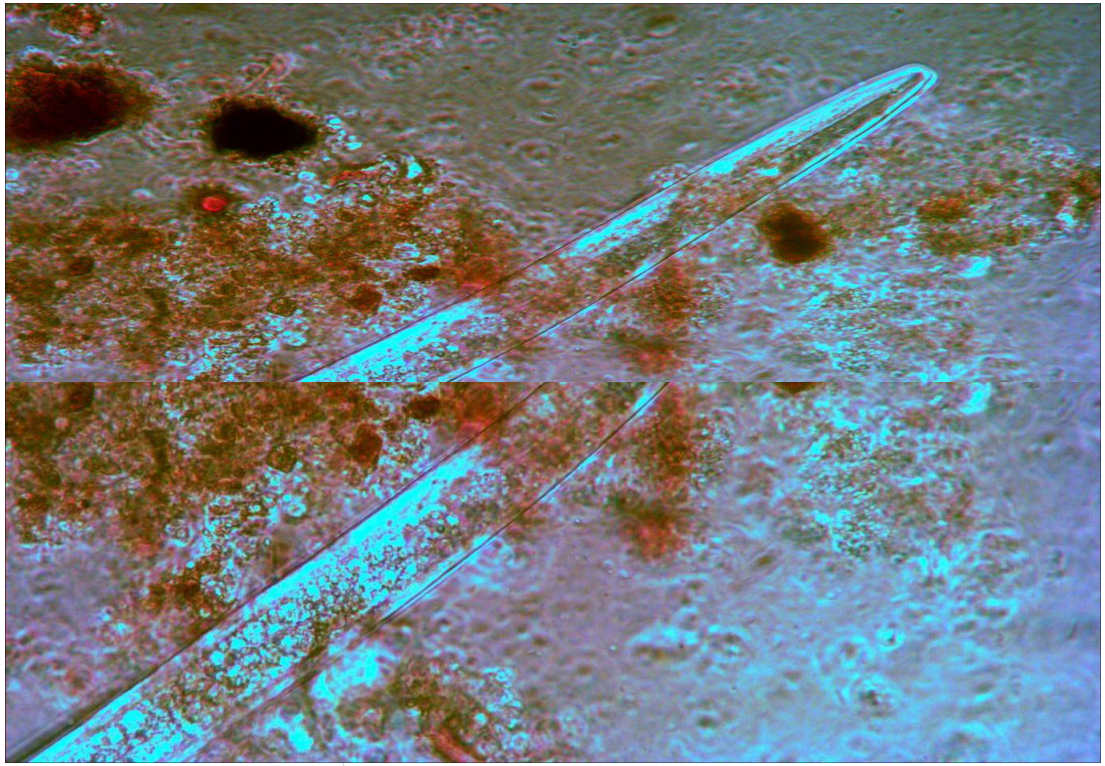
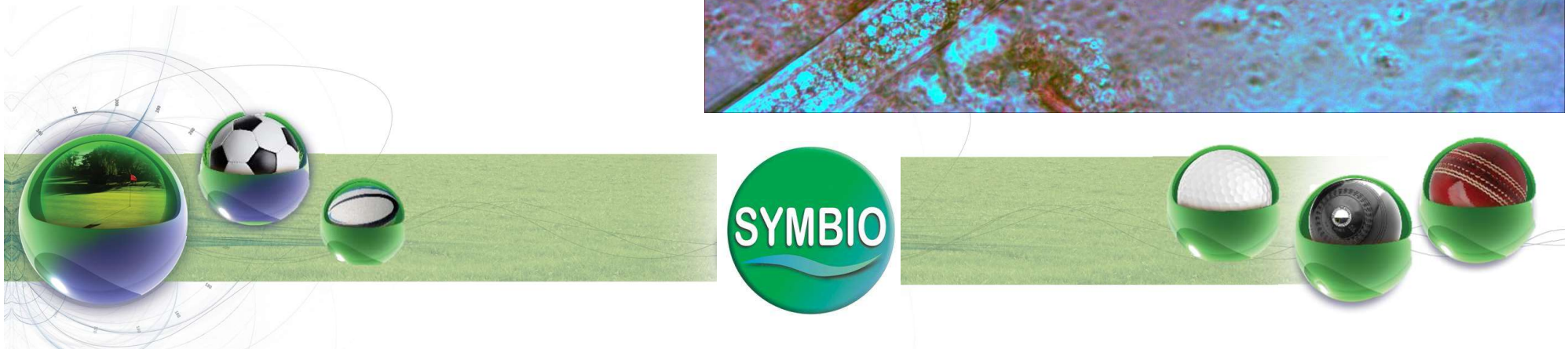
Bring Life to Your Soil

The Benefits of Microbial Life
In Sports Turf grass

Soil Biology Seminar
Slovenia 2O19

Jeremy Hughes





A Greenkeeper for 27 years at the Vale Of Llangollen Golf Club

20 years as course manager

Started working with soil biology 2012

Left to start work with Symbio in June 2015

BIGGA

Member of BIGGA for 25 years
19 years on section committee
10 years on regional committee
5 years Board of Directors
CPD approved
Trained assessor
8 Open support teams
Where I met Gorazd

Agenda

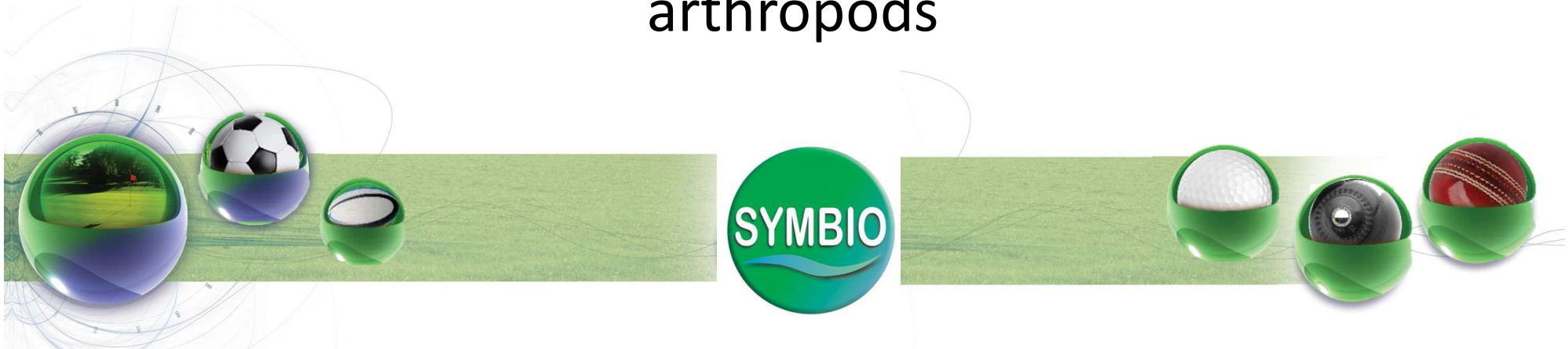
- ✓What is soil biology ?
- ✓Why is biology so deficient in so many sports turf rootzones
- ✓Organic matter- most of it good!
- ✓Is hollow coring and heavy top dressing necessary?
- ✓The importance of Mycorrhizal in our soils
- ✓Cost saving benefits

