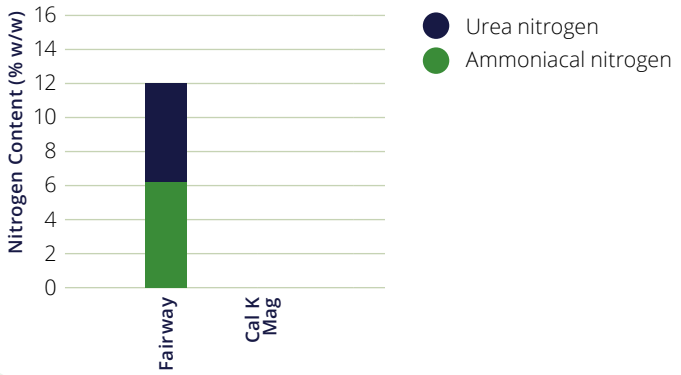
*depending on environmental factors

Areas of use

Tees	★
Fairways	✓
Greens Surrounds	✓
Greens Collars & Approaches	✓
Stadium Pitches	★
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	★
Cricket Table	★
Lawn Tennis	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Nitrogen content



Sportsmaster Base

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown										Application Rate (g/m²)	Nutrient Levels Applied (kg/ha)			Bag Coverage per m²
			Nitrogen				Total P	Total K	S	Ca	Mg	Fe		N	P	K	
			Total N	N-NH_4	N-Urea	Organic											
Fairway 12-2.6-7.5 +1.8Mg	Ideal for use during spring and summer periods when grass is growing strongly.	25	12	6.2	5.8		6	9			3		35 40 45 50	42.0 48.0 54.0 60.0	21.0 24.0 27.0 30.0	31.5 36.0 40.5 45.0	714 625 556 500
Cal K Mag 0-0-11.6+9.2Ca+3.6Mg	A unique multi-nutrient compound fertilizer providing four macro-nutrients K, Mg, Ca and S.	25	0				0	11.6		9.2	3.6		35 40 45 50	0 0 0 0	0 0 0 0	40.6 46.4 52.2 58.0	714 625 556 500

Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
35	4	3.7m	P ½	L ½
40	4	3.7m	Q	M
45	4	3.7m	R	M ½

Drop spreader (SS-2)			
Rate (g/m²)	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
35	0.91m	6	4 ½
40	0.91m	6 ¼	4 ¾
45	0.91m	6 ¾	5

Greenmaster® Pro-Lite®

Outstanding micro-granular fertilizer range for high quality, fine turf nutrition

A conventional release, finely granulated homogeneous fertilizer for use on fine turf areas. The range contains various analyses designed to optimise turf health throughout the year.

Pro-Lite

Benefits

- The micro-granule formulation allows consistent distribution, even at low rates
- High quality ingredients provide reliable release patterns
- Contains zeolite to improve performance and longevity
- Greenmaster Autumn provides moss control

Characteristics

Formulation type:	**Mini granule**
Technology:	**Conventional**
Granule size:	**0.5mm–1.5mm**
Granule dispersal*:	**3–4 days**
Longevity*:	**6 weeks**
Typical turf response*:	**< 7 days**

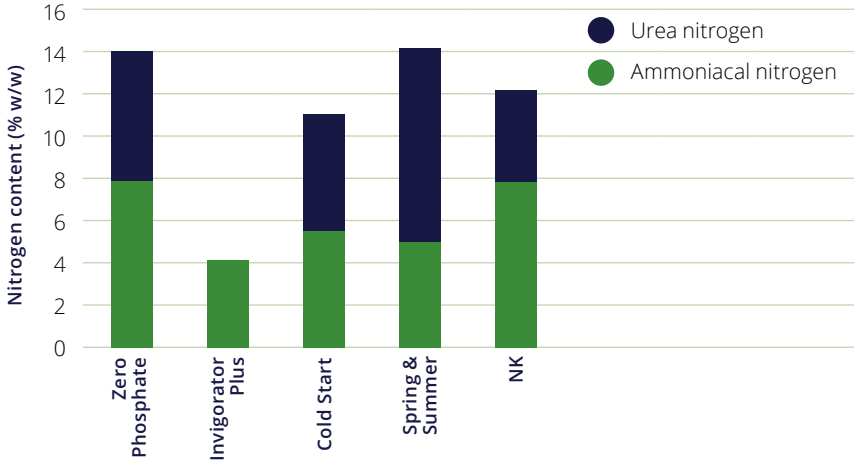
*depending on environmental factors

Areas of use

Greens	★
Tees	★
Fairways	✓
Greens Surrounds	✓
Greens Collars & Approaches	★
Stadium Pitches	★
Sports Pitches	✓
Lawns	★
Cricket Table	★
Lawn Tennis	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Nitrogen content



The Greenmaster Pro-Lite range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown								Application Rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage per m²
			Nitrogen												
			Total N	N-NH_4	N-Urea	N-MU_2	Total P	Total K	Mg	Fe		N	P	K	
Zero Phosphate 14-0-8.3 +2.1Mg	Maintains turf health during periods of growth. Magnesium added to improve turf colour and stress tolerance.	25	14	7.8	6.2		0	10	3	7	30 35	42 49	0 0	30 35	833 714
Spring & Summer 14-2.2-8.3 +1.2Mg	Maintains strong growth levels and enhances turf colour during the spring and summer.	25	14	5.1	8.9		5	10	2		30 35	42 49	15 17.5	30 35	833 714
NK 12-0-10 +1.8Mg +2Fe	Ideal for use from spring through to late summer to maintain potassium levels.	25	12	4.1	7.9		0	12	3	2	30 35	36 42	0 0	36 42	833 714
Double K 7-0-11.6 +4Fe	Low nitrogen, high potassium for turf strengthening throughout the year.	25	7	2.8	4.2		0	14		4	30 35	21 24.5	0 0	42 49	833 714
Cold Start 11-2.2-4.1 +8Fe	Readily available nitrogen, phosphorus and potassium to kick-start spring recovery growth.	25	11	5.6	5.4		5	5		8	30 35	33 38.5	15 17.5	15 17.5	833 714
Invigorator Plus 4-0-11.6 +12Mg +4Fe	Low nitrogen, high potassium with iron to help harden turf in spring and autumn.	25	4	4			0	8	3.3	4	30 35	12 14	0 0	24 28	833 714

Spreader settings

Rotary spreader (SR-2000)

Rate (g/m²)	Cone Setting	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
30	6	3.7m	M	J ½
35	6	3.7m	N	K

Drop spreader (SS-2)

Rate (g/m²)	Spread Width	Single Pass at Full Rate	Double Pass at Half Rate
30	0.91m	5 ¼	4
35	0.91m	5 ½	4 ¼

STEP® Hi-Mag

Unique granular trace element supplement

Contains all the micronutrients required for healthy turf growth. Especially useful for preventing deficiencies in sand-based constructions, the Magnesium content enhances turf health and colour for an immediate response.

Characteristics

Formulation type:	**Micro granule**
Technology:	**Slow release**
Granule size:	**0.7mm–1.4mm**
Granule dispersal*:	**2–3 days**
Longevity*:	**6–8 weeks**
Typical turf response*:	**7 days**

*depending on environmental factors

Areas of use

Greens	★
Tees	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Trace elements for disease management

STEP Hi-Mag has been proven to reduce disease pressure in turf when used as part of an an integrated turf management programme.

Manganese plays an important role in managing Take-All Patch disease. If this nutrient can be made available to the turf in an efficient manner, it can help minimise the occurrence of this disease.

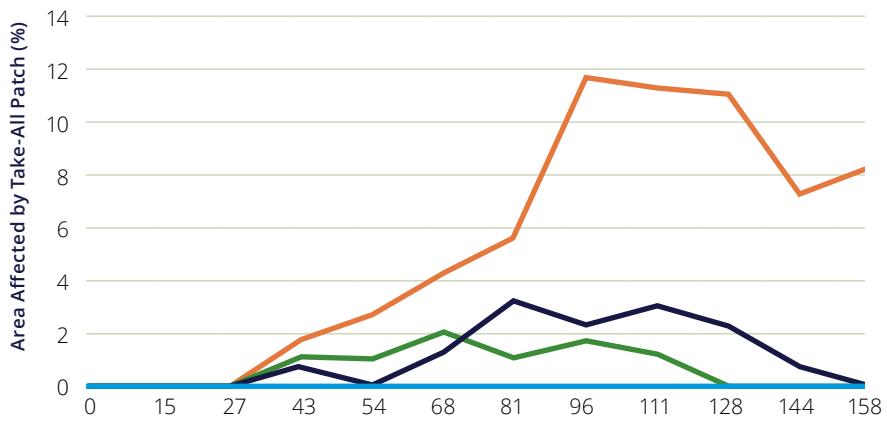
Benefits

- Helps prevent nutrient deficiencies in sand-based constructions
- Contains a high proportion of magnesium to enhance turf health and colour
- Proven benefits against the development of Take-all Patch
- Extremely low rate of application required

STEP Hi-Mag

Product name	Product notes	Pack size (kg)	Nutrient breakdown						Application Rate (g/m²)	Nutrient levels applied (kg/ha)						Bag coverage per m²
			S	Mg	Cu	Fe	Mn	Zn		S	Mg	Cu	Fe	Mn	Zn	
STEP Hi-Mag	Prevents trace element deficiencies and contains magnesium for turf health and colour. Note: irrigate immediately after application to ensure product has dispersed from turf surface.	20	7.9	12	0.50	8	3	1	7 11	5.5 8.7	8.4 13.2	0.4 0.6	5.6 8.8	2.1 3.3	0.7 1.1	2,857 1,818

Take-All Patch Trial



Spreader settings

Rotary spreader (SR-2000)				
Rate (g/m²)	Cone setting	Spread width	Single pass at full rate	Double pass at half rate
5	7	4.3m	H	G ½
10	7	4.3m	I ½	H
15	7	4.3m	K	I

Sportsmaster® WSF

High performance ultra soluble fertilizers for treatment of large turf areas

Contains specialist adjuvant TMax to enhance foliar and root uptake. The WSF range provides excellent value when treating large areas such as golf fairways and sportsfields.

TMax

Benefits

- Cost-effective fertilizer treatment
- TMax specialist adjuvant enhances nutrient uptake
- Low scorch risk
- Extremely pure and soluble
- Tank-mix compatible with Primo Maxx

Characteristics

Formulation type:	**Water Soluble**
Technology:	**Conventional**
Granule dispersal*:	**Immediate**
Longevity*:	**2-4 weeks (depending on rate)**
Typical turf response*:	**< 24 hours**

*depending on environmental factors

Sportsmaster WSF Seaweed Tank-Mixing

1. Three quarter fill your spray tank with water
2. Turn on agitation
3. Add appropriate tank-mix partner (see tank-mix compatibility table on page 95)
4. Gradually sprinkle required quantity of WSF Seaweed directly into spray tank to allow solubilisation
5. Fill spray tank to required volume with agitation
6. Spray

Areas of use

Greens	✓
Tees	★
Fairways	★
Greens Surrounds	✓
Greens Collars & Approaches	★
Stadium Pitches	★
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	✓
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

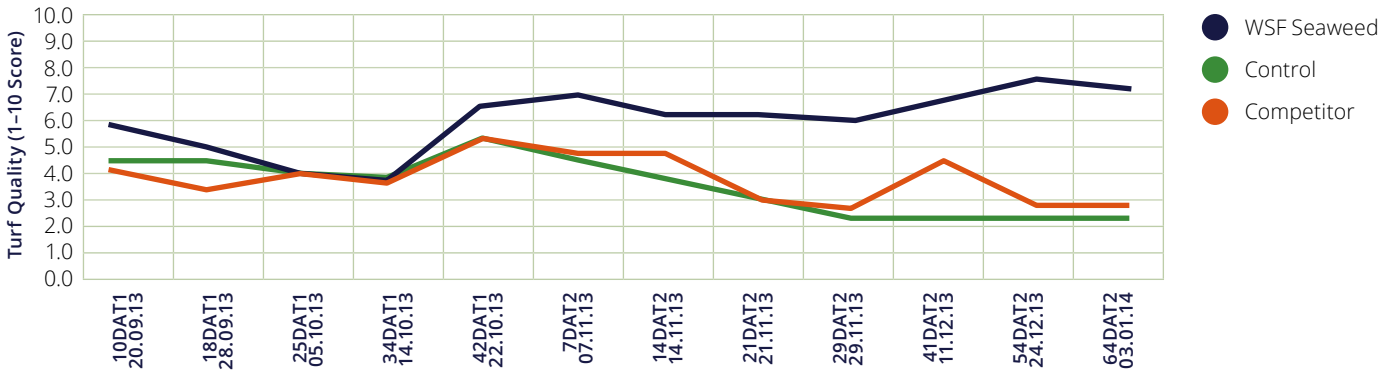
The Sportsmaster WSF range

Product name Elemental Analysis	Product notes	Pack size (kg)	Nutrient breakdown: Nitrogen: Total N	N-NO_3	N-NH_4	N-Urea	Total P	Total K	Ca	Mg	B	Cu	Fe	Mn	Mo	Zn	Application Rate (g/m²)	Water Volume (L/ha)	Nutrient Levels Applied (kg/ha): N	P	K	Bag Coverage per m² (15kg bag)
High N 35-0-11.6 +Fe	Nitrogen boost with potassium content provides balanced growth and stronger turf.	15	35	4.3		30.7	0	11.6					0.13				15 30	300–600 (Foliar)	5.3 10.5	0.0 0.0	2.1 4.2	10,000 5,000
																	45 60	600–1,000 (Root)	15.8 21.0	0.0 0.0	6.3 8.4	3,333 2,500
High K 15-0-35.7 +Fe	The low nitrogen to high potassium ratio ensures maximum turf hardening and stress conditioning.	15	15	12.7		2.3	0	35.7					0.13				15 30	300–600 (Foliar)	2.3 4.5	0.0 0.0	6.5 12.9	10,000 5,000
																	45 60	600–1,000 (Root)	6.8 9.0	0.0 0.0	19.4 25.8	3,333 2,500
IRON 0-0-0 +19.5Fe	Produces a dark green sward and promotes disease tolerance.	15											20				10 15 20	900 (Foliar & Root)				15,000 10,000 7,500
SeaWeed 4-0-12.4	Premium high density Atlantic Ascophyllum nodosum seaweed extract with proven plant benefits.	8 x 1	4		4		0	12.4					0.13	0.06	0.01	0.016	0.1	300–800	0.04	0	0.124	10,000 (8 x 1kg bags)

Independent Sportsmaster WSF Seaweed trial

Significant improvements in turf quality and turf colour occurred after only two treatments compared to another industry standard as well as an untreated control.

Results – Turf Quality



Greenmaster® Liquid

Liquid fertilizers with foliar and root uptake

The Greenmaster Liquid formulation allows quick foliar uptake and nutrient movement through the plant. Ideal for regular applications to all types of turf.

TMax

Benefits

- Foliar feeding is available at lower water rates
- Up to 6 weeks longevity
- Compatible with Sportsmaster WSF Seaweed, the Vitalnova range of biostimulants, H2Pro wetting agents, Primo Maxx and other ICL products

Characteristics

Formulation type:	**Liquid**
Technology:	**Conventional**
Longevity*:	**4 weeks**
Typical turf response*:	**< 24 hours**

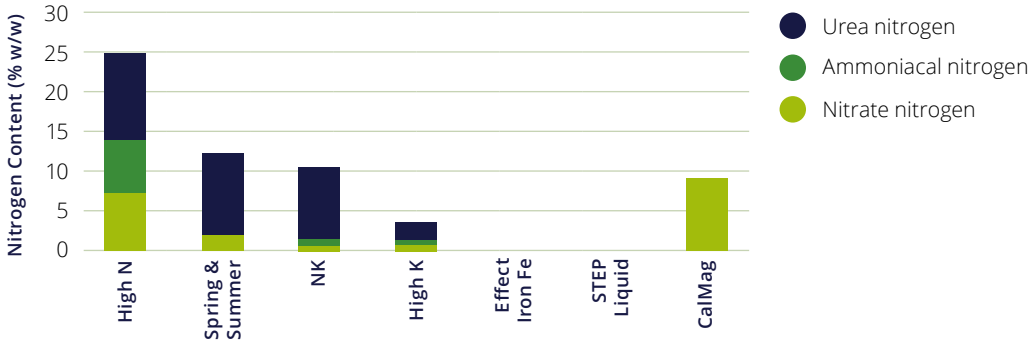
*depending on environmental factors

Areas of use

Greens	★
Tees	★
Fairways	✓
Greens Surrounds	✓
Greens Collars & Approaches	★
Stadium Pitches	★
Sports Pitches	✓
Outfields	★
Racecourse/Gallops	✓
Lawns	★
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Nitrogen Content in Greenmaster Liquid



The Greenmaster Liquid range

Product name Elemental Analysis	Product notes	Pack size (L)	Nutrient breakdown: Nitrogen: Total N	N-NO_3	N-NH_4	N-Urea	Total P	Total K	Ca	Mg	B	Cu	Fe	Mn	Mo	Zn	Specific Gravity (kg/L)	Application rate (L/ha)	Water volume (L/ha)	Nutrient levels applied (kg/ha): N	P	K	Pack coverage (m^2 per 10L pack)
Effect Fe 6.3Fe	For use throughout the growing season. Gives green-up within 3 hours.	10 200											6.3				1.25	10 20	400–600 (Foliar)	0.0 0.0	0.0 0.0	0.0 0.0	10,000 5,000
																		30	600–1,000 (Root)	0.0	0.0	0.0	3,333
Hi N 25-0-0 +1.2Mg +TE	Mixed nitrogen sources to optimise plant uptake. Magnesium and trace elements to enhance turf health.	10 200	25	7.3	5.9	11.8	0	0		1.2	0.01	0.004		0.01	0.001	0.004	1.31	40 80	400–600 (Foliar)	13.1 26.2	0.0 0.0	0.0 0.0	2,500 1,250
																		100 120	600–1,000 (Root)	32.8 39.3	0.0 0.0	0.0 0.0	1,000 833
NK 10-0-8.3 +TE	The NK ratio balances growth and toughens the sward. Trace elements enhance turf health.	10 200	10	0.7	0.7	8.6	0	8.3			0.01	0.004		0.01	0.001	0.004	1.23	40 80	400–600 (Foliar)	4.9 9.8	0.0 0.0	4.1 8.2	2,500 1,250
																		100 120	600–1,000 (Root)	12.3 14.8,	0.0 0.0	10.2 12.3	1,000 833
Spring & Summer 12-1.7-5 +TE	Complete NPK formula for main season feeding without excess growth.	10 200	12	0.8	11.2		1.7	5			0.01	0.004		0.01	0.001	0.004	1.18	40 80	400–600 (Foliar)	5.7 11.3	0.8 1.6	2.4 4.7	2,500 1,250
																		100 120	600–1,000 (Root)	14.2 17.0	2 2.4	5.9 7.1	1,000 833
Hi K 3-1.3-8.3 +TE	Designed to apply prior to stressful periods. Trace elements enhance turf health.	10 200	3	0.3	0.3	2.4	1.3	8.3			0.01	0.004		0.01	0.001	0.004	1.18	40 80	400–600 (Foliar)	1.4 2.8	0.6 1.2	3.9 7.8	2,500 1,250
																		100 120	600–1,000 (Root)	3.5 4.2	1.5 1.8	9.8 11.8	1,000 833
STEP Chelated Trace Elements	Contains chelated trace elements to maximise nutrient delivery and to prevent soil lock-up.	10									0.200	1.000		1.500	0.100	1.000	1.15	20 40	400–600 (Foliar)	0.0 0.0	0.0 0.0	0.0 0.0	5,000 2,500
																		60	600–1,000 (Root)	0.0	0.0	0.0	1,667
CalMag 9-0-0 +13CaO +3MgO +TE	Designed to boost turf health where Calcium and Magnesium are required.	10 200 1,000	9	9					9.3	1.8								20 40	400–1,000 (Foliar)	2.4 4.8	0.0 0.0	0.0 0.0	5,000 2,500
																		80	600–1,000 (Root)	9.6	0.0	0.0	1,250

Sprayer Information

Spray Quality	Retention on Leaf Surface	Potential Drift Hazard*	Foliar Applications	Root Applications
Very Fine	Good	■■■■■	★	×
Fine	Good	■■■□□	✓	×
Medium	Good	■■■□□	✓	✓
Course	Moderate	■■□□□	✓	✓
Very Course	Poor	■□□□□	×	★

Vitalnova® Blade

A proven biostimulant to boost microbial activity in soil and to encourage rooting

A totally unique biostimulant for turf, containing a carefully engineered concentration of carbohydrates (sugars), seaweed and micronutrients.