Soil Organisms

Four main groups of soil micro-organisms

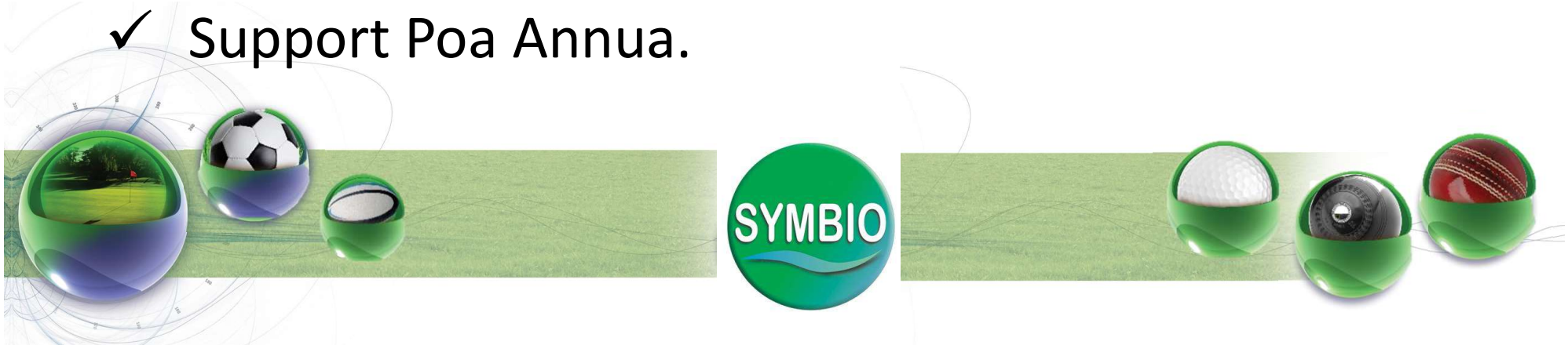
- ✓**Bacteria**
- ✓**Fungi**
- ✓**Protozoa**
- ✓**Nematodes**

Other soil dwellers include algae, earthworms and arthropods



The Benefits/Actions of Bacteria

- ✓ Decompose Simple Organic Matter.
- ✓ Recycle, solubilise and retain nutrients in the rootzone.
- ✓ Protect the plant from disease.
- ✓ Produce by-products that promote plant growth (enzymes, vitamins, hormones).
- ✓ Support Poa Annua.



Fungal spp.

The Benefits/Actions of Fungi

Like bacteria, **fungi** are

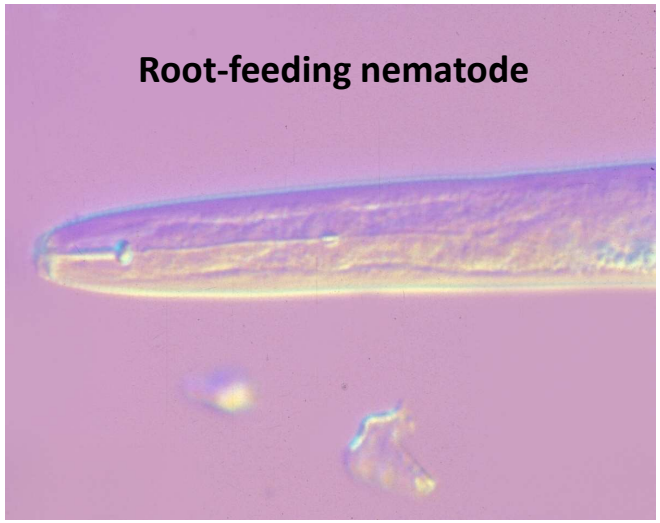
- ✓Decomposers.
- ✓Nutrient cyclers.
- ✓Soil structure builders.
- ✓Plant protectors.

Nematodes

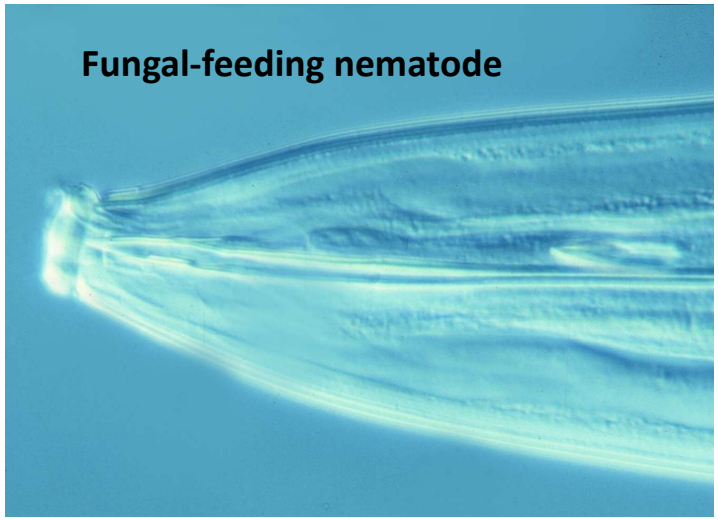
What are Nematodes?

- ✓ Microscopic worms.
- ✓ ~20,000 different species are known.
- ✓ 4 different types:
  - ✓ Bacterial feeders
  - ✓ Fungal feeders
  - ✓ Nematode feeders (Predatory)
  - ✓ Root feeders (Parasitic)
- ✓ Nematodes play an important role in releasing nutrients in plant available form.