Characteristics

5-2.8-2.9+CHO+Seaweed+TE

Formulation type:	**Liquid**
Technology:	**Biostimulant**
Pack size:	**10 litre, 200 litre, 1,000 litre**
Pack coverage:	**2,000–4,000m² (10 litre pack)**
Longevity*:	**4 weeks**
Typical turf response*:	**< 24 hours**
Specific gravity:	**1.36**

*depending on environmental factors

Areas of use

Greens	★
Tees	✓
Greens Collars & Approaches	✓
Stadium Pitches	★
Outfields	✓

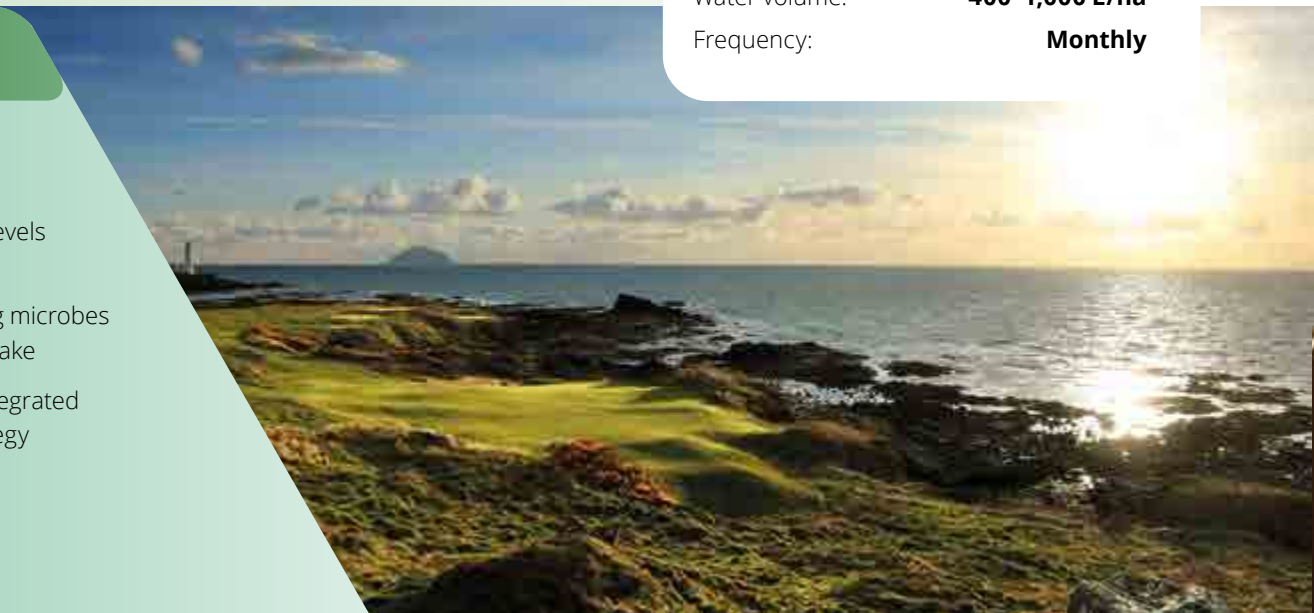
Key: ★ Ideal for purpose ✓ Suitable for purpose

Application information

Application rate:	**25–50 L/ha**
Water volume:	**400–1,000 L/ha**
Frequency:	**Monthly**

Benefits

- Increases root mass by up to 40%
- Up to 50% increase in levels of beneficial bacteria
- Stimulates root dwelling microbes to improve nutrient uptake
- A versatile tool in an integrated turf management strategy



Vitalnova® Stressbuster

Unique liquid formulation designed to pre-condition turf against stress

Vitalnova Stressbuster is a specially formulated liquid treatment to help condition turf against stress and also aid recovery from stress.

Benefits

- Original formulation
- Immediate colour-up response
- Long-lasting results
- Can be used as part of an integrated turf management plan

Characteristics

7-0-0+2Fe+TE+various

Formulation type:	**Liquid**
Technology:	**Conventional**
Analysis:	**7-0-0 +2Fe +sugars +wetting agents +amino +TE**
Pack size:	**10 litre, 200 litre, 1,000 litre**
Pack coverage:	**2,000–4,000m² (10 litre pack)**
Longevity*:	**4 weeks**
Typical turf response*:	**< 24 hours**
Specific gravity:	**1.24**

*depending on environmental factors

Areas of use

Greens	☆
Tees	✓
Fairways	☆
Greens Surrounds	☆
Greens Collars & Approaches	☆
Stadium Pitches	☆
Sports Pitches	✓
Outfields	☆
Racecourse/Gallops	✓
Lawns	☆
Cricket Table	✓
Lawn Tennis	✓

Product contains

Nitrogen for colour density and growth

Amino acid for foliar uptake in times of stress

Iron for immediate colour response

High percentage sugars to activate soil biology

Surfactants to aid efficient uptake

Application information

Application rate:	**25–50 L/ha**
Water volume:	**400–600 L/ha**
Frequency:	**Monthly**

Vitalnova® AminoBoost

Liquid fertilizer containing amino acids designed for foliar feeding in the summer

Designed to enhance turf quality and support a healthy plant, Vitalnova AminoBoost is an ideal product for use to stimulate growth or to maintain turf quality through periods of plant stress.

Characteristics

8-0-5.8+Amino Acids

Formulation type:	**Liquid**
Technology:	**Biostimulant**
Pack size:	**10 litre**
Pack coverage:	**2,000–4,000m² (10 litre pack)**
Longevity*:	**3–4 weeks**
Typical turf response*:	**Immediate**
Specific gravity:	**1.21**

*depending on environmental factors

Areas of use

Greens	★
Stadium Pitches	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Application information

Application rate:	**10 L/ha**
Water volume:	**400–600 L/ha**
Frequency:	**Monthly**

Benefits

- Ideal for summer foliar feeding
- Allows efficient uptake in stressed conditions
- A perfect tank-mix partner for Primo Maxx and other liquid and water soluble products

Vitalnova® SiLK

Potassium silicate formulation designed for leaf and stem cell strengthening

A specially formulated liquid fertilizer containing high levels of potassium silicate. Vitalnova SilK has been designed to help increase leaf and stem strength to increase wear tolerance and help produce a cleaner cut.

Characteristics

0-3-10+6Si

Formulation type:	**Liquid**
Technology:	**Conventional**
Pack size:	**10 litre**
Pack coverage:	**5,000m²**
Longevity*:	**3–4 weeks**
Typical turf response*:	**Immediate**
Specific gravity:	**1.32**

*depending on environmental factors

Areas of use

- **Greens** ✓
- **Greens Collars & Approaches** ✓
- **Stadium Pitches** ✓

Application information

Application rate:	**20 L/ha**
Water volume:	**400–600 L/ha**
Frequency:	**Monthly**

Benefits

- Potassium silicate formulation
- Designed to improve cell strength
- For use as part of an integrated turf management (ITM) approach

Vitalnova® Seaweed

Highly concentrated and effective seaweed extract

Vitalnova Seaweed contains concentrated seaweed extract which has shown to improve turf colour, turf quality, root development and stress tolerance.

Benefits

- Helps enhance root development
- Shown to improve turf quality and colour
- Helps condition turf against stress
- Extremely tank-mix compatible
- Highly concentrated Atlantic Ascophyllum nodosum

Characteristics

Formulation type:	**Liquid**
Technology:	**Seaweed Extract**
Analysis:	**4-0-11 (4-0-9.2) + 10% concentrated seaweed**
Pack size:	**10 litre & 120 litre**
Pack coverage:	**10,000–20,000m² (10 litre)**
Longevity*:	**3–4 weeks**
Typical turf response*:	**Immediate**
Specific gravity:	**1.27**

*depending on environmental factors

Application information

Application rate:	**5–10 L/ha**
Water volume:	**400–600 L/ha**
Frequency:	**Monthly**

Areas of use

Greens	★
Tees	✓
Fairways	★
Greens Surrounds	✓
Greens Collars & Approaches	★
Stadium Pitches	★
Sports Pitches	✓
Outfields	✓
Racecourse/Gallops	✓
Lawns	✓
Turf Production	✓
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Water Management

Water is a precious resource essential for premium quality turf

	Page	Formulation	Type	Greens	Tees	Fairways	Greens Surrounds	Greens Collars & Approaches	Stadium Pitches	Sports Pitches	Outfields	Racecourse/ Gallops	Lawns	Turf Production	Cricket Table	Lawn Tennis
H2Pro TriSmart	38	Liquid	Penetrant, Spreading, Holding	★	★	✓	★	★	★		✓		★			
H2Pro FlowSmart	39	Liquid	Soil penetrant	★	★			★	✓						★	★
H2Pro DewSmart	40	Liquid	Dew dispersant	★	✓			✓							✓	✓
H2Pro AquaSmart	42	Liquid	Penetrant, Water retention		★	★	✓	✓		★	★	★	✓	✓		
H2Pro Tablet	43	Soluble tablet	Spot treatment	★	✓		★	★					★		✓	✓
Hydraflo L	44	Liquid	Wetting Agent	★	✓	★	★	★	★	★	★	✓	★	★	✓	✓
Hydraflo 2	45	Granular	Wetting Agent	★	✓	★	★	★	★	★	★	✓	★	★	✓	✓

Key ★ Ideal for purpose ✓ Suitable for purpose

H2Pro® TriSmart

A high quality wetting and water conservation agent

H2Pro TriSmart is formulated with three water management surfactant technologies to provide great water penetration, even water spread through the root zone and to improve the water holding capacity of sandy root zones.

Benefits

- Highly effective triple action formulation
- Very effective against localised Dry Patch development
- Evenly distributes moisture through the upper soil profile
- Significantly reduces irrigation requirement

Characteristics

Formulation type:	**Liquid**
Technology:	**Surfactant**
Pack size:	**5, 120, 200 and 1,000 litre**
Pack coverage:	**5,000m² (5 litre)** **120,000m² (120 litre)**
Longevity:*	**4 weeks**
Type:	**Soil moisture optimiser**

* depending on environmental factors

Application information

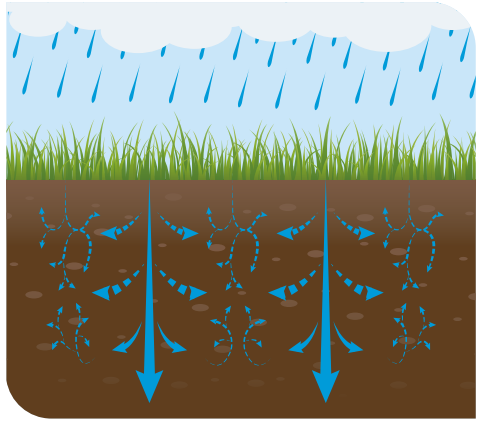
Application rate:	**Full programme:** **10 L/ha monthly.** **Late start programme:** **25 L/ha then 10 L/ha monthly**
Water volume:	**600–1,000m²**
Frequency:	**Monthly**

Areas of use

Greens	★
Tees	★
Fairways	✓
Greens Surrounds	★
Greens Collars & Approaches	★
Stadium Pitches	★
Outfields	✓
Lawns	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Penetrates, spreads and retains



H2Pro® FlowSmart

A specialist super penetrant

H2Pro FlowSmart is a high performance penetrant wetting agent for use on a wide range of turf surfaces. The FlowSmart formulation combines polymer and super-penetrant surfactant technologies to optimise performance for up to 4 weeks. FlowSmart works by reducing the surface tension of water to promote quick water infiltration and penetration through receptive soil profiles.

Benefits

- Helps surface water penetrate quickly
- Creates drier and firmer year round playing surfaces
- Assists with the flushing of carbonates and salts from root zones
- Can be used as part of an integrated disease reduction plan

Characteristics

Formulation type:	**Liquid**
Technology:	**Surfactant**
Pack size:	**10, 120, 200 and 1,000 litre**
Pack coverage:	**10,000m² (10 litre)** **120,000m² (120 litre)**
Longevity:*	**4 weeks**
Type:	**Soil penetrant**

* depending on environmental factors

Application information

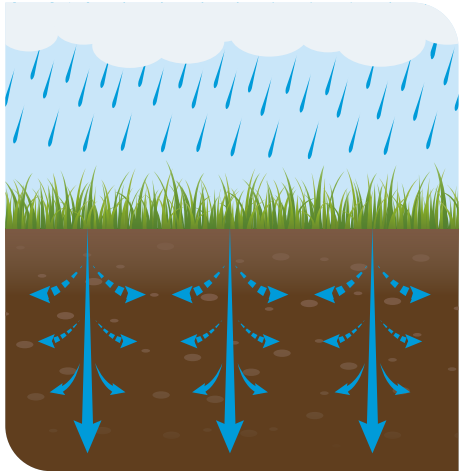
Application rate:	**10 L/ha**
Water volume:	**250–600 L/ha**
Frequency:	**Monthly**

Areas of use

Greens	★
Tees	★
Greens Collars & Approaches	★
Stadium Pitches	✓
Cricket Table	★
Lawn Tennis	★

Key: ★ Ideal for purpose ✓ Suitable for purpose

Water infiltration and penetration through the root zone



H2Pro® DewSmart

Dew dispersant for turf

H2Pro DewSmart is designed to prevent or reduce the formation of dew on the grass leaf.

This is ideal as part of an integrated turf management approach to help minimise the risk of disease outbreaks and to improve surface quality.

Application of other foliar products is not recommended in the 3-4 week period after H2Pro DewSmart is applied.

Benefits

- When used as part of an integrated disease management programme, DewSmart can help reduce the risk of disease attack
- Reduces the need for regular early morning switching of dew from greens
- Greens can be clear of dew for a cleaner cut and for the early morning golfer
- Under optimum conditions, 3–4 weeks control of dew can be achieved

Areas of use

Greens	★
Tees	✓
Greens Collars & Approaches	✓
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Application notes

Best performance is achieved when applied under optimum conditions. Apply to a dry surface. Cut or brush grass before foliar application. Use nozzles suitable for a foliar application.

Tank-mixing instructions

Mixing H2Pro DewSmart with other products may adversely impact performance.

Characteristics

Formulation type:	**Liquid**
Technology:	**Surfactant**
Pack size:	**10, 120, 200 and 1,000 litre**
Pack coverage:	**10,000m² (10 litre)**
Longevity:*	**Up to 21 days if applied in optimum conditions**
Type:	**Dew dispersant**

* depending on environmental factors

Application information

Application rate:	**10 L/ha**
Water volume:	**300–400 L/ha**
Frequency:	**Every 14 days**

Sprayer advice

Spray quality	Size of droplets		Retention on leaf surface	Potential drift hazard*					Foliar applications	Root applications
Very Fine		Fine	Good	High					★	
Fine			Good						✓	
Medium			Good						✓	✓
Coarse			Moderate						✓	✓
Very Coarse		Coarse	Poor	Very Low						★

Key: ★ Ideal for purpose ✓ Suitable for purpose

UK trial during winter.
Without DewSmart.

UK trial during winter.
With DewSmart
(26 days after treatment)

Why is dew a problem?

The dew forming on grass blades can be problematic because it provides very good conditions for the spread and expansion of fungal diseases. It is no coincidence that the times of year with high disease pressure, autumn, warm winter days and early spring, are also the times of year with the greatest number of 'dew days'. The moisture coating the leaf allows easy spread of fungal spores and the water droplets can combine with 'guttation' water to provide food for fungal pathogens.

A single application of DewSmart can prevent dew forming for an extended time period (under optimum conditions), which reduces the need to switch/brush the greens on a daily basis, thus saving staff time. It will also provide protection over the weekend when switching might not take place. There is also the added benefit of having the greens dew-free for the early morning golfer. With DewSmart the surface will be drier for cutting which should enable a cleaner cut.

H2Pro® AquaSmart

A cost-effective wetting and water conservation agent

H2Pro AquaSmart is an outfield wetting agent for a low application rate to provide a cost-effective programme. The formulation provides greater water-use efficiency by slowing drying and then allowing quick rewetting of the soil, so maintaining a healthy plant and quality surface.

Benefits

- Improves water efficiency for outfield areas
- Helps reduce incidence of Dry Patch
- Flexible application rates
- Protects turf quality through periods of dry conditions

Characteristics

Formulation type:	**Liquid**
Technology:	**Surfactant**
Pack size:	**5, 120, 200 and 1,000 litre**
Pack coverage:	**10,000m² (5 litre)** **240,000m² (120 litre)**
Longevity:*	**4–6 weeks**
Contains:	**Soil moisture optimiser**

* depending on environmental factors

Application information

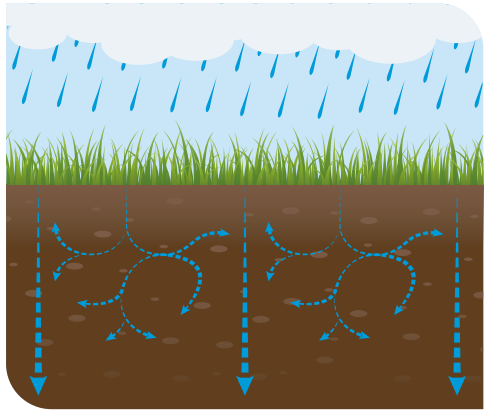
Application rate:	**5–10 L/ha**
Water volume:	**400–800 L/ha**
Frequency:	**Every 4–6 weeks**

Areas of use

Tees	★
Fairways	★
Greens Surrounds	✓
Greens Collars & Approaches	✓
Sports Pitches	★
Outfields	★
Racecourse/Gallops	★
Lawns	✓
Turf Production	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Specialist super penetrant



H2Pro® Tablets

A hose-end applied wetting agent for effective hand watering

H2Pro Tablets are especially effective for treating localised Dry Spot and helping reduce overall irrigation requirements.

Benefits

- Effective rewetting through the root zone
- Excellent water spreading and penetration characteristics
- For spot-treating problem areas and to complement main wetting agent programmes

Characteristics

Formulation type:	**Soluble Tablet**
Technology:	**Surfactant**
Pack size:	**6 x 250g tablets**
Pack coverage:	**6 x 500m²**
Longevity:*	**2–4 weeks**
Type:	**Spot treatment**

* depending on environmental factors

H2Pro Tablet

Applicator	Product	Spray Time (Minutes)	Area Treated (m²)
H2Pro Pellet Pro Gun	1 x 250g Tablet	5–10	250–500

Areas of use

Greens	★
Tees	✓
Greens Surrounds	★
Greens Collars & Approaches	★
Lawns	★
Cricket Table	✓
Lawn Tennis	✓

Key: ★ Ideal for purpose ✓ Suitable for purpose

Application information

Frequency: **As required**

Application notes

Apply using an H2Pro application gun.

Hydraflo® L

Liquid soil wetting agent

Hydraflo L is a liquid soil wetting agent that is as safe for use on delicate ornamental flowering plants as it is on turfgrass greens, sportsfields and lawns.

Made in Australia for varied conditions, both Hydraflo L and Hydraflo 2 assist in overcoming extremes in weather and hydrophobic soil conditions.

Benefits

- Long term performance enables rewetting of dry soils
- Aids infiltration and drainage promoting deeper stronger roots
- Safe for use on all ornamental plants and turfgrasses
- Uniform wetting to avoid summer dry patch

Left – Not treated with Hydraflo

Application of coloured water demonstrates uneven water distribution and lack of moisture and nutrient retention in the root zone.

Right – Treated with Hydraflo

Treatment with ICL Hydraflo ensures an even matrix flow retaining moisture and nutrients in the root zone.

Hydraflo L application rates

Situation	Rate	Application frequency
Greens and fine turf, lawns and landscapes	0.125-0.375L/100m²	3 months, or as required
Fairways, sports turf, lawn turf and landscapes	0.375-0.625L/100m²	8 months, or as required

Apply in advance of expected dry patch formation. Hydraflo L is a polymeric wetting agent that rewets readily after treated soil has been dry for extended periods.

Application through boom spray should use a minimum dilution of 1 part Hydraflo L to 200 parts water (1.0 litre of Hydraflo L in 200 litres of water). Additional irrigation (3-6mm) should be applied to ensure the Hydraflo L is thoroughly watered into the soil profile.

Hydraflo L characteristics

Formulation type:	**Liquid**
Technology:	**Surfactant**
Pack size:	**20L and 200L**

Hydraflo® 2

Granular soil wetting agent

Assisting in overcoming extremes in weather and hydrophobic soil conditions, Hydraflo 2's improved dual-action formulation delivers both immediate and longer term performance.

This granular formulation can be easily and accurately applied by spreader.

Benefits

- Safe for use in any season
- No mixing required – minimises risk of application mistakes
- Easily applied as a topdress or incorporated into soil mix
- Encourages deeper stronger roots
- Improves soil drainage and enables greater efficiency of irrigation
- Inhibits the growth of moss, algae and soil borne pathogens

Hydraflo 2 & Hydraflo L – ideal summer rewetters and winter drainers

Summer rewetters

Hydraflo effectively decreases water surface tension aiding the successful rewetting of soils in dry summer periods, eliminating localised dry spots and increasing the uniformity of wetting throughout the soil profile. By allowing for better water penetration & absorption, Hydraflo encourages deeper stronger roots.

Winter drainers

Hydraflo encourages free drainage of water-logged soils in winter and during heavy rainfall. This inhibits surface moss, algae growth and soil borne pathogens. When water logged soils drain, air is allowed into the root zone enabling the plant to take up valuable nutrients.

Hydraflo 2 application rates

Application timing	Application rate (per m²)	Water
Season long	20-25g/m²	4-6mm
Bi-monthly	10-15g/m²	4-6mm

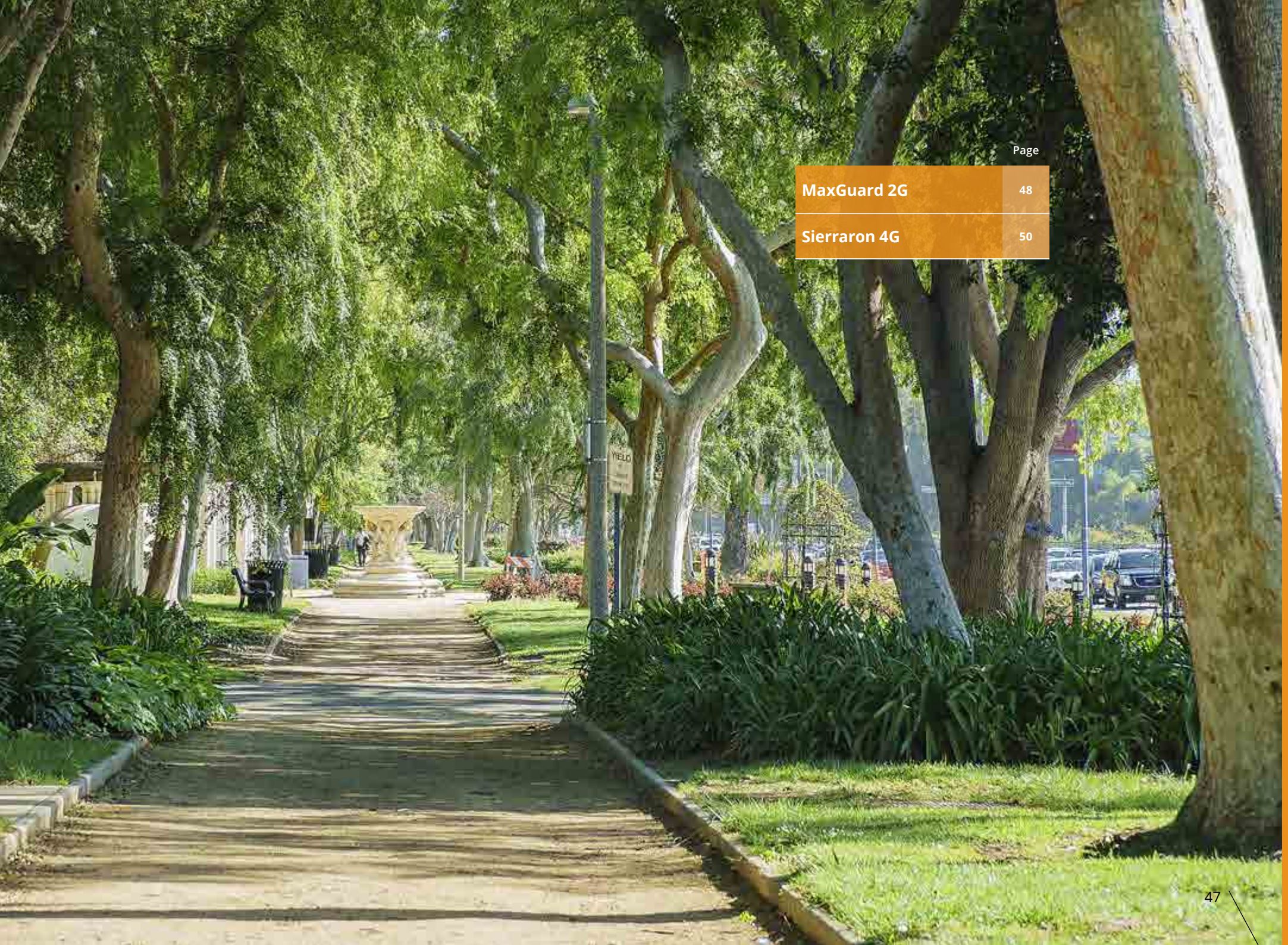
Hydraflo 2 characteristics

Formulation type:	**Granular**
Technology:	**Surfactant**
Pack size:	**20kg**

Plant Protection

Responsible solutions for effective control of weeds and insects

With broad-spectrum formulas, ICL's plant protection products treat a wide variety of insect and weed problems. Designed to be effective and safe, they will assist in providing you with the all-round protection you need for the life of your plant investment.



MaxGuard® 2G

Fast-acting, granular contact insecticide

MaxGuard 2G uses an advanced pyrethroid chemistry, uniquely stable to sunlight. This provides much longer control (depending on application rate) when compared to other conventional pyrethroids. MaxGuard 2G is proven to be very effective even at low application rates.

Benefits

- Quicker turf recovery
- High safety margin / low toxicity
- Easily applied using a spreader
- Cost effective alternative to preventative systemic insecticides
- Very effective insect control even at low rates

Immediate control of problem surface-feeding insects

MaxGuard delivers fast acting, contact pyrethroid insecticide for immediate control of problem surface feeding insects, such as

- Lawn armyworm
- Sod webworm
- Billbug adults
- Argentine stem weevil adults
- African black beetle adults
- Cutworms
- Ants, including Stinging ants

Acts faster to combat target insects at low rates

MaxGuard chemistry has more insecticidal activity than other classes of insecticides such as organophosphates and carbamates, therefore requiring less active ingredient to control pest problems.

Technical information

Pack size	Formulation	Active constituents	Mode of action group	Poison schedule
22.7kg	Granular insecticide	2g/kg Bifenthrin	Group 3A Insecticide	Not scheduled

MaxGuard 2G application

Target	Rate	Critical comments
Lawn armyworm *(Spodoptera mauritia)*	60kg/ha (0.6kg/100m²)	Broadcast MaxGuard 2G with suitable application equipment to ensure uniform coverage over the treated area. To ensure optimum control, irrigate the treated area with up to 4mm of water soon after application. Inspect the treated areas for continuing activity. Reapply as required. Where a rate range is indicated use lower rates under lower insect pressure and higher rates under higher insect pressure.
Sod webworm *(Herpetogramma licarsisalis)*	60kg/ha (0.6kg/100m²)	
Cutworm *(Agrotis sp.)*	60kg/ha (0.6kg/100m²)	
Argentine stem weevil adults *(Listronotus bonariensis)*	60-120kg/ha (0.6-1.2kg/100m²)	
African black beetle adults *(Heteronychus arator)*	120-180kg/ha (1.2-1.8kg/100m²)	
Billbug adults *(Sphenophorus brunnipennis)*	60-120kg/ha (0.6-1.2kg/100m²)	
Black ant, Coastal brown ant, Funnel ant, Meat ant, Sugar ant and Stinging ant only.	60-220kg/ha (0.6-2.2kg/100m²)	Apply granules to areas where ants are active. Where possible, apply granules directly to the nest. Use the low rate for maintenance treatments or to control light infestations and the high rate for heavy infestations and for maximum residual control. The elimination of Funnel ants from a particular site will generally require more than one application. Initial applications should be broadcast over affected areas. As the initial numbers of active colonies is reduced, application should shift to targeting active mounds. Apply granules directly to the mound and in the area immediately surrounding active mounds (300mm radius).

For further information refer to product labels and Safety Data Sheets (SDS).

MaxGuard 2G applicable APVMA Permits

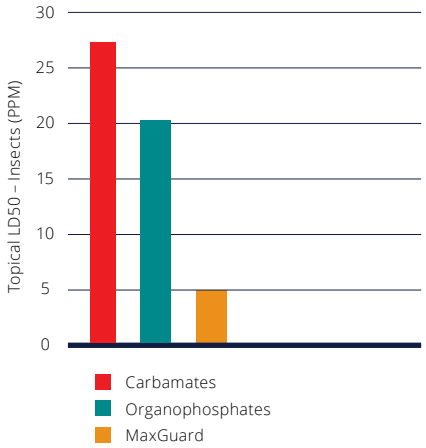
Target	Protection period (months)	Dose rate (ppm)	Potting mix rate	Permit
Red imported fire ant	0-12	12	3.9kg/m^3	PER10536 – NSW only PER10562 – QLD only (standard potting mix with bulk density of 0.65)
Identified quarantine soil pests susceptible to Bifenthrin	Potting mix	Bulk density	Product Rate g/L	
	25% sand / 75% peat	0.85	2.7	PER9796 – All states

See permit for detailed application rates. For more permit info: https://portal.apvma.gov.au

Safer to apply

MaxGuard 2G is not a scheduled poison. With minimal contact when applying the granular formulation, it is extremely safe for users. Additionally, there are no restrictions on transport and storage as MaxGuard is not classified as a dangerous good on land.

MaxGuard 2G requires less active ingredient to control pest problems than other classes of insecticides



Sierraron® 4G

Season-long weed control

A proven, easy to apply, pre-emergent weed controller that continues working for up to six months.

- an extra resource for weed control
- extends your current weed management
- simply weed, and then apply Sierraron 4G for 6 months protection from weed growth

Benefits

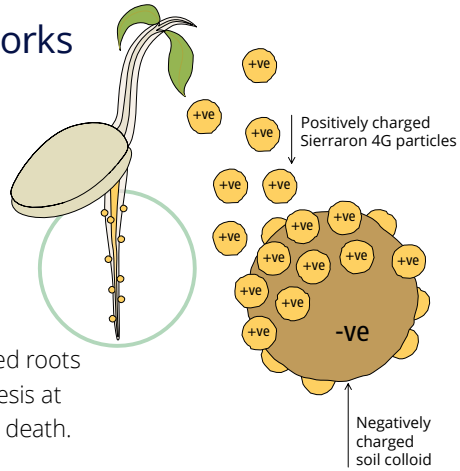
- A single application provides season-long weed control
- Eliminates most annual and perennial broadleaf weeds and grasses
- Classified as a non-hazardous chemical
- Active ingredient binds strongly to the soil, minimising the potential for run-off or leaching
- Easy to apply ready to use granular formulation
- As long as soil is present, Sierraron 4G goes to work after watering in

How Sierraron 4G works

Positively (+ve) charged Sierraron 4G particles are attracted to negatively (-ve) charged soil colloids and adsorbed on contact.

This process ensures there is minimal run-off into waterways.

Sierraron 4G is absorbed by weed roots and prevents cellulose biosynthesis at the root growing points, causing death.



Sierraron 4G is about saving you time

Recurrent weeds need recurrent attention, and it's well known that most organizations whose job it is to maintain the appearance and health of industrial and community grounds and parks find weed control a time consuming and endless task.

With minimal potential for run-off or leaching, its granular form is easy to apply, without the risk of spray drift. Sierraron 4G should become part of your preventative weed maintenance programme.

Technical information

Pack size	Formulation	Active constituents	Mode of action group	Poison schedule	Application rates
22.7kg	Granular pre-emergent herbicide	40g/kg Dichlobenil	Group O Herbicide	S6	Rates are situation specific, refer to label

Sierraron 4G application rate recommendations

	Application rate	25kg pack coverage
Garden maintenance For the safe control of most annual, perennial grass and broadleaf weeds	60g/10m²	4,200m²
Established orchards, vineyards	60g/10m²	4,200m²
Established black current, raspberries etc	60g/10m²	4,200m²
Commercial and industrial Paths, paved areas, fence lines etc **Annual weeds** **Perennial weeds**	 180g-250/10m² 250g-370/10m²	 1,200m² 760m²
Paved areas – Swept into the cracks	25g/10m²	10,000m²

Ideally, Sierraron 4G should be applied in Autumn, Winter and early Spring when lower temperature conditions assist in Sierraron 4G's effectiveness.

For further information refer to product labels and Safety Data Sheets (SDS).

Paved areas – Swept into cracks

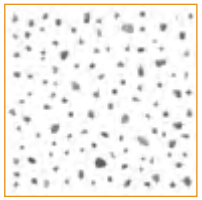
25g/10m²

General rate – Parks & recreation

60g/10m²

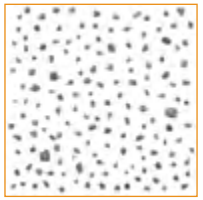
Application rate visual recommendation guide showing actual size granule spread for visual reference when calibrating and applying Sierraron 4G.

Industrial use – Standard rate



180g/10m²

Industrial use – High rate



250g/10m²

It should be noted that Sierraron 4G is not ideal for every situation. As Sierraron 4G works close to the surface, it has little or no impact on deep-rooted and established trees, however Sierraron 4G should not be used near young, recently planted or shallow-rooted plants and shrubs.

Ideal application areas

Councils	
Public playgrounds and community areas	✓
Established gardens	✓
Roadside and paved centre strips	✓
Sporting field perimeters	✓
Landscape contractors	
Community grounds maintenance	✓
School playgrounds and fence perimeters	✓
Tennis court perimeters	✓
New home display centres	✓
Other locations	
Community grounds maintenance	✓
Plant Nurseries – in non-growing areas	✓
Exterior paved shopping walkways	✓
Stadium seating areas where concrete expansion joints can support weed growth	✓
Can be applied before paths and paving are laid down to prevent weeds emerging	✓
Industrial areas	✓

The hidden weed manager

For most other herbicides to be effective, weeds have to first emerge. Spraying them results in unsightly dead weeds and alerts the public that a herbicide has been used.

The advantage of Sierraron 4G is that after the initial weeds are eliminated, it works below the surface, unseen.

Extensive testing by ICL Specialty Fertilizers in Europe has shown conclusively that Sierraron 4G works more effectively to control most common weeds than the treatments used traditionally by councils and commercial landscape contractors.

Consequently, Sierraron 4G has become a standard addition to the weed maintenance programmes of many European councils for over two decades.

Landscape Range

Specify ICL Professional Landscape products and grow your reputation

Largely utilising ICL's unique PACE and Poly-S technologies, our landscape range provides extremely efficient nutrient uptake – minimising the risk of leaching and ensuring these products are safer for the environment.

Landscaper Pro®

Efficient nutrient uptake that's safer for the environment

The Landscaper Pro range largely utilises ICL's unique PACE and Poly-S technologies (see pages 6 and 7 for details). Due to the nutrient uptake being so efficient with both fertilizer technologies the risk of leaching is minimal and therefore these products are safer for the environment.

The Landscaper Pro range

Product Name Elemental Analysis	Technology/ Longevity	Product notes	
Flora 15-3.9-9.1+1.8Mg	**PACE** 5-6 months	Season-long nutrition for garden beds, pots and high-mown turf	
Spring and Summer 20-0-5.8-11.6 +2.1Ca +1.8Mg	**Poly-S** 2-3 months	Strong initial boost coupled with longevity is ideal for maintenance applications	
New Grass 20-8.7-6.6-8.4	**Poly-S** 3 months	Controlled release base feed is ideal for laying new turf or re-sowing	
All Round 24-2.2-6.6-7.6 +1.2Mg	**Poly-S + PACE** 4-5 months	Steady release of nutrients ensures balanced growth and good root development	

Flora

Longevity: 5-6 months. 15kg bag.

Specifically developed for fertilizing garden beds, borders, pots and hanging baskets in a landscape situation. Nutrients are gradually and evenly released throughout the season using PACE technology. Ensuring balanced, healthy plant growth with maximum flowering.

- A single application for entire growing season
- Even growth for healthy plants, profuse flowering
- Added magnesium for good leaf colour

Application rate: 40-80g/m^2 (4-8kg/100m^2)
Bag coverage: 375m^2

Spring and Summer

Longevity: 2-3 months. 15kg bag.