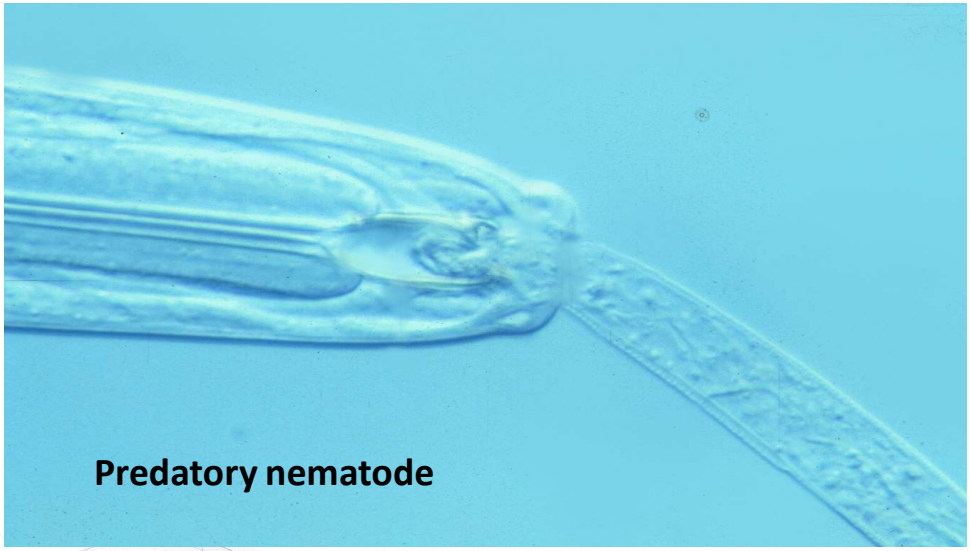
Fungi eating Root feeding nematode



Root-feeding nematode



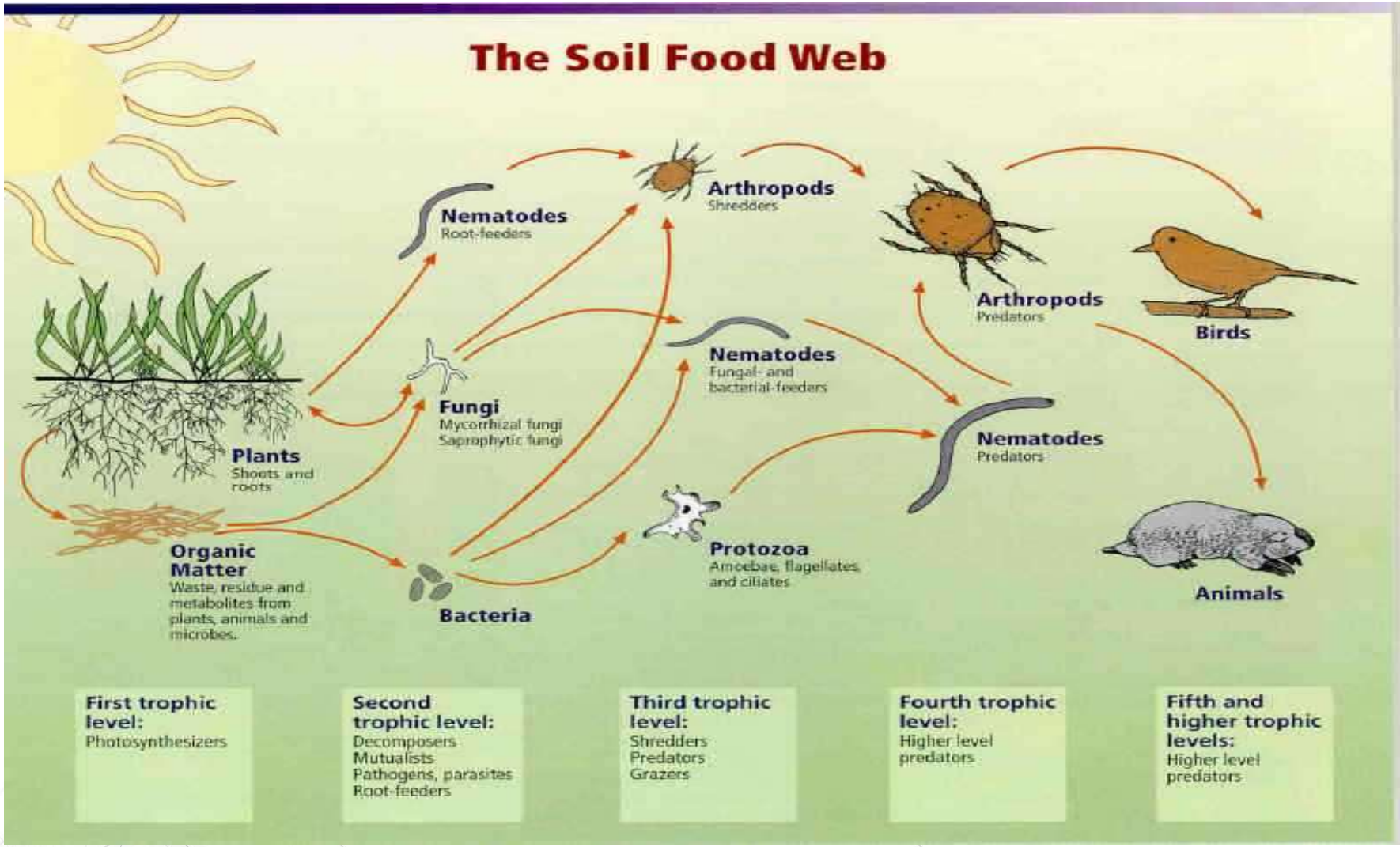
Fungal-feeding nematode

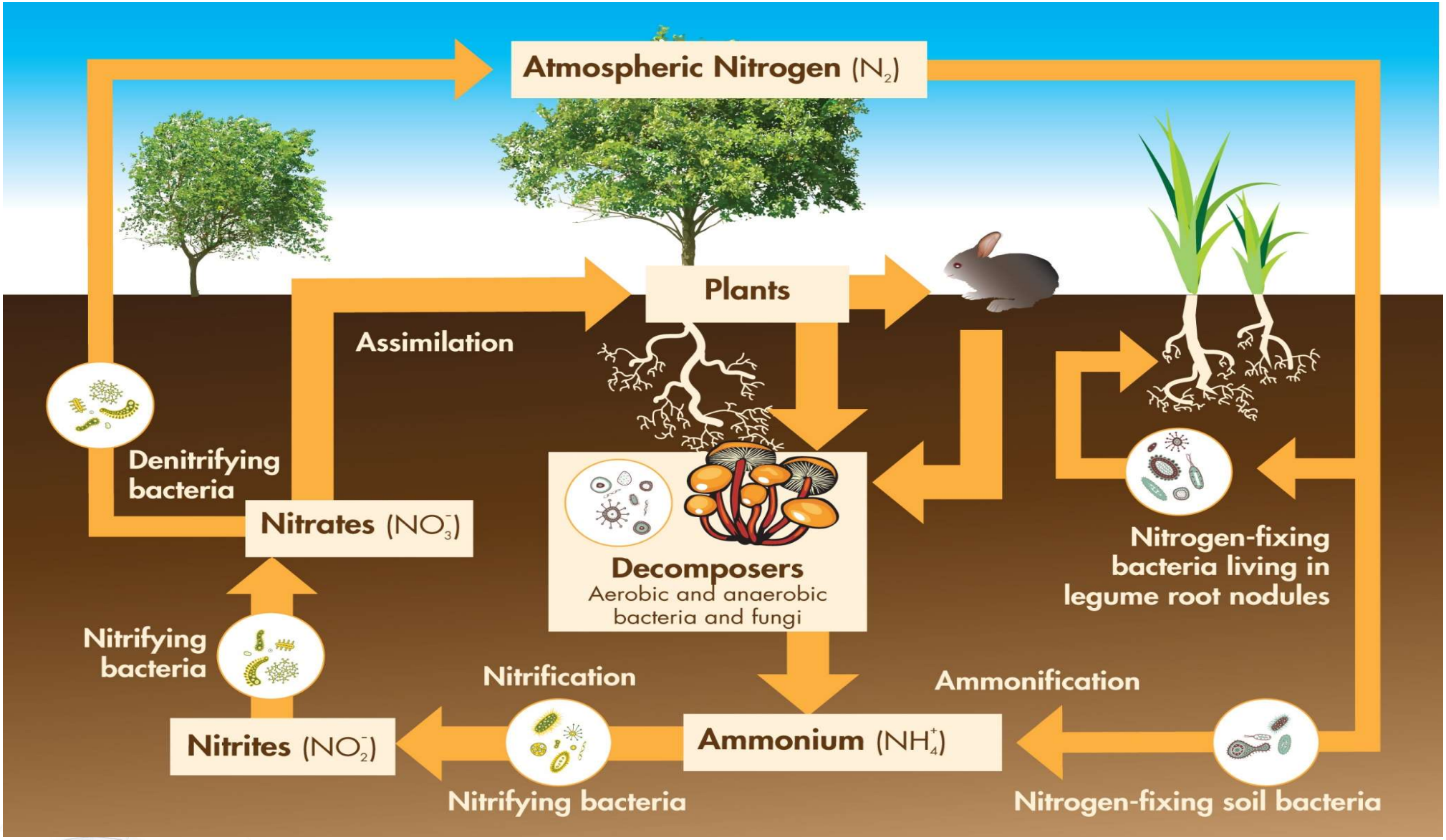


Predatory nematode

Bacterial-feeding nematode

Soil Food Web




Atmospheric Nitrogen (N_2)
Plants
Assimilation
Denitrifying bacteria
Nitrates (NO_3^-)
Decomposers
Aerobic and anaerobic bacteria and fungi
Nitrogen-fixing bacteria living in legume root nodules
Nitrifying bacteria
Nitrification
Ammonification
Nitrites (NO_2^-)
Ammonium (NH_4^+)
Nitrifying bacteria
Nitrogen-fixing soil bacteria


SYMBIO

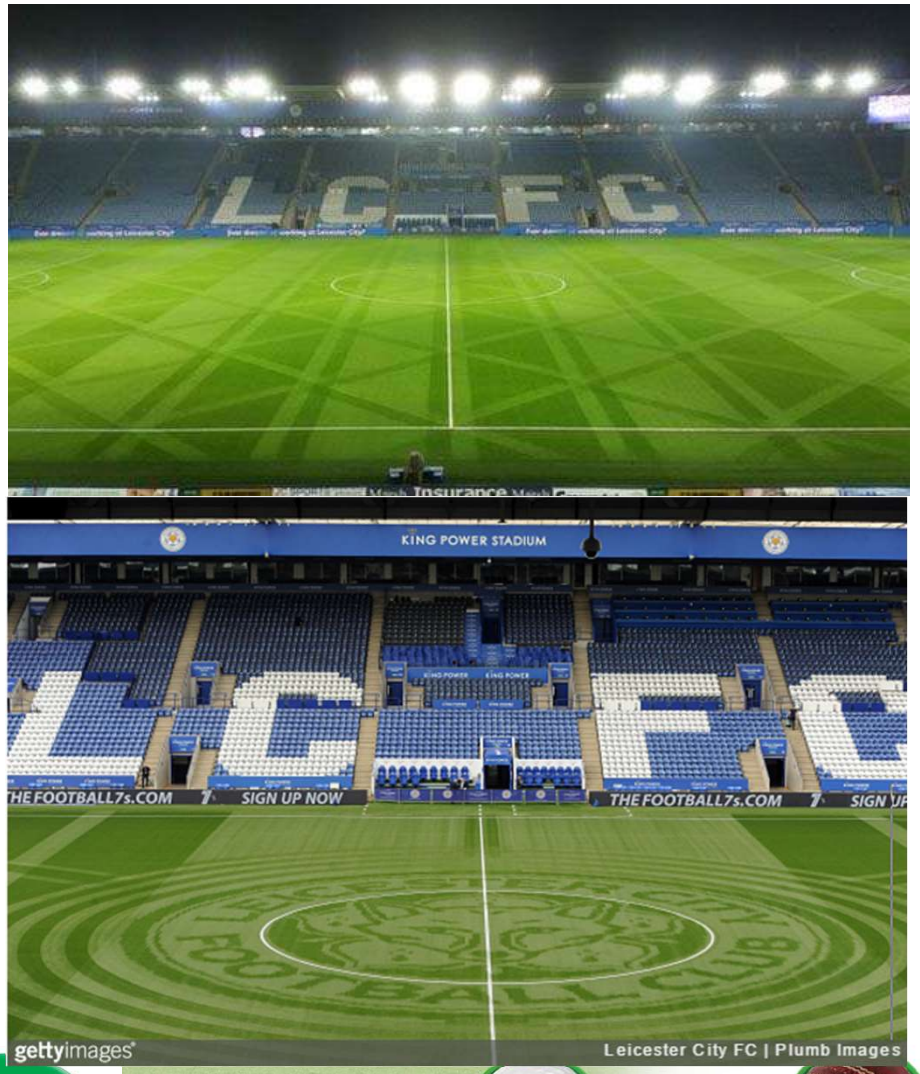
SO WHY IS THERE VERY

LITTLE BIOLOGY

IN OUR ROOTZONE PROFILES ??

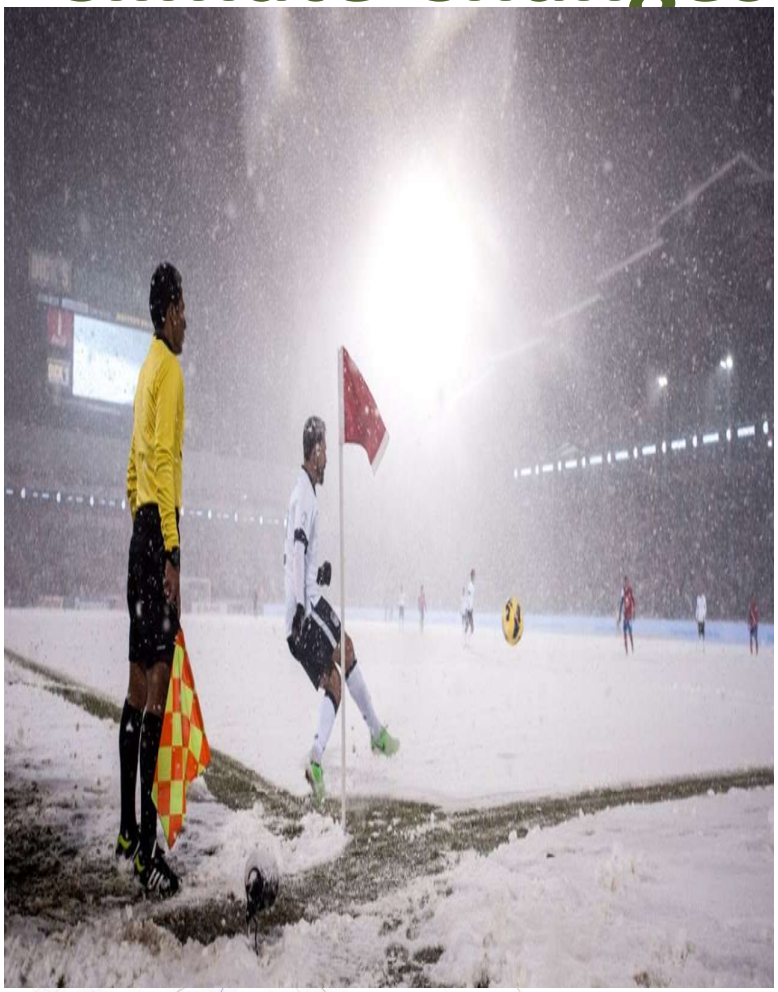
Cutting Regimes

Expectations & Standards
TV & climate extremes



Present Day High Maintenance

Temperature
Climate Changes Extremes



Salt

Fertiliser Salt Index

Sodium Nitrate	100
Sodium Chloride	154
Potassium Chloride	120
Ammonium Nitrate	105
Ferrous Sulphate	85
Urea	75
Potassium Nitrate	74
Ammonium Sulphate	69
Calcium Nitrate	53
Potassium Sulphate	45
Magnesium Sulphate	44
Methylene Urea	4
Organic	4

The conductivity of 1% solution of the salt compared with NaNo3 which has been given a value of 100

The higher the salt index the higher the osmotic pressure

Too much salt is bad for you!

Top-dressing
“more sand Honeyman”

Before

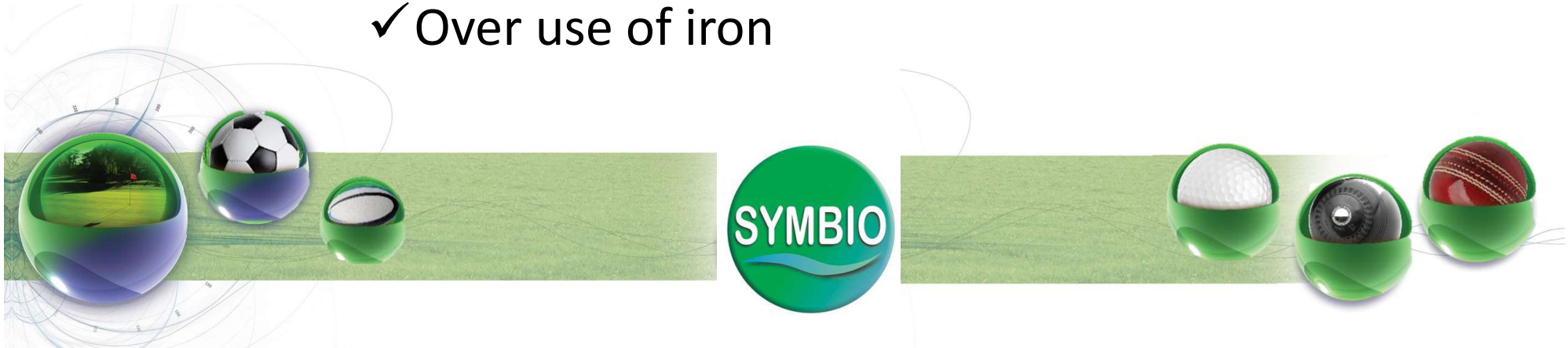
✓ Old dressing contained massive soil life and compost