A controlled release fertilizer providing the lawn with all essential nutrients for a fast start to the season. Added magnesium provides for good leaf colour.

- Ideal first application follow up 3-4 times per year
- Fast start, quick green-up
- Revitalises worn lawns
- Suitable for all lawn species including buffalo, all couch grass types, kikuyu and cool season grasses such as rye and fescues

Application rate: 35g/m^2 (3.5kg/100m^2)
Bag coverage: 420m^2

	Nutrient Breakdown																	
	Nitrogen				Total P (% coated)	Total K (% coated)	S	Ca	Mg	Bag sizes (kg)	Application rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	Granule Size mm	Granule dispersal	Turf response
	Total N (% coated)	$N\text{-}NO_3$	$N\text{-}NH_4$	N-Urea								N	P	K	15kg bag			
	15	6.5	8.4		3.9	9.1			1.8	15	40-80g/m² (4-8kg/100m²)	60	15.6	36.4	375	2.0-4.0	10 days (visually dispersed from surface)	10 days
	20 (25%)			20	0	5.8	11.6	2.1	1.8	15	35g/m² (3.5kg/100m²)	70	0	20.3	420	1.3-2.5	8 days (visually dispersed from surface)	7 days
	20 (80%)		4	16	8.7	6.6	8.4			15	35g/m² (3.5kg/100m²)	70	30.5	23.1	420	0.85-2.0	7 days (visually dispersed from surface)	7 days
	24 (80%)	5.3	6.3	12.4	2.2 (45%)	6.6 (65%)	7.9		1.2	15	45g/m² (4.5kg/100m²)	108	9.9	29.7	330	0.85-2.0	8 days (visually dispersed from surface)	7 days

New Grass

Longevity: 3 months. 15kg bag.

Ideal fertilizer when laying new turf or re-sowing. Nitrogen release is controlled thanks to the Poly-S coating. This ensures balanced growth and good root development.

- The high phosphorus content promotes root growth
- The fine granule is ideal for even nutrient distribution
- Safe for young grass, minimal risk of scorching

Application rate: 35g/m² (3.5kg/100m²)
Bag coverage: 420m²

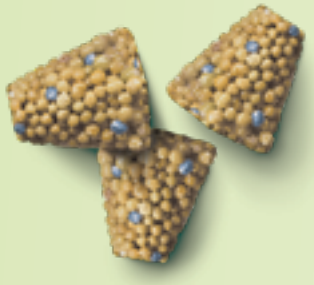
All Round

Longevity: 4-5 months. 15kg bag.

Nutrients in the All Round formula are released gradually through the Poly-S and PACE coating technologies used. The steady release of nutrients ensures balanced growth & good root development. The added magnesium improves grass colour. Perfect for use after moss or weed treatment.

- Mini granule for perfect distribution, simple to combine in maintenance programmes.
- Stimulates the development of young grass into a strong sward.
- Contains magnesium for added grass colour.

Application Rate: 45g/m² (4.5kg/100m²)
Bag coverage: 330m²



Osmocote Exact Fertilizer Planting Tablets

14-3.5-9.1, longevity 8-9 months
14-3.5-8.3, longevity 12-14 months
5g tablet – 1500 tablets/carton

Flexible controlled release fertilizer tablet offering the possibility of giving very accurate dosages of fertilizer in a simple manner. With a clever conical shape, the tablets can be pushed into the growing medium or placed in the planting hole.

- Safe to apply in the planting hole.
- Convenient and easy to use.
- Patented Osmocote Exact technology, safe for the environment with minimal leaching.
- Ideal for use in re-vegetation and landscaping.
- Safe for use in planting out of Australian natives.

Hydraflo 2 Granular soil wetting agent

Assisting in overcoming extremes in weather and hydrophobic soil conditions, Hydraflo 2's improved dual-action formulation delivers both immediate and longer term performance.

This granular formulation can be easily and accurately applied with a HandyPro handheld spreader.

- Safe for use in any season.
- No mixing required- minimizes risk of application mistakes.
- Encourages deeper stronger roots.
- Improves soil drainage and enables greater efficiency of irrigation.
- Inhibits the growth of moss, algae and soil borne pathogens.

Suggested application rate

Pot size		5g Osmocote Exact Planting tablets	Landscape Flora		Hydraflo 2		Hydraflo 2 For lawns & grass areas	
mm	litres		(g)	Spoon Size No.	2g/ Litre	Spoon Size No.	Application Rate	Water Volume
Well rooted tube stock		1	5	1/2 of 1	3	5g spoon	Every 3 months (season long)	
140	1.3	1	5	1/2 of 1	3	5g spoon	20-25g /m²	4 - 6mm
180	3	2	9	No.1	6	No.1	Every 2 months (bi-monthly)	
200	5	3	15	No.3	10	No.3	10-15g /m²	4 - 6mm
250	8	5	24	No.3	16	No.4		
300	12	7	36	No.4	24	No.5		
400	24	14 or use Flora	72	No.6	48	No.6		
500	45	27 or use Flora	135	No.7+No.4	90	No.6 *2		
Larger pot sizes/ Established plants		For each 30cm of plant height or spread, or for each 1.25cm of tree trunk diameter, use:						
For slow growing plants		2	10	1				
For fast growing plants or poor soil situations		4	20	3				

Integrated Turf Management

Increase performance and minimise disease with effective turf management practices

ICL believe that the best turf is created by taking a responsible and well-rounded approach. We know that good turf maintenance requires consideration, understanding and planning.

Our research demonstrates the benefits of combining treatments and this is something we need to adopt as integrated turf management.

Disease identification and control

Disease management approaches to minimising turf diseases with ICL turf solutions

Disease identification and control

Anthracnose

(Colletotrichum graminicola)

This usually attacks Poa annua type species. Occurs during summer following stress caused by factors such as high temperatures, low fertility, dry soil and compaction. Likely to occur under high humidity. The main symptom is irregular shaped and sized patches in which leaves initially yellow then develop a reddish colour following wilting. Diseased plants may be easily removed from the sward and the black rotted plant base easily seen – a highly characteristic symptom of Anthracnose disease. As far as possible, compaction should be avoided by reducing wear over an affected area e.g. keeping the heavy traffic off the turf for a while. Regular aerating and spiking are also beneficial.

In the summer months Anthracnose may be discouraged by timely and moderate Nitrogen applications but do not apply fertiliser in the winter months as this could lead to severe outbreaks of Microdochium Patch disease.

Brown Patch

(Rhizoctonia solan)

Brown Patch occurs during summer, when Nitrogen is high, the weather is humid and the soil is thatchy and poorly drained. Symptoms are rapidly enlarging circular or irregular patches up to 0.5m in diameter. A dark purplish or greyish border may be visible in early morning. Sometimes turf recovers from the centre, resulting in a ring of diseased turf. Brown Patch can be prevented by regular scarification, if necessary, to reduce water-holding thatch.

As Brown Patch is favoured by high Nitrogen fertilization, applications should be light and frequent rather than in one large application.

Damping-off

(caused by a number of fungi including *Microdochium*)

Also known as Seedling Disease, Damping-off affects mainly bents and fescues. Perennial ryegrass is seldom susceptible. Cold, wet conditions in early spring and late autumn favour attacks, as does poorly prepared seedbeds, heavy soil, low fertility, uneven sowings and excessive seed rates.

Dollar Spot

(Sclerotinia homoeocarpa)

This occurs mid-spring to early autumn when an extended period of leaf wetness will encourage the disease. Warm day temperatures and cool nights add to susceptibility. Most likely when Nitrogen fertility is low and growth is poor. Varieties of red fescues, particularly slender creeping red fescue are the most susceptible grass species. Also those fescues found in sea-washed turf.

The main symptoms are numerous small (no more than 50mm) bleached spots which may coalesce to form larger, irregular patches.

Infected leaves appear water-soaked at first, then bleached. Leaf lesions have a characteristically bleached white centre with a reddish-brown border. White 'cotton wool' mycelium may be noted in early morning. Recovery is usually rapid, as roots are not affected.

Maintaining adequate fertility is often the easiest method of preventing attacks of Dollar Spot.

Disease identification and control

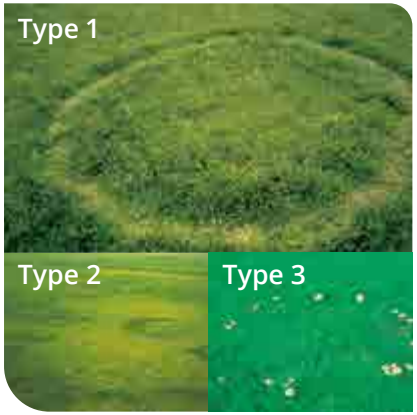
Fairy Rings

(Basidiomycetes)

Fungi primarily colonise thatch at the turf base and/or organic matter within the soil, usually caused by an infrequent watering and fertilizing regime. The rings of stimulated grass growth are the result of Nitrogen released in the soil by the Fairy Rings' activity underground, breaking down organic matter to release ammonia, which is then processed by soil micro-organisms into Nitrates. **There are three Types of Fairy Ring.**

Type 1 Fairy Rings (*Marasmius oreades* fungus) typically appear as a ring of dead or stressed turf, bordered on both inner and outer edges by a band of stimulated grass growth. New rings can appear just as green 'patches'. Prevalent in hot, dry conditions, it may cause turf death by soil water repellency and/or toxic substances.

Type 2 Fairy Rings (*Agaricus* spp. and *Lycoperdon* spp.) of stimulated grass growth are seen normally without fruiting bodies. It is rare that excessive damage is caused to the turf.



Type 3 Fairy Rings (*Hygrophorus* spp. and *Psilocybe* spp.) have no distinct affect on turfgrass except when the fruiting bodies are present (normally during the autumn) when they form rings of mushrooms or puffballs. These obviously affect the quality of the sports surface.

Leaf Spot or Melting Out

(Drechslera poae)

Occurs during warmer seasons. Turf under drought stress, high Nitrogen and a close mowing regime is most susceptible, especially if the foliage remains wet for an extended period. These pathogens commonly cause disease.

Affected turf exhibits a general browning and melting out (thinning) resembling damage from drought. A closer inspection may show die back of the leaf tip, with the browning gradually extending down the leaf and subsequent shrivelling.

Circular lesions with dark brown margins and tan centres may be seen on the leaf. The crown and sheath can rot, which can result in thinning of the turf.

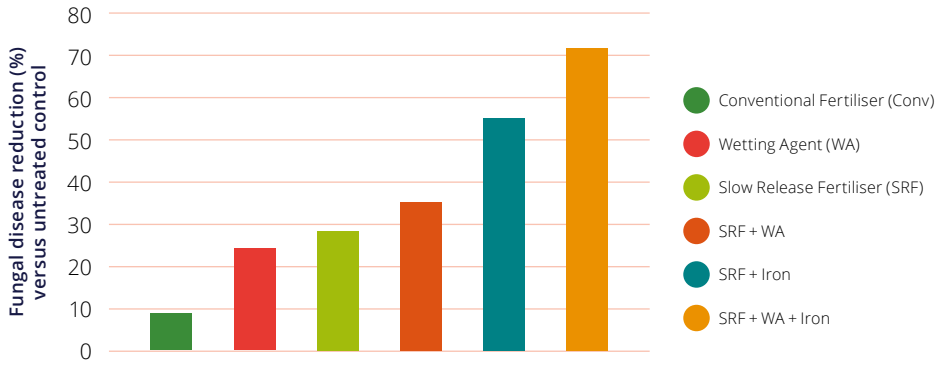
It is difficult to give general advice about Leaf Spots and Melting Out. It is recommended that advice is sought from a local ICL Technical Manager.

A program of SierraformGT, Hydraflo and Iron effect has shown to reduce disease occurrence and severity by over 70%

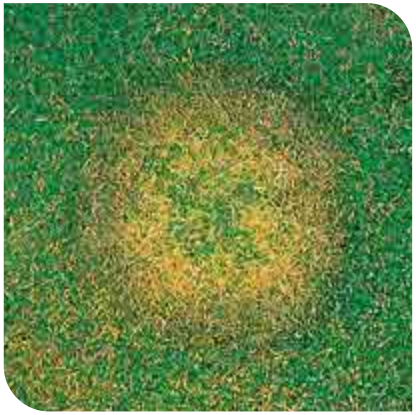
STRI

A replicated trial at STRI, UK (Nov 07 – Mar 09) showed the following graphed results.

Average Fungal disease reduction (%) compared to untreated control (Nov 07 – Mar 09)



Disease identification and control



Microdochium Patch

(Formerly known as Fusarium Patch)

(Microdochium nivale)

Occurs late autumn and early spring during cool humid weather, high Nitrogen fertility and on thatchy poorly drained soil. The disease is discouraged by high Potash and Sulphate levels and acidic conditions. The main symptom is rapidly developing circular patches of 25-50mm diameter. Leaves become brown and mushy. Sometimes pink or white cobweb-like fungal threads can be seen in early morning. To control Microdochium Patch – promote good turf management. Your aim is to promote healthy, vigorous growth. Fescue and Browntop bents are much more resistant to the disease.

Moisture control to avoid humid surface conditions will do much to prevent disease attack. Regular aeration and careful application of fertilisers with an appropriate sandy topdress will make the surface less moisture-retentive. Reducing water holding thatch is also beneficial. Returned clippings provides a substrate for disease development, so catch and remove the grass. Taken care when applying fertilisers as excessive Nitrogen combined with cool wet weather can lead to severe disease outbreaks.

Red Thread

(Laetisaria fuciformis)

This can occur anytime of the year, in shady, poorly aerated, compacted soils and a lack of Nitrogen. Particularly summer and autumn under warm moist conditions. The main symptoms are irregular patches of light brown or bleached leaves covered with distinctive red threads.

Pink patch lacks the characteristic 'Red Threads'. Instead leaves may become coated with pink mycelial growth. Whilst red thread may occur alone, it often occurs as a disease complex with pink patch. Severe outbreaks may kill the grass but generally affected turf will recover adequately.

Rust

(Puccina spp, Uromyces spp)

There are many rust diseases of turf grasses. Susceptible species to this are Perennial ryegrass and Poa pratensis. This can occur all year round but most commonly from early summer to late autumn, during mild humid weather, low fertility and infrequent mowing regimes. The affected turf appears rust-coloured, due to the production of numerous yellow or orange spores on the leaf. Spores adhere to fingers when rubbed.

Conditions that favour rusts are warm, humid summers. Most often seen in long grasses.

Regular mowing will help to discourage rust attack. Ensure adequate fertility in particular with regard to Nitrogen.

Slime Mould

(Myxomycetes)

This does not cause any turf damage. It occurs mid autumn to mid spring. Favourable conditions are cool, wet weather which promotes fruiting body formation. They quickly disappear in dry weather. It is more common in thatchy turf. The main symptom is masses of pinhead-sized, rounded fruiting bodies suddenly appearing on leaves during cool, humid conditions. Fruiting bodies can be of various colours, but are most commonly grey, purplish-brown or white. They are easily rubbed off by fingers.

Where there are slight infestations only, control measures are not needed. Heavy infestations may be removed by mowing. Pesticides are not normally recommended, but applications of fertiliser containing Iron sulphate would probably limit the spread of slime moulds.

Disease identification and control

Take-All Patch

(Gaeumannomyces graminis)

Take-All Patch occurs mid-spring or early autumn. Conditions favouring the disease include sterile soil conditions (such as newly constructed sand greens), poor aeration, & high alkalinity. Patches of bronzed Agrostis up to 30cm diameter with centres colonised by fescues, Poa annua or broad-leaved weeds are characteristic. Centres may be slightly sunken. Turf takes a long time to recover. Consequently, all efforts must be directed at preventing outbreaks.

Firstly, recognise the situation in which Take-All Patch is likely to occur. Avoid applying lime unless it is absolutely necessary. Ascertain if the water supply has a high lime content.

Apply fertilisers containing Iron and/or Ammonium Sulphate to acidify the turf surface. Maintain good turf vigour by maintaining an adequate supply of other nutrients.

Thatch Collapse

(Basidiomycete)

All turfed areas are susceptible to excessive thatch and it can occur right throughout the year. Excessive thatching can be induced by heavy liming. Circular patches up to 500mm diameter can form where the surface of the green sinks due to decomposition of the thatch layer. Sometimes turf in the affected areas undergoes colour change to a darker green or yellow.

The affected thatch may also change colour, to orange, whitish or black. White mycelium may also be visible in thatch.

Physical causes of thatching may be alleviated by additional aeration on the areas worst affected. Commercial wetting agents, e.g. Hydraflo, specifically designed for use on turf are available from ICL. Wetting agent applications should begin at the start of the growing season.

White (Grey) Snow Mould

(Typhula incarnata)

Strictly a cold weather disease, White Snow Mould appears as a fluffy white/grey or pink residue caused by the Typhula fungi. The fungi spend the warmer months as sclerotia embedded in infected grass blades and in the turf canopy. Sclerotia are very small black to orange structures that can survive hot, dry conditions. Heavy moisture and near-freezing temperatures trigger germination of sclerotia and infection of grass plants. A situation that often produces these key conditions is a deep snow or heavy mulch covering wet turfgrass before the ground has frozen. It invariably seems to follow a retreating snow line. White snow mould activity will be slowed when the snow cover is gone due to winter thaws, but the activity will resume every time it snows, regardless of whether it is a light flurry or heavier snow. Injury to the turf is aggravated when the snow is compacted by walking, etc.

Yellow Tuft

(Sclerophthora macrospora)

All turf species are susceptible, occurring during spring and summer when the plant is actively growing combined with poorly-drained soils and over-watering. Individual plants form into a dense tuft of yellow leaves, resulting in a bumpy surface during spring and autumn. To control yellow tuft, improve surface drainage. Yellow tufts are removed by mowing.

Maximising turf health through effective disease management practices

Turf health can be impacted by eight key factors. Too much or too little of each can reduce plant health, making turf susceptible to disease and excess wear and tear.

By assessing and balancing these eight factors, the ideal programme can be implemented and maintained.

Cultural practices

- Encourage a healthy grass sward
- Optimum nutritional inputs based on objectives and soil analysis needs
- Reduce thatch
- Increase aeration/reduce compaction
- Improve drainage
- Minimise damp turf for prolonged periods (irrigation, dew removal, manage irrigation inputs, reduce shade)
- Encourage disease resistant grasses

Spraying

- Disease identification
- Use correct fungicide for the right disease
- Use appropriate mechanical operations, eg appropriate nozzles, boom height indicators, calibration equipment etc
- Calibrate the sprayer using sprayer guidelines or a specialist contractor
- Look at weather information and disease prediction services

Using Fungicides

- Choose the right fungicide
- Identify the disease and use the appropriate product
- Adopt an appropriate preventative or early curative programme
- Always alternate fungicides as part of a disease resistance management approach

Algae

Problem

- Algae is normally found in cool, shady moist conditions.
- Many species are capable of fixing atmospheric Nitrogen.
- Turf with poor density is susceptible to algae infestation.
- Causes of poor density could be under fertilization, over-watering, scalping from mowing and shady conditions.
- Algae damages turf in terms of aesthetics, competition, and via its mucilage excretions that seal the surface which then leads to reduced infiltration and decreased atmospheric gas exchange.