Now

✓ Modern sand is relatively sterile, has little if any organic matter, no life, no biology no goodness

Factors Attributing to Poor Biology

- ✓Temperature
- ✓Salt (fertilisers)
- ✓Lack of air
- ✓Burial in sand
- ✓Over use of water
- ✓Over use of fungicide
- ✓Over use of iron




Disease
Fertiliser
STERILE SOIL
Fungicide
Reduced microbe activity

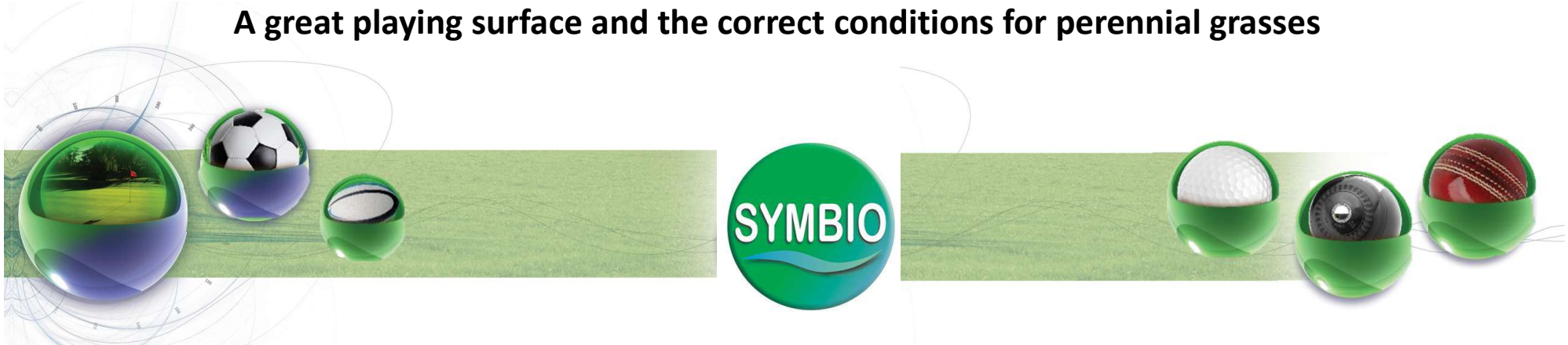
Poa annua v Perennial Grasses

- ✓*Poa annua* predominantly grows in:
  - ✓bacteria dominant
  - ✓Compacted and / or highly fertilised rootzones
  - ✓New top dressing

- ✓Perennial grasses need soils with :
  - ✓A balanced bacterial : fungal population
  - ✓Mycorrhizal fungi

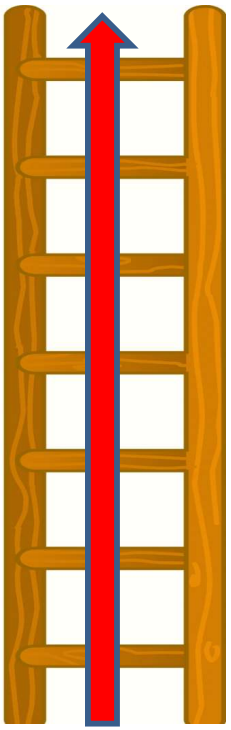
- ✓Thatch and decaying root matter is fungal food combined with an appropriate amount of top dressing creates :

A great playing surface and the correct conditions for perennial grasses



Biology Ladder

Phase 3	Fescue / Bent Bent / Fescue Rye	Fungi – Introduce Mycorrhizal Fungi and Fungal foods
Phase 2	Bent / rye Bent / Poa Poa / Bent	Fungi – Introduce Fungi and fungal foods
Phase 1	Perennial Poa *Poa annua*	Bacteria – Bacteria foods



Poor Drainage / Soft / Thatch / Disease

Removing Thatch- Is it necessary?

Improving the environment

- ✓ Improved machinery
- ✓ Less disruptive regular light aeration
- ✓ Air2G2 good air little disruption
- ✓ Solid time only when conditions ok
- ✓ Sorrel roller / star slitting
- ✓ Light topdressing monthly more for surface
- ✓ Keeping the good biology program going with compost tee and bio stimulants
- ✓ This promoting good microbial activity increasing soil health and nutrition whilst helping the friability and percolation of the rootzone

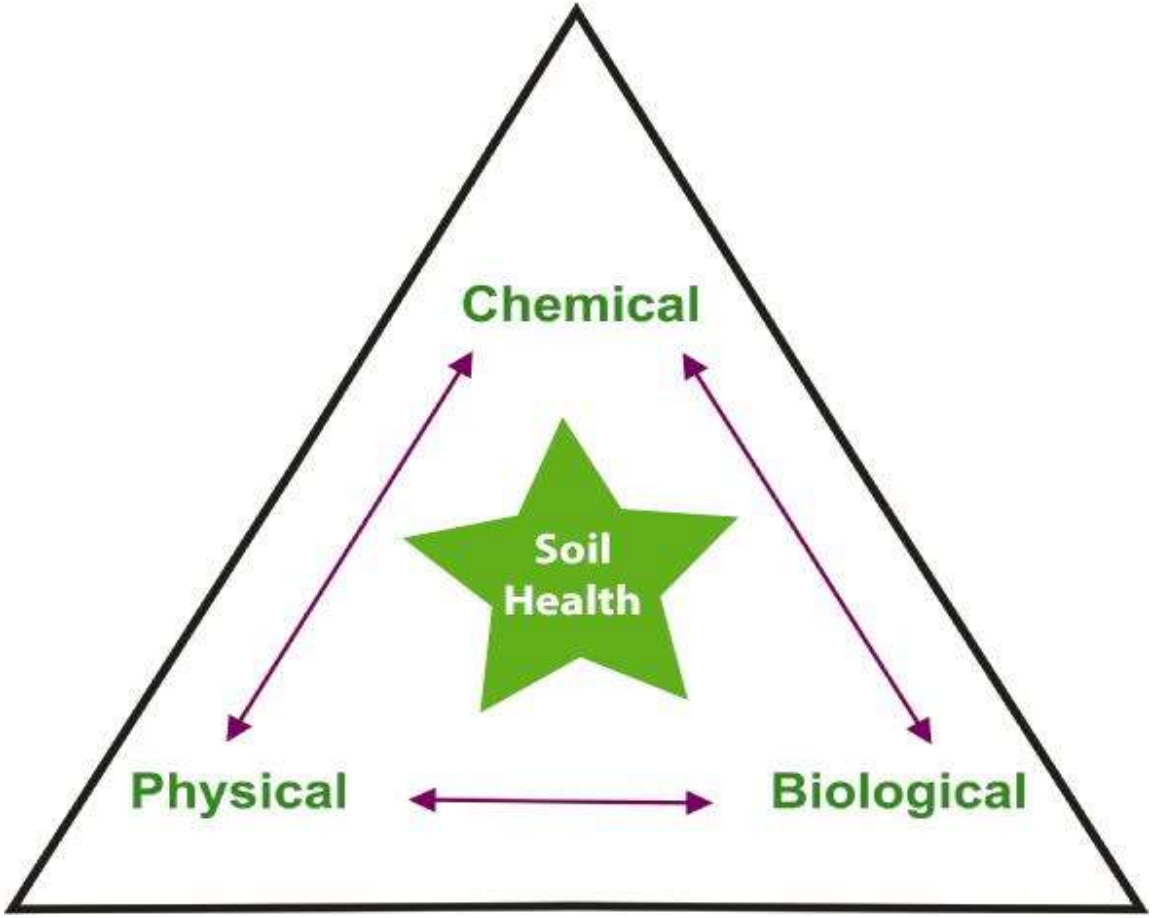
Regular non-disruptive aeration is best

- ✓ Micro tine
- ✓ Sorrel roll
- ✓ Light top dressing
- ✓ Weekly
- ✓ Monthly
- ✓ Liquid aeration
- ✓ Oxygen into rootzone without disturbing play!

Root Zone Health

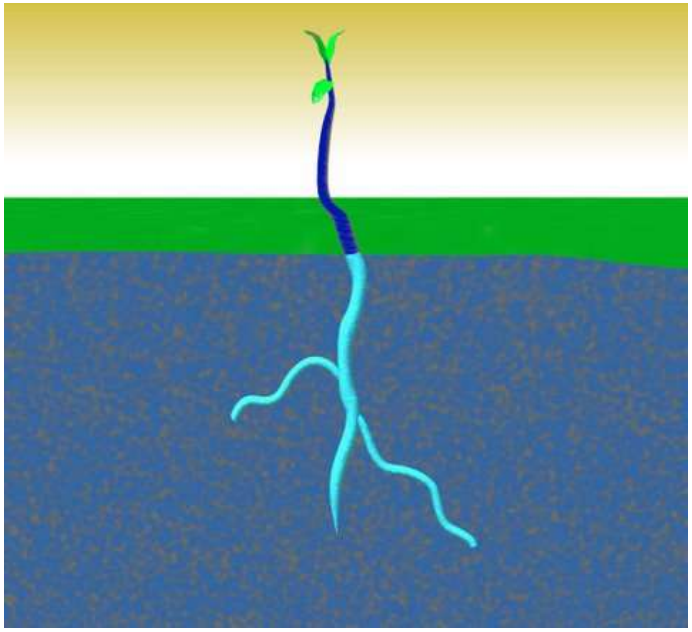
A balance between:

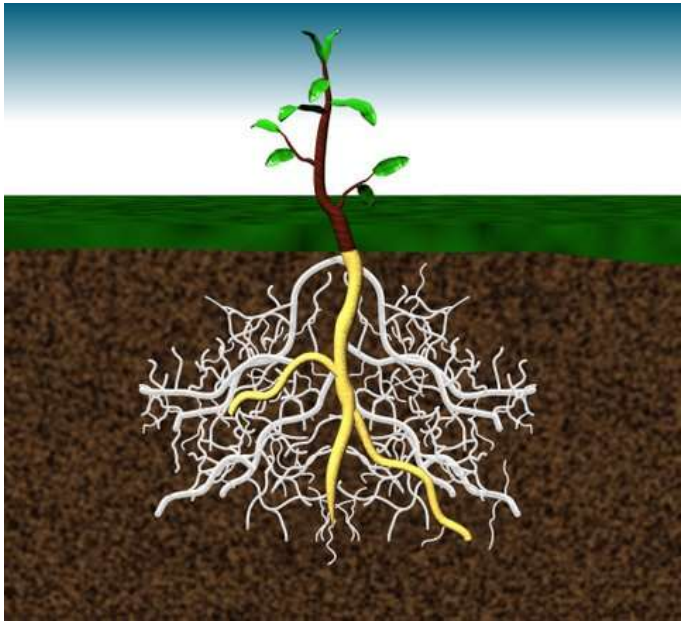
- ✓Soil Chemistry
- ✓Soil Physics
- ✓Soil Biology



Mycorrhizae

Mycorrhizae are the most important fungi in your rootzone





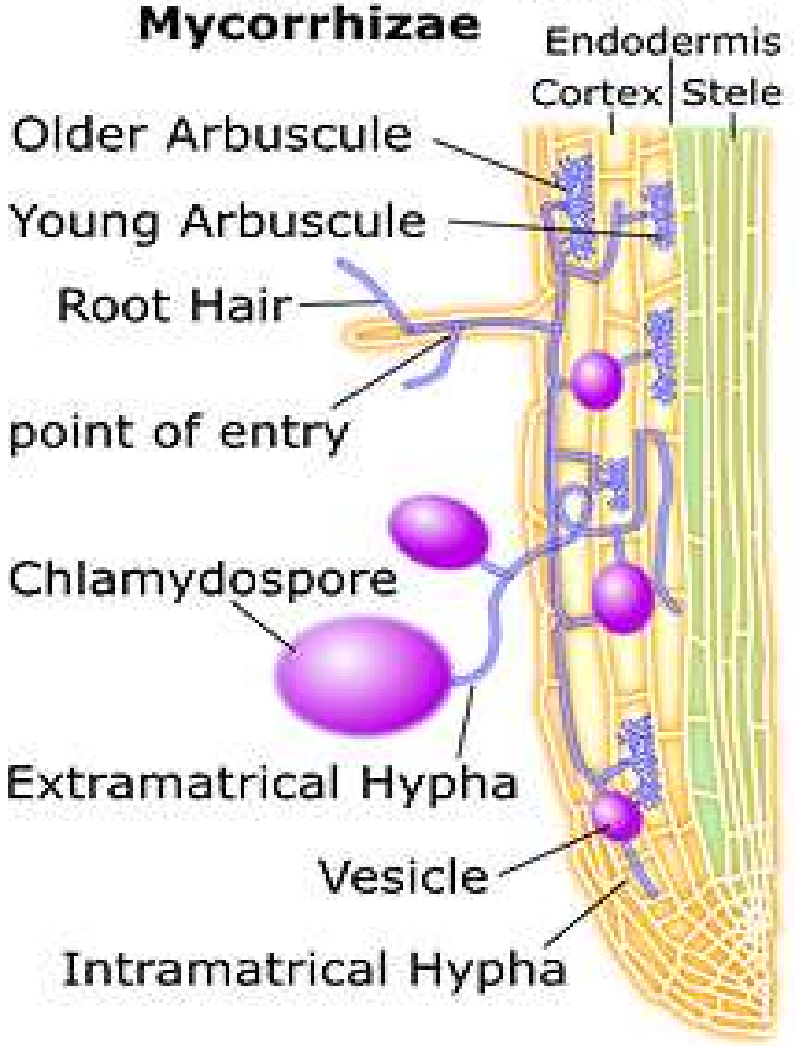
As highlighted above the fungal hypae extend the rooting system. The fungi pass water and essential nutrients to the plant in return they receive all the carbohydrates which they require from the plant. When this symbiotic relationship exists a physical barrier is create to protect against pathogen attack.