Solution

1. The first step should be to create an environment which is unsuitable for the growth of algae.
2. Increase airflow and light.
3. Increase water movement and infiltration.
4. Adjust irrigation practices to allow the surface to dry out.
5. Using wetting agents with a good penetrant activity will help to remove surface moisture.
6. Raise mowing height where possible to allow turf to outcompete algae.
7. Ensure turf is healthy via a good nutritional programme so that is has a competitive advantage.
8. Use of fertilizers containing ferrous sulphate will act directly upon the algae.
9. Control thatch in a programmed approach.
10. Regular aeration.
11. Once environmental conditions have been adjusted, use an approved Plant Protection Product.

Product type	Why	ICL products
Slow or controlled release fertiliser	Promote balanced growth to create conditions less likely for Algae growth.	SierraformGT, Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf
Penetrant wetting agent	This will move water away from the surface creating drier surface conditions less suitable for algae growth.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Ferrous sulphate containing fertiliser	Lowering surface pH creates conditions less favourable for algae growth.	Greenmaster Liquid Effect Fe

ICL Turf Management Solutions

Anthracnose

Problem

- Anthracnose attacks grass plants (normally only *Poa Annua*) when they are under environmental stress.
- Disease triggered by low nutrition and compaction leading to reduced turf vigour.
- Once disease reaches the basal rot stage fungicides are no longer effective for control of disease but should be applied to prevent further attack.

Solution

1. Turf should have sufficient nutritional input coming into the end of the growing season.
2. Using a slow release fertilizer late in the season ensures that adequate nutrition is in the soil to promote a healthy turf.
3. Avoid low heights of cut.
4. Minimise mechanical cultivation during periods of stress.
5. Aerate to relieve compaction and improve oxygen levels.
6. Minimise *Poa Annua* population in sward.
7. Over-seed with less susceptible varieties.
8. Irrigate in the morning to minimise long periods of leaf wetness overnight.
9. Use penetrant wetting agents to move water through the soil profile and to keep the surface dry.
10. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Quality fertilizer	Promotes healthy turf. Plants more resilient to disease attack.	Greenmaster Pro-Lite, SierraformGT, Greenmaster Liquid
Slow release fertilizer	For spoon feeding over a prolonged period.	SierraformGT
Penetrant wetting agents	Use Hydraflo to ensure good water movement from the surface.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Approved fungicide	Controls disease.	Registered product for this use
Plant Growth Regulator	Strengthen and pre-stress condition plants.	

Black Layer

Problem

- Black Layer can have serious consequences on turf health.
- Black Layer only occurs in anaerobic soil conditions.
- It is caused by a physical condition of the soil.
- If soil drainage is insufficient it is likely that anaerobic conditions will develop and encourage Black Layer.
- Anaerobic bacteria produce Hydrogen sulphide gas, which has a characteristic 'rotten egg' smell.
- Hydrogen sulphide (H_2S) is poisonous to grass plant roots.
- H_2S reacts chemically with metal elements such as Iron (Fe), creating black deposits, which form layers within the soil.

Solution

1. To control Black Layer it is essential that you treat the cause of the problem and not just the symptoms.
2. Use a good quality root zone material.
3. Minimise layering in the soil profile through compatible top dressing and mechanical action.
4. Minimise thatch in a programmed approach.
5. Minimise compaction and soil panning.
6. Use penetrant wetting agent to improve water through the root zone.
7. Sulphur does not cause Black Layer. Sulphur is an essential grass nutrient.
8. Potassium nitrate does not prevent 'Black Layer'. Continued use of Potassium nitrate may cause soil deflocculation, which could increase the risk of 'Black Layer' (J.B. Beard).
9. Continue normal programme but ensure good cultural practices.

Product type	Why	ICL products
Liquid fertiliser applied as a foliar	Black Layer causes poor soil structural conditions so plants are unable to take up soil based nutrition.	Greenmaster Liquid
Penetrant wetting agent	To improve water flow through the root zone and to improve soil aeration.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo

ICL Turf Management Solutions

Cold Management

Problem

- Temperature is an important factor in determining the growth rate of turf. In low temperatures, grass growth will slow and eventually become dormant; in very low temperatures the turf may be damaged.
- Exposure to cold temperatures can cause water to freeze within the plant, a process that can lead to ice crystals forming in and around the cells, with the potential to cause plant cell damage.
- As ice crystals form around the cells water can be drawn out from individual cells. Plant cells will die from desiccation if enough water is lost. This form of freeze damage often occurs during periods of thaw or in late winter, and is commonly referred to as crown hydration injury.
- Suffocation or anoxia can also damage turf that is encased in ice or is under some type of impermeable cover for an extended period.
- Soil microbes and plants under ice cover utilise oxygen as they respire – resulting in anaerobic conditions as oxygen is depleted.

Solution

1. Raise cutting height in late summer to increase photosynthesis potential and ability to produce carbohydrates and develop an improved root system.
2. Minimise shade where possible to maximise carbohydrate production. Turf growing in shade also has higher moisture content and a reduced cell thickness.
3. Harden turf coming into winter by appropriate use of fertilisers. Use fertilisers with low Nitrogen: high Potassium ratios to harden turf.
4. Increase aeration / reduce compaction to encourage better rooting and to help diffuse toxic gas during winter months.
5. Improve surface drainage to minimise prolonged ice cover and freeze injury.
6. Irrigate sparingly in autumn to reduce plant hydration – allowing plant to tolerate dehydration in cold winters.
7. Select cold tolerant grass species and cultivars.

Product type	Why	ICL products
Slow or Controlled release Nitrogen fertilisers	Encourage more balanced growth to maintain healthier turf in low temperature conditions. Slow release Methylene urea (MU_2) Nitrogen fertilisers and controlled release fertilisers (Poly-S and PACE) ensure that Nitrogen is not released in cold conditions.	SierraformGT, Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf
Slow release Potassium fertilisers	Slow release Potassium fertiliser ensures Potassium is not leached out of root zone in wet winter months.	SierraformGT
Carbohydrate and seaweed biostimulant	To supply a direct source of carbohydrates to the plant and to encourage a better root system.	Sportsmaster WSF Seaweed
Plant Growth Regulator	Reduce vertical growth to minimise etiolation so the plant can re-direct its energy resources for lateral growth.	Registered product for this use
Cold tolerant grass species and cultivars	Select cultivars that are tolerant to low temperatures to optimise performance in cold conditions.	

Dollar Spot

Problem

- Fescue (*Festuca*) is perceived to be the most susceptible.
- Spots 25-50mm in diameter; distinct straw coloured sunken spots; leaf lesions have a bleached white centre and reddish brown borders; some mycelial growth may be visible in early morning.
- Disease triggered by:
  prolonged periods of leaf wetness; moderately dry soil; humid with temperatures of 21-26°C; morning dews; low to deficient Nitrogen (N) fertility; excessive thatch; frequent mowing.

Solution

1. Reduce periods of leaf wetness.
2. Maintain balanced nutritional inputs to prevent and aid recovery.
3. Aerate to ensure that root zone is not compacted.
4. Manage thatch levels in a programmed approach.
5. Box-off cuttings from affected areas if possible.
6. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Penetrant wetting agents	Reduce periods of leaf wetness.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Water conserving wetting agents	To ensure uniform wetting of the soil profile.	H2Pro TriSmart, H2Pro AquaSmart, Hydraflo
Quality fertilizers	To encourage a healthy sward.	Select from ICL Range
Nitrogen containing fertilizers	Can help to prevent disease and to aid recovery.	Greenmaster Pro-Lite Spring & Summer, SierraformGT Momentum, Greenmaster High N
Approved fungicides	To prevent or cure disease outbreaks.	Registered product for this use

ICL Turf Management Solutions

Drought Management

Problem

- Water resources are very valuable and becoming scarcer.
- Possibility of drought is increasing due to access to quality water sources, cost of water, climate change and legislation.

Solution

1. Maintain a good soil structure and composition.
2. Monitor water quality.
3. Maximise water absorbency in the soil.
4. Help turf regulate water uptake and losses.
5. Develop a good root system.
6. Maintain low salt levels in the soil.
7. Aeration programme to encourage deep rooting.
8. Topdress with appropriate material to avoid layering and avoid irregular water movement.
9. Avoid topdressing during periods of stress.
10. Use wetting agents to avoid hydrophobic conditions prior to the onset of drought.
11. Raise the height of cut where possible.
12. Use pedestrian operated instead of ride-on machinery to reduce soil compaction.
13. Select drought resistant grass varieties.
14. Balanced fertilizer to improve root growth and turf health.

Product type	Why	ICL products
Wetting agents	Conserve water, make more water available, encourage deeper rooting.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Potassium fertilizers	Potassium (K) regulates water loss.	Select from ICL Range
Slow release Nitrogen and Potassium fertilizers	Slow release N encourages harder growth and improved rooting. Slow release K ensures the plant is able to maintain water regulation over a longer period of time.	SierraformGT K-Step and Anti-Stress
Calcium fertilizers	Calcium helps strengthen plant cell walls and helps maintain plant vigour during drought periods.	Greenmaster Liquid Ca-Booster
Low Salt Index fertilizers	Reducing salt input maximises soil water available to turf.	All ICL fertilizers use low salt index nutrients
Low chlorine content fertilizers	Minimise Cl-accumulation in leaf tissues that can increase risk of scorch and desiccation.	Select from ICL Range
Plant growth regulator	Encourage greater root development.	
Porous topdressing material	Open cage structure of Pro-Lite allows increased water holding in soil.	Greenmaster Liquid Effect Iron FE

Earthworms

Problem

- Earthworms have an important role in helping to aerate soils, reducing compaction, improving water penetration & infiltration rates, processing organic matter and reducing thatch.
- Earthworms come to the surface under moist soil conditions (eg in late autumn & winter) & retreat downward in dry weather.
- However, some species of earthworms leave casts on the turf surface and this has many negative effects:
  - Aesthetics
  - Uneven surface levels
  - Weed invasion more likely as casts may bring dormant weed seed to the surface or by wind blown seeds landing on casts and germinating.

Solution

1. Reduce thatch in programmed approach to minimise food source for earthworms.
2. Minimal use of organic amendments.
3. Lower soil surface pH to discourage earthworm activity by using acidifying fertilisers.
4. Encourage drier surfaces through aeration and verticutting etc.
5. Minimise amount of clippings returned to soil (organic material) by the use of slow release fertilisers and/or Plant Growth Regulators.
6. Using a wetting agent with strong penetrant activity will ensure that moisture moves from the surface and down the soil profile making surface casting less likely.

Product type	Why	ICL products
Acidifying fertilizer	Reducing soil surface pH will discourage earthworms from surfacing & producing casts.	Greenmaster Pro-Lite
Acidifying fertilizer with slow release	Reducing soil surface pH will discourage earthworms from surfacing and producing casts, while the slow release nutrition will minimise excessive top growth and hence reduce potential food source for worms.	SierraformGT
Penetrant wetting agent	Encourage water movement away from surface down through the soil profile making surface less appealing to earthworms.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Plant Growth Regulator	Minimise clipping return by up to 50% and reduce food source for earthworms.	

ICL Turf Management Solutions

Fairy Rings

Problem

- Although not always necessary or appropriate to control Fairy Rings, they can be troublesome on many turf types.
- Decayed organic matter and high levels of thatch can favour disease development.
- Usually caused by infrequent watering and fertilizer regimes.
- The rings of stimulated grass growth are the result of Nitrogen released in the soil by the Fairy Ring activity underground breaking down organic matter to release ammonia.
- The ammonia is processed by soil micro-organism into nitrates.

Solution

1. Try to minimise those conditions which favour disease development.
2. Control thatch in a programmed approach.
3. Apply wetting agents that have a penetrant activity and will help to move water through the hydrophobic layer to help cure the symptoms of the disease.
4. Wetting agents should be used in combination with deep aeration.
5. To prevent spreading pathogen use solid rather than hollow tines.
6. If required, Nitrogen fertilizers can be used to mask the visual symptoms of light and dark green rings.
7. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Wetting agent	To alleviate hydrophobic conditions caused by the fungus.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Quality liquid or water soluble fertilizer	Used to quickly mask the symptoms.	Greenmaster Liquid, Sportsmaster WSF
Approved fungicide	To control disease.	Registered product for this use

The 3 main types of Fairy Rings

Type 1
Marasmius oreades
Ring of dead turf bordered by stimulated turf growth. Causes turf death by soil water repellence and/or toxic substances.

Type 2
Agaricus & Lycoperdon spp
Stimulated grass growth with no fungal bodies. Rarely causes excessive damage to turf.

Type 3
Hygrophorus & Psilocybe spp
No affect on turf grass except when fruiting bodies are present (normally in autumn).

Green Speed

Problem

- Fast greens are sometimes perceived to be good greens but this is not necessarily the case.
- Trueness and consistency across all greens is more important than speed.
- Average mowing heights in the summer months are between 3-5mm and slightly higher in the winter months.
- Although cutting greens lower and rolling can increase green speed, these practices can, over time, encourage undesirable coarse grasses such as *Poa annua*, moss and algae.
- A Stimpmeter is a device that measures Green Speed.

Solution

1. Greens can be managed to produce firm, true putting surfaces without the need to cut them down to excessively low heights. Treatments include: light/frequent top dressing, regular verticutting treatments, balanced nutrient input.
2. Occasional light rolling can help to increase green speed without the need to lower the cutting heights (treatments should be used in conjunction with an appropriate aeration programme).
3. Use low Nitrogen inputs to harden turf growth.
4. Slow release nutrients will not give surge growth and will therefore improve green speed consistency between mowing.
5. Calcium fertilizers strengthen cell walls and improve green speed.
6. Use Plant Growth Regulators to increase green speed and improve consistency during the day.
7. Double mowing especially prior to tournaments.
8. Irrigation should be kept to minimum required for healthy turf growth.
9. Remove surface dew.

Product type	Why	ICL products
Slow release fertilizer	No flush of growth, low nutrient inputs and good balance between shoot and root growth.	SierraformGT
Liquid fertilizer	Spoon feeding low nutrient inputs creates harder turf growth and faster greens	Greenmaster Liquid
Plant Growth Regulator	Minimising top growth and improving consistency between mowing will increase green speed.	
Penetrant wetting agent	Product will move water away from surface ensuring it is firm and dry.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Calcium fertilizer	Calcium enhances cell strength and makes plant more rigid.	Select from ICL Range

ICL Turf Management Solutions

Leaf Spot / Melting Out

Problem

- Occurs during warmer seasons, high humidity, drought conditions, wet foliage, high shade levels, conditions typical of a stadium environment.
- Moves across the surface on water film.
- Mainly prevalent on *Lolium Spp,* but can also be found on *Festuca Spp* and *Agrostis Spp.*
- Leaf Spot phase does not usually damage plants significantly.
- Crown infected plants turn yellow and die as temperatures increase; this is referred to as the melting-out phase of the disease.

Solution

1. Minimise surface wetness.
2. Increase airflow.
3. Balanced nutrition promotes harder turf more resistant to disease attack.
4. Remove excess thatch in an integrated programme.
5. Use resistant cultivars.
6. Raise the height of cut to avoid stress if less than 50mm.
7. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Penetrant wetting agent	Remove surface moisture.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Controlled release fertilizers	Ensures turf is never starved of nutrient, thereby creating conditions where Leaf Spot is less likely to occur and plants are assisted in recovering from the disease	Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf
Approved fungicide	Control disease.	Registered product for this use

Microdochium Patch

Problem

- Circular patches up to 300mm in diameter.
- Leaves become water soaked, turn reddish-brown and then bleach.
- Pink mycelia may be visible in early morning.
- Develops under various conditions: wet, humid, cool (0-15°C); high Nitrogen (N) fertility in autumn and excessive thatch.

Solution

1. Do not apply excessive amounts of Nitrogen during high-risk periods susceptible to disease attack.
2. In autumn use fertilizers with a high K to low N ratio.
3. Spoon feeding Nitrogen (either through liquids or slow release fertilizers) will avoid soft growth.
4. Control excessive thatch through programmed approach.
5. Avoid surface moisture.
6. Increase aeration.
7. Increase airflow.
8. Use acidifying fertilizers.
9. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Approved fungicide	Control disease	Registered product for this use
Acidifying fertilizer	Reducing soil surface pH will make conditions less favourable for pathogen.	Greenmaster Pro-Lite, Greenmaster Liquid, SierraformGT
Penetrant wetting agent	Reduced surface moisture.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Long lasting liquid iron	Reducing soil surface pH will make conditions less favourable for pathogen.	Greenmaster Liquid Effect Iron FE

ICL Turf Management Solutions

Moss

Problem

- Mosses are normally found in cool, shady, moist conditions.
- Little soil is required by the moss for nutrient extraction.
- Turf with poor density is susceptible to moss infestation.
- Causes of poor density could be under-fertilization, over-watering, scalping from mowing and shady conditions.
- Moss damages turf in terms of performance, aesthetics, and competition, creating vulnerability to wear and allow conditions for weed invasion.

Solution

1. The first strategy should be to create an environment that is not naturally suitable for the growth of moss.
2. Increase airflow and light.
3. Increase water movement and infiltration, adjust irrigation practices to allow the surface to dry out.
4. Using wetting agents with a good penetrant activity will help to remove surface moisture.
5. Raise mowing height where possible to allow turf to outcompete moss.
6. Ensure turf has a healthy competitive advantage over moss through good nutritional programmes.
7. Use fertilisers containing ferrous sulphate that will act directly upon the moss.
8. Control thatch in a programmed approach.
9. Once environmental conditions have been adjusted then use an approved Plant Protection Product.
10. Physically remove dead moss through scarifying.

Product type	Why	ICL products
Slow or Controlled release fertilizers	Encourage more balanced growth to maintain healthier turf able to outcompete moss.	SierraformGT, Sierrablen, Sierrablen Plus, Sportsmaster CRF
Ferrous sulphate containing fertilizers	Ferrous sulphate kills moss via an acidification effect.	Greenmaster Liquid Effect Iron Fe
Penetrant wetting agent	This will move water away from the surface creating drier surface conditions less suitable for moss growth.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo

Nutrition – Greens

Problem

- The greens of a golf course are the single most important area of turf so their appearance and performance are critical.
- The green should have a healthy appearance and be as uniform as possible across each individual green and from green to green.
- The surface should be firm and the ball should run true when putting.

Solution

1. Use soil analysis results as a base for determining a nutrient programme.
2. Use a combination of granular and liquid applied fertilizers.
3. Use granular fertilizers as a core nutrient programme.
4. Provide supplementary nutrition via liquid applications.
5. Avoid excessive nutrient applications.
6. Adapt the nutrient programme according to commonly occurring diseases (refer to *Disease identification and control*, pages 58 to 61).
7. Overseed at regular intervals with quality seed to maintain desired sward composition.

Product type	Why	ICL products
Micro granulated fertilizer	To ensure even distribution of granules across the area and to avoid mower pick-up.	SierraformGT, Greenmaster Pro-Lite
Homogeneous granular fertilizer	To ensure even distribution of nutrients across the area and to maintain uniform growth and performance.	SierraformGT, Greenmaster Pro-Lite
Slow release Nitrogen fertilizer	To avoid growth surges that can create an imbalance between leaf and root growth. Slow nutrient release means less growth between mowing and this can help to maintain quicker green speeds with a lower height of cut.	SierraformGT
Slow release Potassium fertilizer	Slow release Potassium allows sufficient K to be applied to aid wear tolerance, water management and tolerance to environmental stresses without creating soil nutrient imbalances from using excessive conventional K sources.	SierraformGT
High-quality liquid-applied fertilizer for foliar uptake with readily-available nutrients	Use liquid applied nutrition to complement the core granular base feed.	Greenmaster Liquid
Plant Growth Regulator	Reduce vertical growth and promote lateral and root growth to create a stronger harder turf.	
Quality grass seed	Seed with the best cultivars and overseed to maintain the desired sward composition.	

ICL Turf Management Solutions

Pythium Blight

Problem

- Primarily affects cool season grasses.
- Common in hot summer weather (29-35°C) with little air movement and high relative humidity. Can occur at lower temperatures (20°C) when other environmental factors are suitable.
- Water logged, poorly drained turf is particularly susceptible.
- In warmer climates can also attack Bermuda grasses.
- Lush over-fertilized turf susceptible to attack.
- The disease spreads rapidly and can destroy large areas overnight.
- First appears as rough circular patches from a few centimetres up to 15cm in diameter.
- Grass plants within affected area look dark, slimy, greasy and often mat together.
- May be covered in white mycelium.
- The infection can look streaked as it follows channels of natural drainage and paths of mowing equipment.

Solution

1. Avoid water-logging of the soil.
2. Use irrigation appropriately to avoid excess soil moisture.
3. Regular aeration to develop good soil structure.
4. Use a top-dressing programme.
5. Avoid excess nutrition.
6. Reduce thatch.

Product type	Why	ICL products
Slow or controlled release fertilizers	Avoid excessive nutrition that can encourage Pythium Blight.	SierraformGT, Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf
Penetrant wetting agent	Encourage movement of excess soil surface moisture down the soil profile.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo

Red Thread

Problem

- Red Thread occurs mostly on turf where there is a low soil Nitrogen level
- However, there are cases of nutrient independent Red Thread attacks.
- Light brown spots can be seen on turf, which have a reddish appearance.
- Red mycelial growth extends out from lesions in leaf.
- Compacted soils or conditions where poor rooting is likely, can increase disease occurrence.

Solution

1. Red thread is an indicator of low nutrition, especially Nitrogen.
2. The first approach should be to prevent this situation arising by applying adequate Nitrogen fertilizer as part of a programmed approach.
3. Apply the correct fertilizer according to turf situation and height of cut.
4. Aerate soil to encourage good root growth.
5. Select resistant grass cultivars.
6. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Controlled release fertilisers	Ensures turf is never starved of nutrient and therefore can create conditions whereby Red Thread is less likely to occur.	Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf

ICL Turf Management Solutions

Salt Affected Soils

Problem

- Caused by an increase in salt ions; calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}), potassium (K^{+}), chloride (Cl^{-}), sulfate (SO_4^{2-}), bicarbonate (HCO_3^{-}), nitrate (NO_3^{-}), carbonate (CO_3^{2-}) (at pH >9.0).
- Salt ions come from; dissolution of minerals, irrigation water, fertilizers, soil amendments, high water table, salt water spray, insufficient leaching.
- High soil salt levels cause the following problems: water deficit, ion toxicity, ion (nutrient) imbalances & poor soil permeability.
- Salt affected soils are classed as: Saline (high salts), Sodic (high Sodium) or Saline-Sodic (high salt and sodium).

Solution

1. Assess the site to evaluate potential risk.
2. Restrict salt addition through the choice of fertilizer type.
3. Use salt tolerant grass cultivars.
4. Leach salt out of root zone.
5. Check (and amend if possible) water quality.
6. Ensure nutrients are in balance.
7. Encourage good rooting.
8. Monitor situation and adapt as required (season specific).

Product type	Why	ICL products
Slow release Nitrogen and Potassium fertilizers	Encourages deeper rooting so turf more likely to find better quality water.	SierraformGT
Low salt index conventional fertilizers	Minimise salt inputs into root zone to reduce soil electrical conductivity (EC) levels.	Greenmaster Pro-Lite
Low salt index slow release fertilizers	Salt inputs will be further reduced if nutrients are delivered gradually over time.	SierraformGT, Sierrablen Plus
Quality liquid fertilizers	Foliar application using low water volumes ensure nutrients taken up directly by plant and not via soil which could add to salt levels.	Greenmaster Liquid
Use foliar feeds in stress conditions	Foliar feeds can change the cations of Na in the leaf with Ca, K and/or Mg to get better nutrient balance.	Use Greenmaster Liquid and Step Liquid
Calcium fertilizer with nutrient uptake activator	Calcium displaces Sodium (Na) ion from cation exchange sites in sodic soils.	
Organic based fertilizer with low salt index	Organic material can improve the exchange of cations Na-Ca-K-Mg.	
Penetrant wetting agent	Encourage water and salt movement down through the soil profile to reduce surface salt levels.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Use salt tolerant grass cultivars	These varieties are able to withstand high salt levels.	

Shade

Problem

- Low light reduces photosynthesis which in turn reduces carbohydrate production and rooting.
- In low light conditions, plants naturally grow upwards in order to outcompete other plants and capture more light.
- When the low light is caused by permanent shading (not caused by competing plants) then this can also cause etiolation.
- Etiolation causes long, stretched out growth producing weak plants.
- The causes of shading (trees/buildings) are also likely to reduce air movement therefore meaning the turf surface stays wet for longer which can potentially increase disease occurrence.
- Turf growing in shade also has a thinner leaf cuticle which can make the plant more susceptible to disease attack.

Solution

1. Where possible manage the environment to reduce the amount of shade.
2. Encourage the turf to grow without excessive vertical growth and encourage better rooting.
3. Reduce Nitrogen inputs versus full sun areas.
4. Reduce irrigation compared to full sun areas.
5. Dry surface with use of penetrant wetting agent.
6. Aerate well to encourage good rooting and movement of surface water.
7. Increase carbohydrate levels in plant.
8. Select shade tolerant grass cultivars.

Product type	Why	ICL products
Shade tolerant grass cultivars	Promotes healthy turf plant more resilient to disease attack.	
Plant Growth Regulator	Reduce vertical growth to minimise etiolation so plant can re-direct its energy resources for lateral growth.	
Slow or controlled release fertilizers	Encourage more balanced growth to maintain healthier turf in low light conditions.	SierraformGT, Sierrablen, Sierrablen Plus, Sportsmaster CRF, ProTurf
Carbohydrate and seaweed biostimulant	To supply a direct source of carbohydrate to the plant so increasing stress tolerance in low light conditions.	Sportsmaster WSF Seaweed
Penetrant wetting agent	Avoid excessive surface moisture caused by low evapo-transpiration in shaded areas.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo

ICL Turf Management Solutions

Take-All Patch

Problem

- Take-All Patch is most commonly found on newly constructed sand based greens.
- Soils with low CEC, poor Nitrogen fertility and with a high pH (>6.5) are suitable conditions for Take-All Patch to take hold.
- Take-All Patch primarily attacks Bent (*Agrostis*) grasses.
- Circular patches/rings are created where the Agrostis species have been killed off allowing invasion of weeds species.
- Over time, with correct management, Take-all decline is likely to occur due to build-up of natural antagonists whereby the diseases become less severe.

Solution

1. Ensure good availability of nutrients in poor nutrient holding soils.
2. Try to reduce pH of soil so that conditions are less favourable to pathogen.
3. Increase biological activity in the new sand environment so that there are more natural antagonists to the pathogen.
4. Manganese (Mn) has been shown to be effective as part of an integrated approach.
5. Check water quality for pH and nutrient levels.
6. Use acidifying fertilizers.
7. Avoid Potassium nitrate, which increases soil surface pH.
8. Check topdressing pH.
9. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL products
Slow release fertilizers (NPK + trace elements)	Ensure maximum availability of nutrients in low nutrient holding soil.	SierraformGT
Manganese fertilizer	Manganese has been shown to be effective as part of an integrated approach.	SierraformGT Spring Start, Momentum, All Season, NK, K-Step, STEP Hi-Mag, Greenmaster Liquid range (except Effect Iron FE)
Acidifying fertilizers	Lower soil surface pH.	SierraformGT, Greenmaster Pro-Lite, Greenmaster Liquid
Approved fungicide	Use fungicide as part of an integrated programme.	Registered product for this use

Thatch

Problem

- Thatch is the organic layer below the green leaf material of the turf and above the soil itself.
- Excess thatch occurs when new tissue develops at a rate quicker than soil microbes can break it down.
- Thatch can hinder root development.
- Thatch provides a good environment for turf pathogens and insect pests.
- Thatch removes the buffering effect of soil on rapid changes of air temperature around the crown of the plant.
- Thatch becomes hydrophobic when it dries out and it can cause water holding problems.
- Over-seeding can be less successful if thatch creates a barrier between the seed and soil.

Solution

1. Control should be via an integrated approach of cultural practices and sensible product use.
2. Aerate to encourage soil microbial action.
3. Scarify to remove dead plant material.
4. Apply topdressing to dilute thatch.
5. Use correct levels of nutrition. Excess Nitrogen will encourage thatch.
6. Use the correct types of nutrition.
7. Wetting agents to aid water management.
8. Use soil biostimulants to encourage microbial breakdown of thatch.
9. Box off clippings to limit build up of dead plant material in soil.

Product type	Why	ICL products
Slow release fertilizers	Gradual consistent feeding avoids over-feeding that can lead to thatch development.	SierraformGT
Controlled release fertilizers	Gradual consistent feeding avoids over-feeding that can lead to thatch development.	Sierrablen, Sierrablen Plus
Wetting agent with penetrant action	Breakdown hydrophobic barrier caused by thatch to allow better wetting of soil and to allow moisture penetration when too wet.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo

ICL Turf Management Solutions

Water-Logging

Problem

- High rainfall events and winter flooding are becoming more common.
- The risk of water-logging and flooding are more likely due to a number of factors:
  - Poor soil structure reduces water holding capacity of soil
  - Poor ground cover increases potential for surface run-off.

Solution

1. Aerate the soil to encourage water infiltration.
2. Select grass seed cultivars with improved root growth.
3. Encourage good rooting through good nutrition and managing soil structure.
4. Ensure strong growing turf that will take up water efficiently.
5. Use slow and controlled release fertilizers to avoid nutrient losses and to avoid the need for re-application in wet conditions.
6. If possible, use cut off drains to protect sensitive areas.
7. Raise the height of cut prior to likely flood event to increase sward canopy and also to encourage deeper rooting.
8. Contouring of surface levels (where possible) can help to control movement of water away from problem areas.
9. Aerate the soil to encourage water infiltration.
10. Encourage good rooting through good nutrition and managing soil structure.

Product type	Why	ICL products
Slow or controlled release fertilizer applied prior to water-logging	Improves rooting and water uptake efficiency.	SierraformGT, Sierrablen Plus
Slow or controlled release fertilizer applied prior to water-logging	Improve sward density so that surface run-off is reduced.	SierraformGT, Sierrablen Plus
Penetrant wetting agent	This type of wetting agent will move water away from the surface and down the soil profile and therefore reduce surface run-off.	H2Pro TriSmart, H2Pro FlowSmart, Hydraflo
Plant Growth Regulator	Improve sward density and root development to improve water uptake and reduce water loss.	
Use grass seed cultivars with improved root growth	These Poa pratensis varieties have significantly more and longer roots	

Wear Tolerance

Problem

- Turf that receives high traffic pressure will be susceptible to wear damage and also increase the risk of disease.
- Wear damage causes aesthetic damage as well as a poor quality playing surface.
- Where turf becomes worn and bare patches occur this provides opportunities for weed invasion.
- When turf cover is reduced, it also reduces the stability of the soil which can then lead to more problems.
- Turf that receives high traffic pressure will be susceptible to wear damage.

Solution

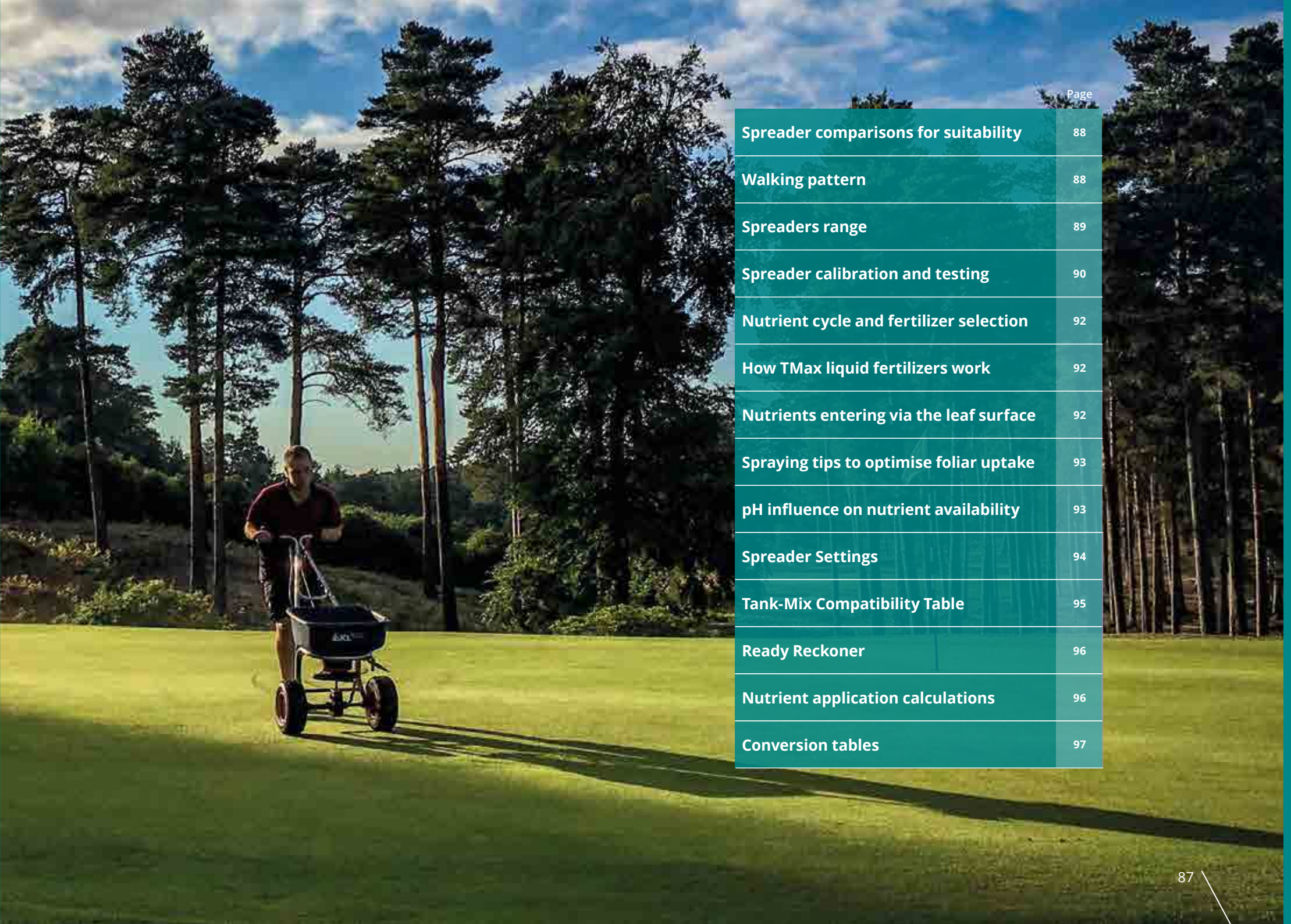
1. Harden turf and avoid soft lush growth.
2. Ensure good nutrition for healthy turf growth to increase wear tolerance.
3. Ensure good nutrition to aid recovery from wear.
4. Reduce surface moisture in wet conditions.
5. Use wear tolerant grass cultivars.
6. Limit traffic where possible and alternate areas of use.

Product type	Why	ICL products
Use slow release fertilizers	Continuous nutrition at the correct level that avoids over and under feeding maintains a stronger and healthier turf surface more tolerant to wear.	SierraformGT
Use controlled release fertilizers	Continuous nutrition at the correct level that avoids over and under feeding maintains a stronger and healthier turf surface more tolerant to wear.	Sierrablen Plus, Sierrablen, Sportsmaster CRF, ProTurf
Use Potassium fertilizers	Potassium plays an important role in hardening the turf against wear and tear.	SierraformGT 6-0-13.3 and Anti-Stress Sierrablen Plus Stress Control
Slow release Potassium nutrition	If Potassium can be delivered constantly over a 6-8 week period then the wear benefits of potassium are enhanced.	SierraformGT
Controlled released Potassium nutrition	If Potassium can be delivered constantly over a 3 month to 4-5 month period then the wear benefits of potassium are over the season and not just following application.	Sierrablen Plus Spring Starter, Sierrablen Plus Active
Water conservation and penetrant wetting agent	Maintain adequate soil moisture to ensure turf is healthy and able to withstand wear stress in dry conditions. Reducing surface moisture and promoting better soil stability will aid the turf in tolerating wear stress.	H2Pro TriSmart, H2Pro FlowSmart, H2Pro AquaSmart, Hydraflo
Use wear tolerant grass cultivars	These varieties are able to withstand high levels of wear.	

If you get the right soil pH, then your fertilizers are really just fine tuning

At ICL our focus is to deliver the best and most professional advice in the industry.

Our reputation is built not just on quality products but also on the advice and technical support we give to our customers.



Spreaders

To get the very best results from your fertilizer, accurate application is essential

ICL spreaders are durable, easy to use, and offer turf managers the very best in application efficiency.

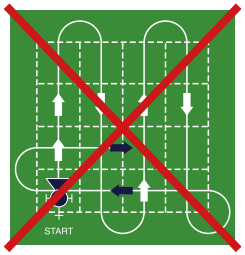
Spreader comparisons for suitability

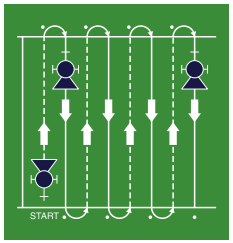
Product Specifications				Product Usage				
Spreader	Type	Spread Width	Hopper Capacity	Conventional Fertilizers	Coated Fertilizers	Granular Wetting Agents	Seeds	Top Dressing
SR-2000	Rotary	2.0–6.0m	42 litres	✓	✓	✓	×	✓
SS-2	Drop	0.91m	46 litres	✓	×	✓	✓	✓
HandyGreen II	Hand-held	Variable	2 litres	✓	✓	✓	×	×

Key: ✓ Suitable for purpose × Not compatible

Walking pattern

Recommended walking pattern for drop and hand-held spreaders. Optimum distribution at half rate and double pass.