Mycorrhizae

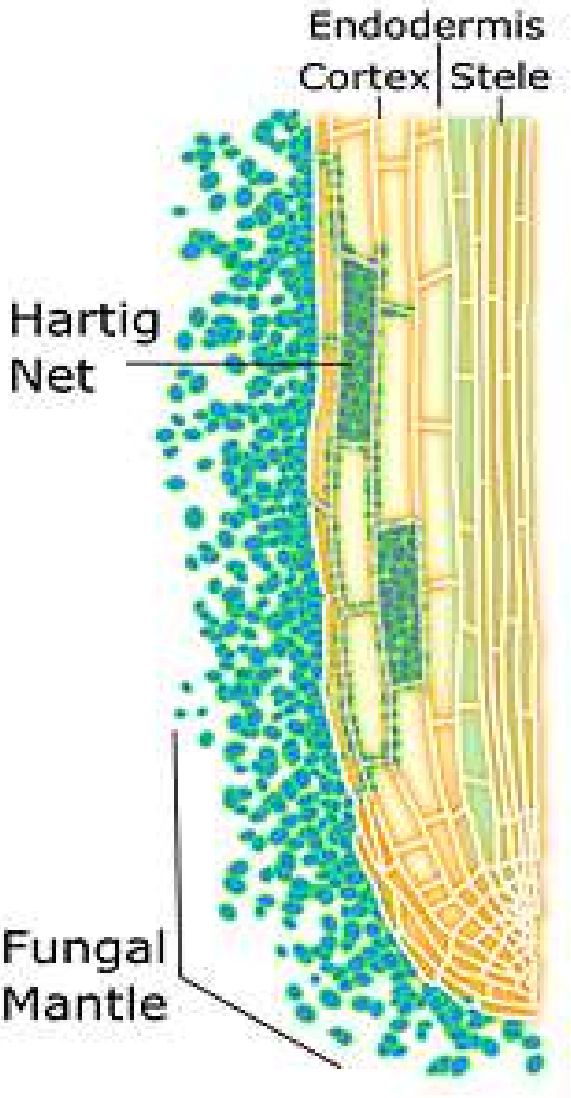
The Benefits of Mycorrhizae

- ✓ Can grow twice as fast as non mycorrhizal grass.
- ✓ Ensures the establishment of perenial grasses.
- ✓ Extends the rooting system by up to 300%.
- ✓ Reduces grow in times by.
- ✓ Require up to 30% less water.
- ✓ Requires less fertiliser.
- ✓ Suffers less from disease.
- ✓ Solubilises Phosphorus and brings nutrients (inc nitrogen and micronutrients) to the plant.

Vesicular Arbuscule Mycorrhizae



Ectomycorrhizae




BIOSTIMULANT
MYCORRHIZAL INOCULANT
CONTROL

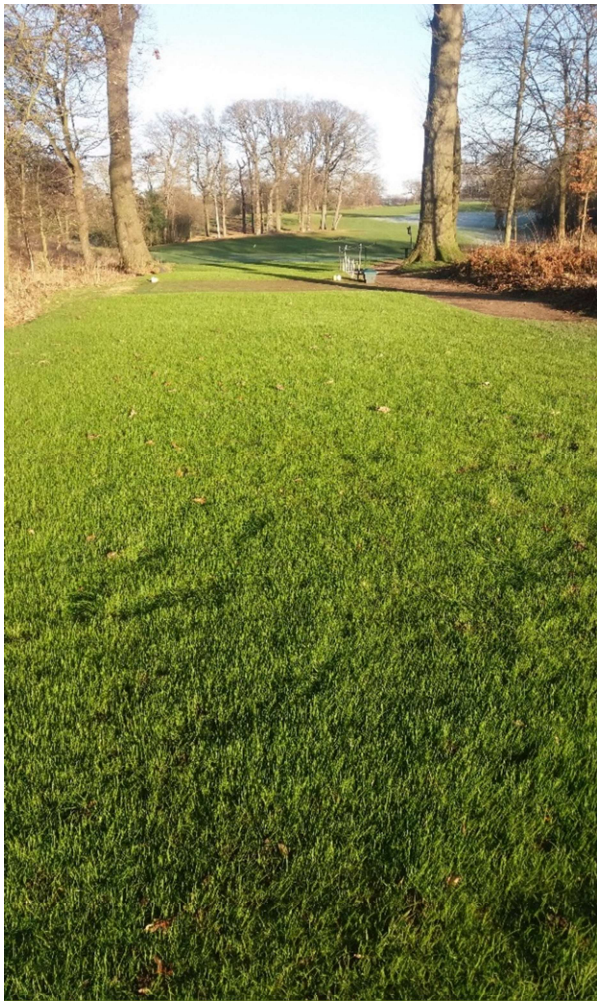
A Good Environment Helps

Roots

Increased Root Mass and Weight:

- ✓ Absorb water and nutrients
- ✓ Anchor the plant to the ground
- ✓ Store of food and nutrients

Henlle Park Golf Club



Tee renovation seed put down 27th November 2016 frost followed early December these pictures on 17th December

Case Studies

Penn Golf Club over seed work 2016 Bent seed 26th September Fescue 18th October

Picture 11 days after seeding master line all bent Seed with Mycorrhizal

Picture 12 days after fescue seeding with Mycorrhizal

Tyn Dwr Hall - Wedding Venue

seeded 9th September 2016
Left picture on the 18th 9 days after seeding
pictures on right 23rd
Cut 14 days after seeding
products used
mycorrhizal inoculant
pre seeder
Seed Coat
aviar 10.0.4 organic granular

ABOVE
14th May 2017
1 app 3.0.3 turf hardener
1 app 15.2.15 mycogro

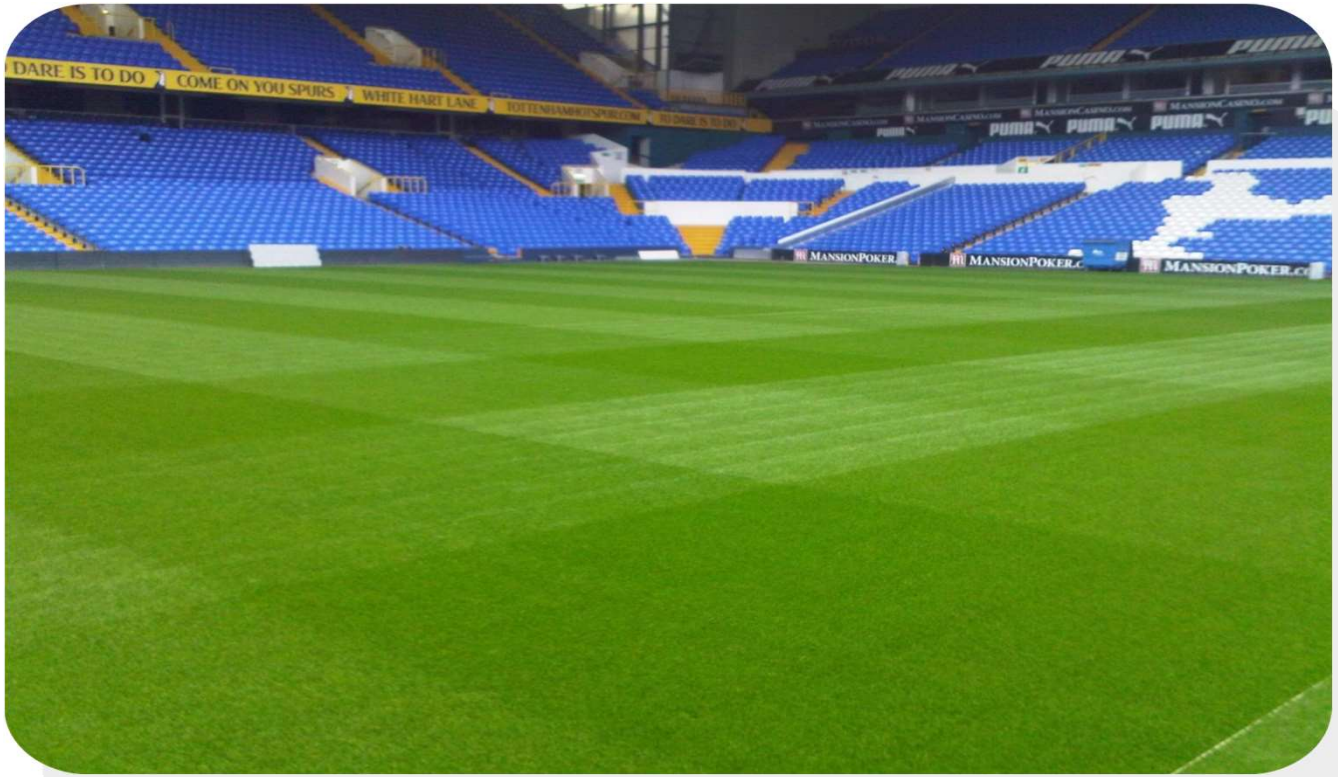
Mycoforce Grass Seed Coat

Ryegrass Roots Inoculated with MycoForce Seed Coat

The photo shows Ryegrass roots 30 days after sowing. Roots on left have been inoculated with MycoForce Seed Coat