SS-2
DROP SPREADER

- Stainless steel frame, hopper and fasteners provide outstanding durability and corrosion resistance
- Extended ergonomic handle is more durable
- Large 139 Turf Saver 2 pneumatic wheels for easy operator use
- Lift handles in the front and back for easier loading and unloading
- Not suitable for coated controlled release products

HandyGreen II
SPREADER

A hand-held spreader that disperses fertilizer as you turn the handle. Comfortable to hold and easy to use, it is suitable for small to medium lawns

SR-2000
ROTARY SPREADER

- Large 136 Turf Saver 2 pneumatic tyres
- Durable large diameter frame
- Positive on-off side deflector provides effective product delivery control
- Extended handle with tuff-foam grips for added comfort
- Standard port shut off control for greater application efficiency
- Durable larger diameter, stainless steel frame

Helical Cone®

Patented Helical Cone® provides optimal spreading

Spreader calibration

Time invested in checking and setting spreaders is quickly recouped through better application accuracy.

SCS Spreader & Sprayer Testing is the UK's largest independent fertilizer spreader testing specialist & their advice to operators is to ensure equipment is properly maintained and tested for application rate & distribution pattern with every product it will apply. Spinning disc spreaders will also need to be tested over trays to determine the true spreading width and evenness of distribution.

Better application accuracy prevents under or over-dosing, and also prevents stripes in the sward caused by misses or overlaps.

Effective applications start with the end of the last job. Machines need to be thoroughly cleaned and, if possible, dried before they are put away. Fertilizer absorbs moisture from the air and if any is left in the spreader this will quickly corrode metal parts.

Before starting work, operators should give the applicator a thorough inspection: Ensure the rate setting mechanism is free and adjusts easily, check the on/off works and the distribution rotor and spinning discs are not worn and are functioning properly.

It is vital to then set and test the machine with the actual fertilizer it will be applying. The bulk density of the material affects the spread pattern and flow rate.

The same application rate will need fewer denser granules to flow through than less dense material, even though they could be the same physical size.

Denser particles will be spread further – e.g. consider how far a cricket ball can be thrown compared with a tennis ball.

This is a very important consideration when setting pedestrian and tractor-mounted spinning disc spreaders, which rely on centrifugal force to achieve the spreading width, with larger, denser granules travelling further than lighter, less dense ones.

With these applicators it is crucial to check the distribution pattern, with a full-width tray test, as well as the rate calibration. This will ensure you know how much is being applied as well as ensuring it is being spread evenly across the whole width.

There are four main spreaders used to apply fertilizer – pedestrian drop-style, pedestrian spinning disc, tractor-mounted spinning disc or oscillating spout. All have different calibration and settings procedures.

With pedestrian operated machines, settings are usually made for a 'normal walking pace' of 5km/hr (3mph). It is important to maintain the speed for which the calibration settings have been made to prevent under or overdosing. Walking speed also influences the spread width on spinning disc applicators. Also keep spreaders parallel to the ground to maintain an even distribution.

Calibration and testing procedures

Pedestrian drop-style

Application width is set (usually a little narrower than the hopper), rate is adjusted by opening or closing the outlet and will vary with walking speed.

- Adjust spreader outlet to the setting in the operator's manual for product type and application rate.
- Apply fertilizer over a measured distance (e.g. 10m) at normal walking pace (5km/hr).
- Determine quantity spread over distance by one of the following methods:
  - Lay sheet on ground and then collect and weigh fertilizer distributed on top.
  - Place a known weight in hopper, apply fertilizer, empty and weigh remaining hopper contents and subtract from original weight.
  - Adjust machine setting for desired application rate if necessary. Note this setting will apply only for this fertilizer and operator's walking pace. Recalibrate for different operators and materials.

Use following formulas to calculate rate in g/m²

Spreading width × distance = area covered
Weight of fertilizer collected ÷ area covered = kg/m²

e.g.
Weight spread over distance = 125g
0.5m (width) × 10m (distance) = 5m²
Application rate = 125 ÷ 5 = 25g/m²

Pedestrian spinning disc

Application width and dose rate will vary with walking speed, fertilizer characteristics and opening adjustment.

- A spreading width test with actual material should be carried out, preferably across special collection trays, before any other calibration. This will determine the spread width for the particular fertilizer & operator's pace (aim for 5km/hr) & how far apart you should walk to maintain an even spread.
- Adjust spreader for desired application rate. Place known quantity e.g. 2kg in hopper.
- Walk set distance (10m) at normal walking pace.
- Empty and weigh remaining hopper contents.
- Calculate area by multiplying the application width by the distance walked.

Use following procedure to calculate application rate

Original hopper content
minus contents after spreading
e.g: 2,000g − 1,000g = 1,000g spread in 10m.

Area: (distance) 10m × (width) 4m = 40m²

Weight ÷ area = application rate/m²
1,000 × 40 = 25/m²

Distribution Pattern Check

- Lay out testing trays to full application width.
- Use fertilizer to be applied and actual operator doing the job walking at set pace (5km/hr).
- Spread fertilizer through trays, which will collect material being spread.
- Place contents of each tray in test tubes to check the evenness of the spread pattern. Alternatively this could be done by weighing contents of each tray and plotting on a bar chart.

Tractor-mounted spinning disc (or oscillating spout)

Application width determined by fertilizer characteristics, machine type and PTO drive speed. Forward speed and opening setting will influence application rate.

- Follow application rate calibration procedure in operator's manual. Usually this means opening a chute and collecting the amount of fertilizer that runs out in a set time. Weigh amount collected and compare with recommendation in manual. Make necessary adjustments to gain correct application rate. This must be done using actual fertilizer to be applied.
- Spreading width will be set by the machine – usually 6-12m. This will be achieved only at the correct PTO speed (eg 540rpm) and requires tractor engine speed to be set at correct rpm. You can check the actual PTO speed with a tachometer.
- The forward speed for the application rate will be shown in the manual. It is crucial to select the right gear with the engine rpm to achieve the PTO speed to drive at the forward speed.

Use the following formula to check the application rate:

Application rate in kg/ha =

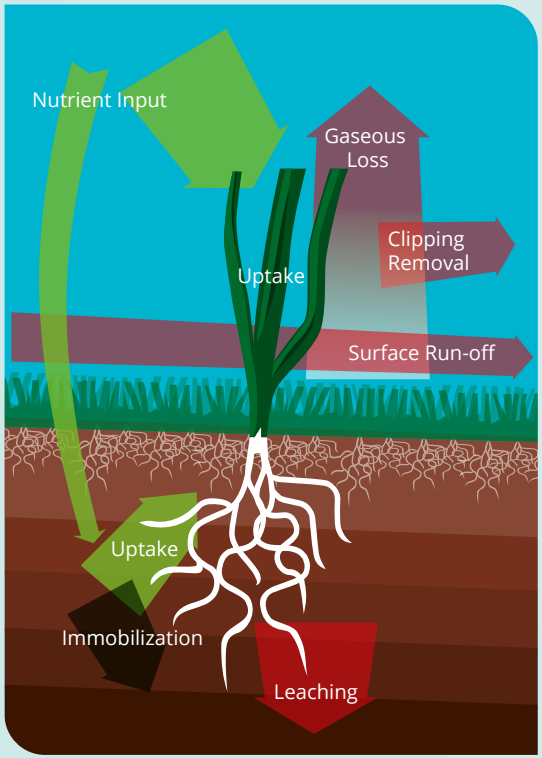
$$\frac{\text{(Total weight collected in one minute (kg)} \times 600)}{\text{(Spread width (m)} \times \text{tractor forward speed (km/hr))}}$$

Spread Pattern Accuracy Test

- A full-width tray test is essential to ensure the fertilizer is being distributed evenly across the whole width.
- Place special collection trays across width.
- Tractor is driven in the gear and set engine speed to achieve the PTO and forward speed.
- Spreader is operated through the line of trays and contents of each are placed in individual test tubes.
- Measure the contents of each tube to assess spread pattern.
- Make the machine adjustment to correct any highs or lows to achieve even pattern.

Nutrient cycle & fertilizer selection

In general terms, fertilizers are products that improve the levels of available plant nutrients – directly to the plant or via the soil. A number of these nutrients are classified as 'Essential Nutrients' – required by the plant in order to complete its life cycle and/or are directly involved in plant metabolism or required in metabolic reactions.



The reason that some turf areas do not need these nutrients applied on a regular basis is because they are either already present within the rootzone, or already supplied via top dressing treatments or other means.

These nutrients (shown with their chemical symbol) can be classed as Macro and Micro (or trace) nutrients.

Macro nutrients are needed in far higher quantities than micro nutrients, but all are equally important. If there is a deficiency of one nutrient then the plant will suffer.

Macro

- Carbon (C)
- Hydrogen (H)
- Oxygen (O)
- Nitrogen (N)
- Phosphate (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)
- Sulphur (S)

Micro (Trace)

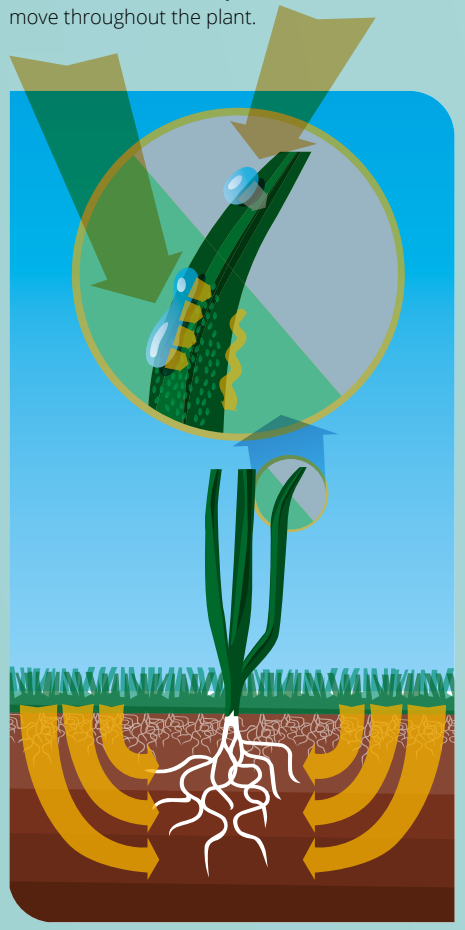
- Iron (Fe)
- Zinc (Zn)
- Copper (Cu)
- Manganese (Mn)
- Molybdenum (Mo)
- Boron (B)
- Chlorine (Cl)

Carbon, Hydrogen and Oxygen are derived from Carbon Dioxide in the air, absorbed by the leaves, and in water, absorbed by leaves and the roots. The remaining elements are mainly taken in by the roots, but may also be absorbed by the leaves if fertilizers are applied.

How TMax liquid fertilizers work

TMax ensures that the liquid application spreads out and sticks to the leaves to maximise the available leaf area for nutrient uptake. Once inside the leaf, nutrients can more easily move throughout the plant.

Without TMax, liquid fertilizer droplets do not spread out & are more susceptible to run-off.



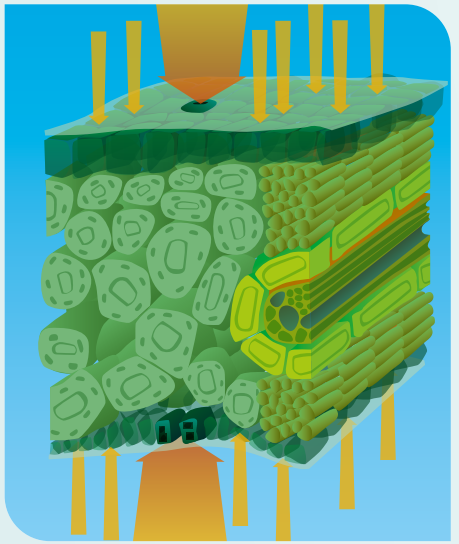
TMax enables nutrients to move through the soil profile for root nutrient uptake making previously locked-up nutrients available to the plant.

Nutrients entering via the leaf surface

Nutrients can enter plants through the stomata of leaves or by diffusing through cuticles and into the cell walls

Stomata are large and allow easy movement of nutrients into the leaf. However, there are less of these compared to transcuticular openings and they are not open all of the time.

Transcuticular pores are small but they are always open and there are many of them. Quality nutrients as in Greenmaster Liquids are able to access the leaf via these very small openings, so enhancing foliar uptake.



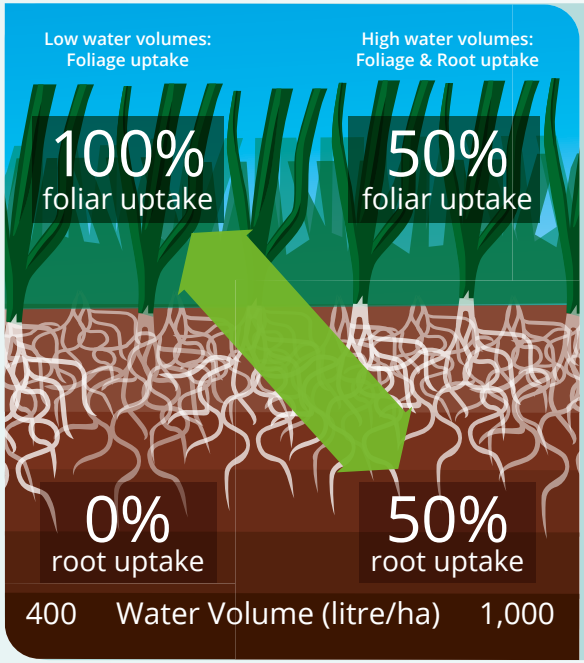
Foliar feeding can be used to provide a quick growth response – achieving nutrient uptake without relying on the root system.

Products such as Greenmaster Liquid or Sportsmaster WSF are ideal for foliar feeding.

Spraying tips to optimise foliar uptake of nutrients

To maximise the quantity of nutrients that can be taken up by the leaves, the nutrients need to remain dissolved as long as possible on the leaf surface.

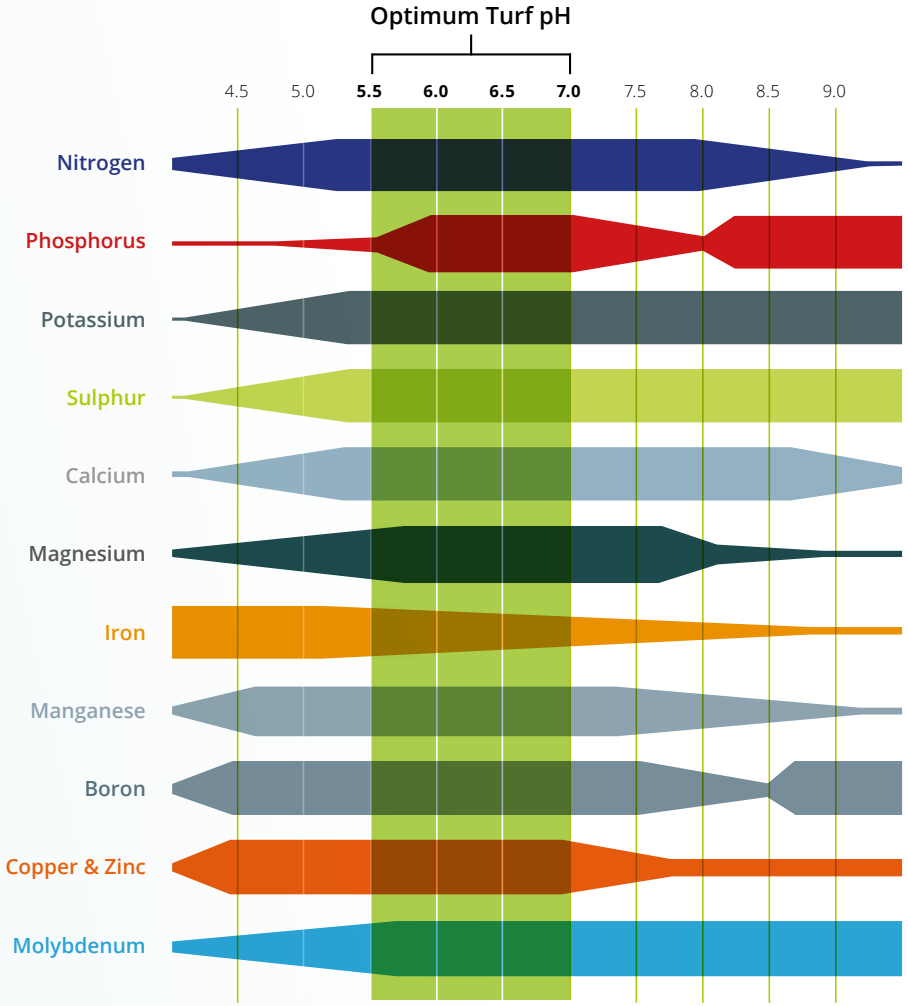
- Spray in cool conditions (less than 26°C)
- Spray on overcast days
- Spray as fine a mist as possible whilst avoiding any potential drift
- Spray should contain small amounts of Nitrogen, which acts as a nutrient absorption enhancer
- Spray mixture pH should be as near neutral as possible
- Use low water volumes to keep more of the spray solution on the target area
- Early morning or evening sprays are preferable as stomata are more likely to be open
- Foliar uptake of phosphate by the turf provides for balanced nutrition. TMax in the Greenmaster Liquid range enhances the ability of nutrients to be taken up by the foliage
- Spreaders contained in TMax are important because the spray will spread out, preventing beads of water which act as prisms, concentrating heat from the sun's rays
- Do not mow or irrigate within 3 hours of application to optimise foliar nutrient uptake



The importance of water volume when foliar feeding

The influence of pH on nutrient availability

Nutrient availability within the soil can be significantly affected by soil pH. This chart shows how availability of a number of essential turf nutrients is affected by pH – a useful reference when formulating fertilizer programmes.



Drop Spreader Settings for SS-2 Single Pass at FULL RATE

Spreader	Type	Amount of Product Applied (g/m²) After One Pass										
		5	10	15	20	25	30	35	40	45	50	55
Greenmaster Pro-Lite	All Analyses		3¾	4	4½	5	5¼	5½	6	6¼	6½	
Sportsmaster	All Analyses (not including CRF Range)		3¾	4	4½	5	5¼	5½	6	6¼	6½	
SierraformGT	All Analyses		3¼	3¾	4¼	4¾	5¼	5¾	6¼	6½		
STEP Hi-Mag	Trace Elements	2	2¾	3½								
H2Pro	Granules		3¾	4¼	4¾							

Rotary Spreader Settings for AccuPro 2000 and SR-2000 Single Pass at FULL RATE

	Cone Setting	Effective Width (m)	Amount of Product Applied (g/m²) After One Pass													
			5	10	15	20	25	30	35	40	45	50	55	60	65	70
SierraformGT All Analyses	6	3.7		I½	K	L	M	M½								
STEP STEP Hi-Mag	7	4.3	H	I½	K½											
Greenmaster Pro-Lite All Analyses	6	3.7						M	N							
Sportsmaster Not including CRF Mini	4	3.7			L	M	N	O½	P½	Q	R	S	T	U	V	W
ProTurf All Analyses	6	5.0				M½	N½	O½	P	Q						
Sierrablen Plus All Analyses	4	4.8			M	N	O	P	R	S	T					
Sierrablen All Analyses	4	4.7					Q	R½	T½	V	X	Q(x2)	R(x2)	R½(x2)		
H2Pro H2Pro Granules	5	4.0		J	K½	M										
Sportsmaster CRF Mini All Analyses	6	4.0			L	M	M½	N½	O½	P½						

Rotary Spreader Settings for AccuPro 2000 and SR-2000 Single Pass at HALF RATE

Amount of Product Applied (g/m²) After Two Passes													
5	10	15	20	25	30	35	40	45	50	55	60	65	70
		H	I½	J½	K								
G½	H	I											
					J½	K							
					L	L½	M	M½	N	O	O½	P	P½
			J½	K½	L½	M	M½						
		K	K½	L	M	M½	N	N½	O				
				M	N	O	O½	P	Q	R	R½		
	H½	I	J										
			J½	K½	L	L½	M						

Tank-Mix Compatibility Table

Key: ★ Fully compatible ✓ Compatible but outside recommended product water rates ✕ Not compatible

Guidance notes for tank-mix compatibility of liquid formulations

	Greenmaster High N 25–0–0 +2MgO	Greenmaster NK 10–0–10 +TE	Greenmaster High K 3–3–10 +TE	Greenmaster Spring & Summer	Greenmaster CalMag 9-0-0+13% CaO+3MgO	STEP Liquid Micronutrient	Greenmaster Effect Iron	Sportsmaster WSF High N	Sportsmaster WSF Spring & Summer	Sportsmaster WSF High K	Sportsmaster WSF IRON	Sportsmaster WSF Seaweed	H2Pro TriSmart	H2Pro FlowSmart	H2pro AquaSmart	H2Pro DewSmart	Qualibra	Vitalnova Blade	Vitalnova SiLK	Vitalnova AminoBoost	Vitalnova Stressbuster	Vitalnova Seaweed	Sportsmaster Liquid Fe	Primo Maxx II	Heritage Maxx	Medallion	Instrata Elite	Praxys	Esteron T
Greenmaster High N 25–0–0 +2MgO		★	★	★	★	★	★	★	★	★	★	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	★	★	✓	✓
Greenmaster NK 10–0–10 +TE	★		★	★	★	★	★	★	★	★	★	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	✕	✕	✓	✓
Greenmaster High K 3–3–10 +TE	★	★		★	★	★	★	★	★	★	✕	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	✕	★	✓	✓
Greenmaster Spring & Summer 12–4–6 +TE	★	★	★		✕	★	✕	★	★	★	✕	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	★	★	✓	✓
Greenmaster CalMag 9–0–0 +13% CaO +3MgO	★	★	★	✕		★	✕	★	★	★	✕	✕	★	★	★	✕	★	✕	✕	★	★	✕	✕	★	★	★	✕	✓	✓
STEP Liquid Micronutrient	★	★	★	★	★		★	★	✕	★	★	★	★	★	★	✕	★	★	✕	✕	★	★	★	★	★	★	★	✓	✓
Greenmaster Effect Iron	★	★	★	✕	✕	★		★	✕	★	✕	★	★	★	★	✕	★	✕	✕	★	★	★	★	★	✕	✕	✕	✓	✓
Sportsmaster WSF High N	★	★	★	★	★	★	★		★	★	★	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	★	★	✕	✓
Sportsmaster WSF Spring & Summer	★	★	★	★	★	✕	✕	★		★	★	★	★	★	★	✕	★	★	✕	★	★	★	★	★	★	★	★	✓	✓
Sportsmaster WSF High K	★	★	★	★	★	★	★	★	★		★	★	★	★	★	✕	✕	★	✕	★	★	★	★	★	★	✕	★	✕	✓
Sportsmaster WSF IRON/Sierrasol Fe	★	★	✕	✕	✕	★	✕	★	★	★		✕	✕	★	✕	✕	✕	✕	✕	✕	✕	★	✕	✕	★	✕	★	✕	✕
Sportsmaster WSF Seaweed	★	★	★	★	✕	★	★	★	★	★	✕		★	★	★	✕	★	★	★	★	✕	★	★	★	★	★	★	★	★
H2Pro TriSmart	★	★	★	★	★	★	★	★	★	★	✕	★		★	★	✕	★	★	✕	✕	★	★	★	★	★	★	★	★	✕
H2Pro FlowSmart	★	★	★	★	★	★	★	★	★	★	★	★	★		★	★	★	★	✕	★	★	★	★	★	★	★	★	✕	✕
H2Pro AquaSmart	★	★	★	★	★	★	★	★	★	★	✕	★	★	★		✕	★	★	✕	★	★	★	★	★	★	★	★	★	✕
H2Pro DewSmart	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	★	✕		✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	★	✕	✕
Qualibra	★	★	★	★	★	★	★	★	★	✕	✕	★	★	★	★	✕		★	✕	★	★	★	★	★	★	★	★	✕	✕
Vitalnova Blade	★	★	★	★	✕	★	✕	★	★	★	✕	★	★	★	★	✕	★		✕	★	✕	★	★	✕	✕	✕	✓	✓
Vitalnova SiLK	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	★	✕	✕	✕	✕	✕	✕		✕	✕	✕	✕	✕	✕	✕	✕	✕	✕
Vitalnova AminoBoost	★	★	★	★	★	✕	★	★	★	★	✕	★	✕	★	★	✕	★	★	✕		★	★	★	✕	★	✕	✕	✕	✕
Vitalnova Stressbuster	★	★	★	★	★	★	★	★	★	★	✕	✕	★	★	★	✕	★	✕	✕	★		★	★	✕	✕	✕	✕	✕	✕
Vitalnova Seaweed	★	★	★	★	✕	★	★	★	★	★	★	★	★	★	★	✕	★	★	✕	★	★		★	★	★	★	★	★	★
Sportsmaster Liquid Fe	★	★	★	★	✕	★	★	★	★	★	✕	★	★	★	★	✕	★	★	✕	★	★	★		★	★	✕	✕	★	★
Primo Maxx II	★	★	★	★	★	★	★	★	★	★	✕	★	★	★	★	✕	★	★	✕	★	★	★	★		★	★	★	✕	✕
Heritage Maxx	★	★	★	★	★	★	✕	★	★	★	★	★	★	★	★	✕	★	✕	✕	★	✕	★	★	★		★	★	✕	✕
Medallion TL	★	✕	✕	★	★	★	✕	★	★	✕	✕	★	★	★	★	✕	★	✕	✕	✕	✕	★	✕	★	★		★	✕	✕
Instrata Elite	★	✕	★	★	✕	★	✕	★	★	★	★	★	★	★	★	★	★	✕	✕	✕	✕	★	✕	★	★	★		✕	✕
Praxys	✓	✓	✓	✓	✓	✓	✓	✕	✓	✕	✕	★	★	✕	★	✕	✕	✓	✕	✕	✕	★	★	✕	✕	✕	✕		✕
Esteron T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✕	★	✕	✕	✕	✕	✕	✓	✕	✕	✕	★	★	✕	✕	✕	✕	✕	

1 Do not exceed individual product rates. Do not exceed 120L/ha for combined total Greenmaster Liquid product input or 60L/ha for speciality Greenmaster Liquids (STEP/Effect Iron Fe).

2 Do not exceed individual product rates. Do not exceed 30kg/ha for combined total Sportsmaster WSF product input for foliar applications (water volumes of 300-600L/ha) or 60kg/ha for drench applications (water volumes of 600-1,000L/ha).

Ready Reckoner

Nutrient Analysis % N P K etc Declared	kg nutrient/ha applied at these application rates					
	20g/m²	30g/m²	35g/m²	70g/m²	105g/m²	140g/m²
1	2.0	3.0	3.5	7.0	10.5	14.0
2	4.0	6.0	7.0	14.0	21.0	28.0
3	6.0	9.0	10.5	21.0	31.5	42.0
4	8.0	12.0	14.0	28.0	42.0	56.0
5	10.0	15.0	17.5	35.0	52.5	70.0
6	12.0	18.0	21.0	42.0	63.0	84.0
7	14.0	21.0	24.5	49.0	73.5	98.0
8	16.0	24.0	28.0	56.0	84.0	112.0
9	18.0	27.0	31.5	63.0	94.5	126.0
10	20.0	30.0	35.0	70.0	105.0	140.0
11	22.0	33.0	38.5	77.0	115.5	154.0
12	24.0	36.0	42.0	84.0	126.0	168.0
13	26.0	39.0	45.5	91.0	136.5	182.0
14	28.0	42.0	49.0	98.0	147.0	196.0
15	30.0	45.0	52.5	105.0	157.5	210.0
16	32.0	48.0	56.0	112.0	168.0	224.0
17	34.0	51.0	59.5	119.0	178.5	238.0
18	36.0	54.0	63.0	126.0	189.0	252.0
19	38.0	57.0	66.5	133.0	199.5	266.0
20	40.0	60.0	70.0	140.0	210.0	280.0
21	42.0	63.0	73.5	147.0	220.5	294.0
22	44.0	66.0	77.0	154.0	231.0	308.0
23	46.0	69.0	80.5	161.0	241.5	322.0
24	48.0	72.0	84.0	168.0	252.0	336.0
25	50.0	75.0	87.5	175.0	262.5	350.0

Note: 35 per m² = 350kg per ha = 1oz. per sq yd = 2.7cwt per acre
Note: 50kg per ha = 0.38 cwt per acre = 43lbs per acre
Note: 1kg per ha = 0.86lbs per acre

Nutrient application calculations

Calculation of amount of nutrient applied from declared analyses and treatment rate. The fertilizer declarations are always expressed as % weight by weight, with nutrients being declared in the elemental form in Australia and New Zealand.

Therefore, a 14–5–10 fertilizer contains:

- 14% w/w N
- 5% w/w P
- 10% w/w K

Granular fertilizers

For calculating nutrient inputs for granular fertilizers, use the following formula:

Application rate
(kg/ha) x (% nutrient/100) = kg nutrient/ha

Example: 14–0–0 @ 35g/m²
Convert application rate from g/m² to kg/ha
(i.e. 35g/m² x10 = 350 kg/ha)
Multiply product rate (kg/ha) by % N content
(i.e. 14% N = 0.14) = kg N per ha
(i.e. 350 x 0.14 = 49kg N/ha)

Liquid fertilizers

In order to calculate the nutrient inputs from Greenmaster Liquid fertilizers, you need to use the Specific Gravity (kg/L) of the particular product being used. This information can be found on the relevant product page.

Specific Gravity (SG) of:

- NK 1.23
- High N 1.31
- Spring & Summer 1.18
- High K 1.18
- STEP Liquid 1.15
- Effect Iron Fe 1.25
- Vitalnova Blade 1.36

For calculating nutrient inputs for liquid fertilizers, use the following formula:

Application rate
(L/ha) x Specific Gravity (SG)
x (% nutrient/100) = kg nutrient/ha

Example: 12–4–6 @ 60 L/ha (SG = 1.18 kg/L)
Convert application rate from L/ha to kg/ha
(i.e. 60 L/ha 1.18 = 70.8 kg/ha)
Multiply product rate (kg/ha) by % N content
(i.e. 12% N = 0.12) = kg N per ha
(i.e. 70.8 x 0.12 = 8.5kg N/ha)

Conversion tables

Ounces per square yard to grams per square metre

oz per sq.yd	¼	½	1	2	3	4	5	6	7	8	9	10	15	20
g per m²	8.5	17	34	68	102	136	170	204	238	272	306	340	510	680

Fluid ounces per square yard to millilitres per square metre

fl.oz per sq.yd	¼	½	1	2	3	4	5	6	7	8	9	10	15	20
mL per m²	8.5	17	34	68	102	136	170	204	238	272	306	340	510	680

Conversion of imperial to metric and metric to imperial

Weight	pounds	to kilograms	divide by	2.205	kilograms	to pounds	multiply by	2.205
	tons	to tonnes	multiply by	1.016	tonnes	to tons	divide by	1.016
	cwts	to kilograms	multiply by	50.794	kilograms	to cwts	divide by	50.794
Area	acres	to hectares	divide by	2.471	hectares	to acres	multiply by	2.471
	square yards	to square metres	multiply by	0.8361	square metres	to square yards	divide by	0.8361
Volume	pints	to litres	multiply by	0.568	litres	to pints	divide by	0.568
	litres	to gallons	divide by	4.546	gallons	to litres	multiply by	4.546
Weight/Area	tons/acre	to tonnes/hectare	multiply by	2.51	tonnes/hectare	to tonnes/acre	divide by	2.51
	cwts/acre	to tonnes/hectare	divide by	8.00	tonnes/hectare	to cwts/acre	multiply by	8.00
	cwts/acre	to kilograms/hectare	multiply by	125.00	kilograms/hectare	to cwts/acre	divide by	125.00
Volume/Acre	pints/acre	to litres/hectare	divide by	0.712	litres/hectare	to pints/acre	multiply by	0.712
	gallons/acre	to litres/hectare	multiply by	11.233	litres/hectare	to gallons/acre	divide by	11.233
	lbs/cu.ft	to kg/cu.m	multiply by	16.052	kg/cu.m	to lbs/cu.ft	divide by	16.052

Quick reference

Length	1 metre (1000mm)	3.281 feet
		1.094 yards
Area	square metres	1.196 square yards
	1 hectare (10,000m²)	2.471 acres
Volume	1 litre (1,000 mL)	1.76 pints
		0.0353 ounces
Weight	1 gram	35.2074 ounces
	1 kilogram	2.205 lbs
Temperature	Centigrade (°C) to Fahrenheit (°F) multiply by 1.8 and add 32	

Typical Areas of Use

Golf Green		365–640m²	400–700 sq.yds
Bowling Green		38.4 x 38.4m 42.0 x 42.0 yds	1,475m² 1,764 sq.yds
Cricket Square		27.4 x 27.4m 30.0 x 30.0 yds	752m² 900 sq.yds
Tennis Court	**(reg)**	23.8 x 11.0m 26.0 x 12.0 yds	262m² 312 sq.yds
	(full)	36.6 x 18.3m 40.0 x 20.0 yds	670m² 800 sq.yds
Lacrosse		137.0 x 73.0m 150.0 x 80.0 yds	10,001m² 12,000 sq.yds
Football Pitch	**(small)**	91.4 x 46.0m 100.0 x 50.0 yds	4,204m² 5,000 sq.yds
	(large)	119.0 x 91.4m 130.0 x 100 yds	10,877m² 13,000 sq.yds
Rugby Pitch		100.0 x 69.0m 110.0 x 75.0 yds	6,900m² 8,250 sq.yds
Hockey Pitch	**(small)**	91.4 x 50.0m 100.0 x 55.0 yds	4,570m² 5,500 sq.yds
	(large)	91.4 x 55.0m 100.0 x 60.0 yds	5,027m² 6,000 sq.yds
Croquet		32.0 x 26.0m 35.0 x 28.0 yds	832m² 980 sq.yds
GAA	**(small)**	130.0 x 80.0m 142.0 x 87.0 yds	10,400m² 12,354 sq.yds
	(large)	145.0 x 90.0m 158.0 x 98.0 yds	13,050m² 15,484 sq.yds

Oxide & Elemental Conversion

				Example conversion	
	Element	**Oxide**	**Conversion**	**Oxide**	**Elemental**
Calcium	Ca	CaO	0.71	5	3.55
Magnesium	Mg	MgO	0.60	5	3.0
Phosphorus	P	P_2O_5	0.44	5	2.2
Potassium	K	K_2O	0.83	5	4.15
Sulfur	S	SO_3	0.40	5	2.0

N.B. Nitrogen is always present in element form (N) and does not require conversion.
Oxide Percent × Conversion Number = Elemental Percent
Elemental Percent ÷ Conversion Number = Oxide Percent

Notes

Get in touch with our team

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If you have questions regarding our products, recommended rates or require other advice, please contact our sales team

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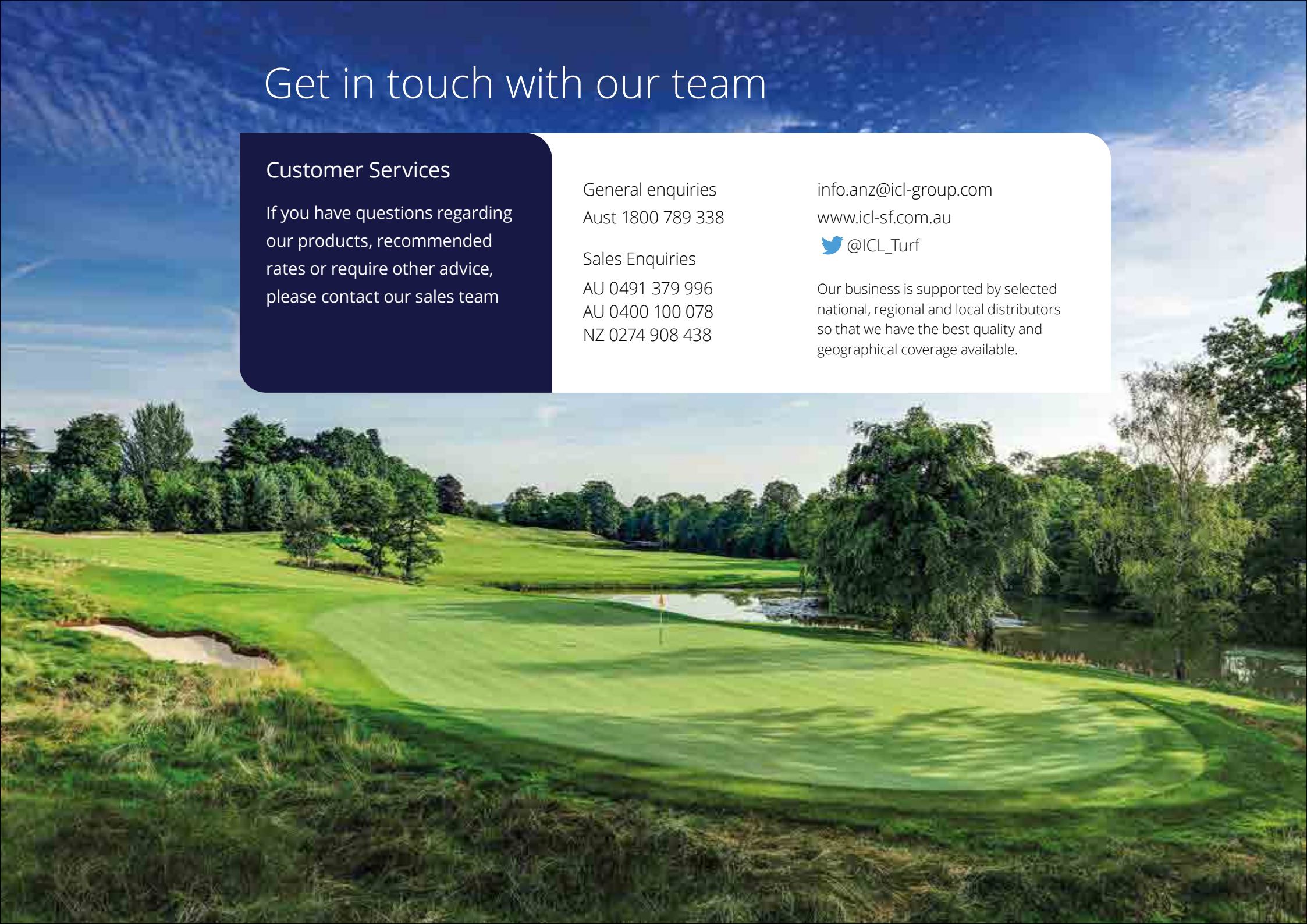

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