5 weeks after seeding

Mycorrhizae, Compost Teas and CMS Shoot 5.0.2 applied



Just 4 Weeks After Seeding

PRODUCTS USED

- ✓ Mycorrhizal Inoculant,
- ✓ Seed Coat,
- ✓ Pre Seeder,
- ✓ Traceolite
- ✓ Caviar

Mycorrhizal Fungi

- ✓ Perennial *Poa* and ‘fine’ grasses associate with mycorrhizae
- ✓ Overseeding with mycorrhizae provides competitive advantage
- ✓ Promotes plant health and vigour
- ✓ Enhanced disease and pathogen resistance
- ✓ Reduced Irrigation and fertilisation

Why?

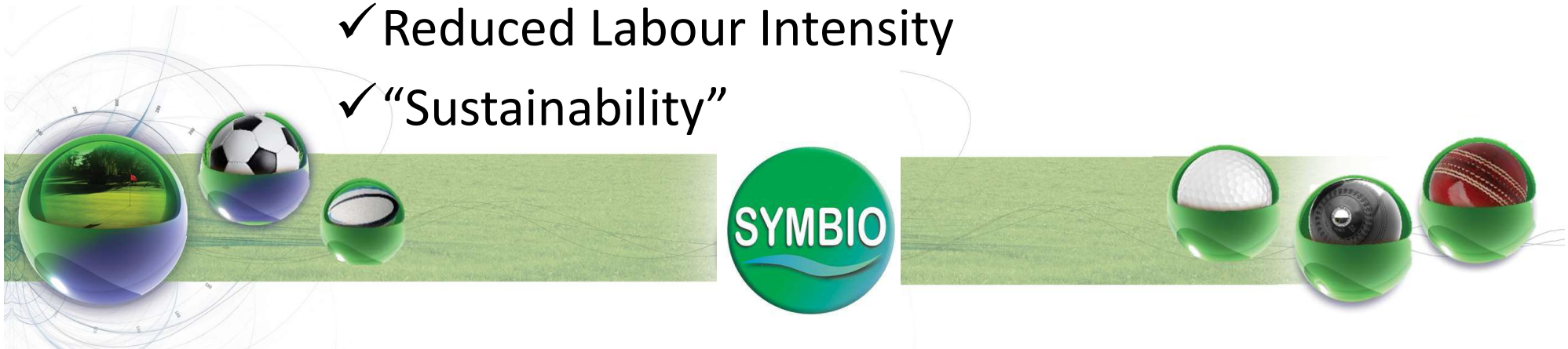
Empower the customers to take **control** of their soils

- ✓Increase the quality of the soil, microbes and essential elements
- ✓Provide an environment conducive to soil, rhizosphere and shoot biology
- ✓Proven reduction in disease

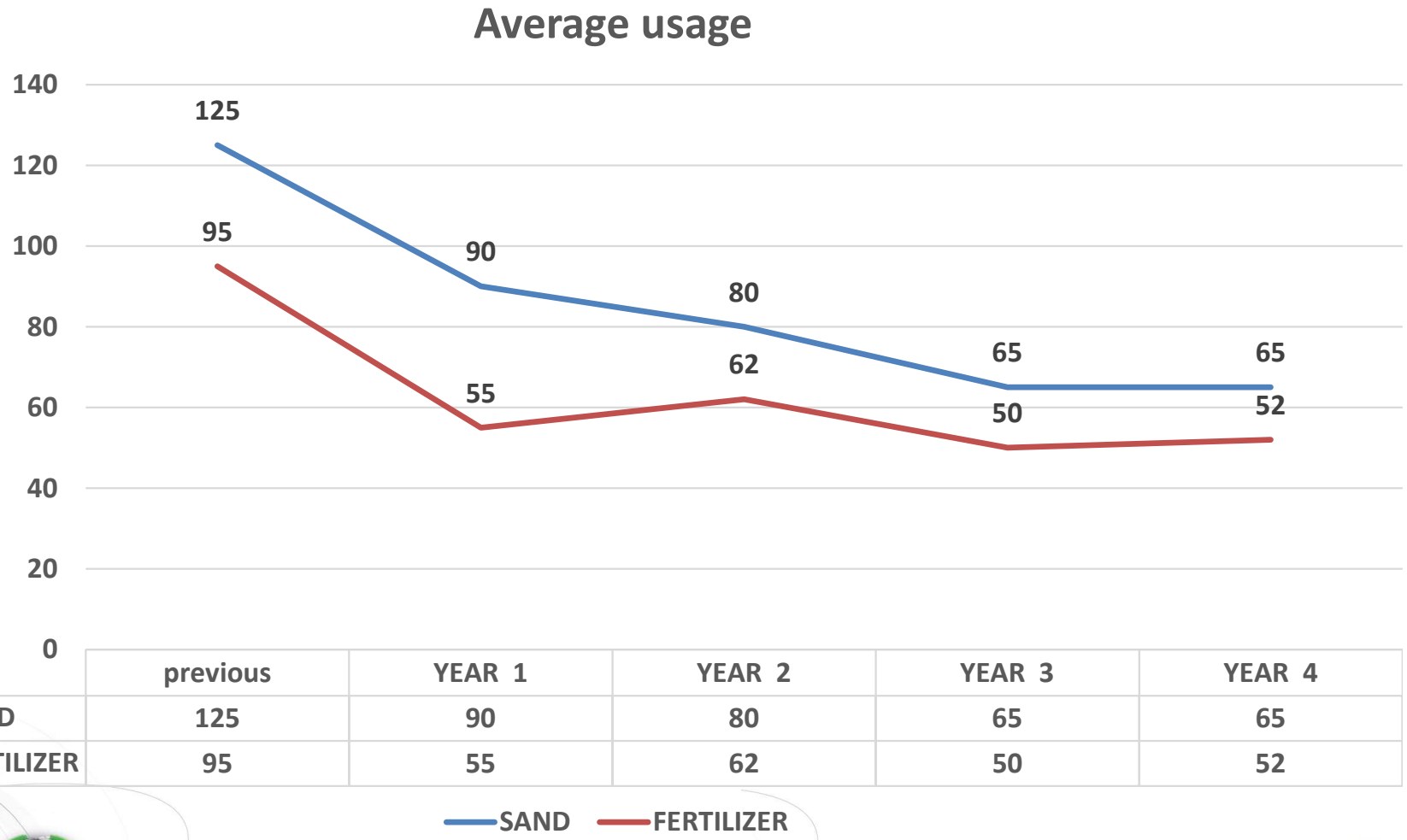
Healthy Soils Promote Healthy Plants

What We Want to Achieve?

- ✓Healthy Plant Growth - Root & Shoots
- ✓Increased Fine Grass Development
- ✓Reduced Pathogenic Fungal Activity: Dry Patch, Fairy Rings, Disease
- ✓Friable, Free Draining Root zone
- ✓Minimal Thatch
- ✓Minimal Disruption
- ✓Reduced Water Requirement
- ✓Reduced Nutrient Inputs
- ✓Reduced Labour Intensity
- ✓“Sustainability”

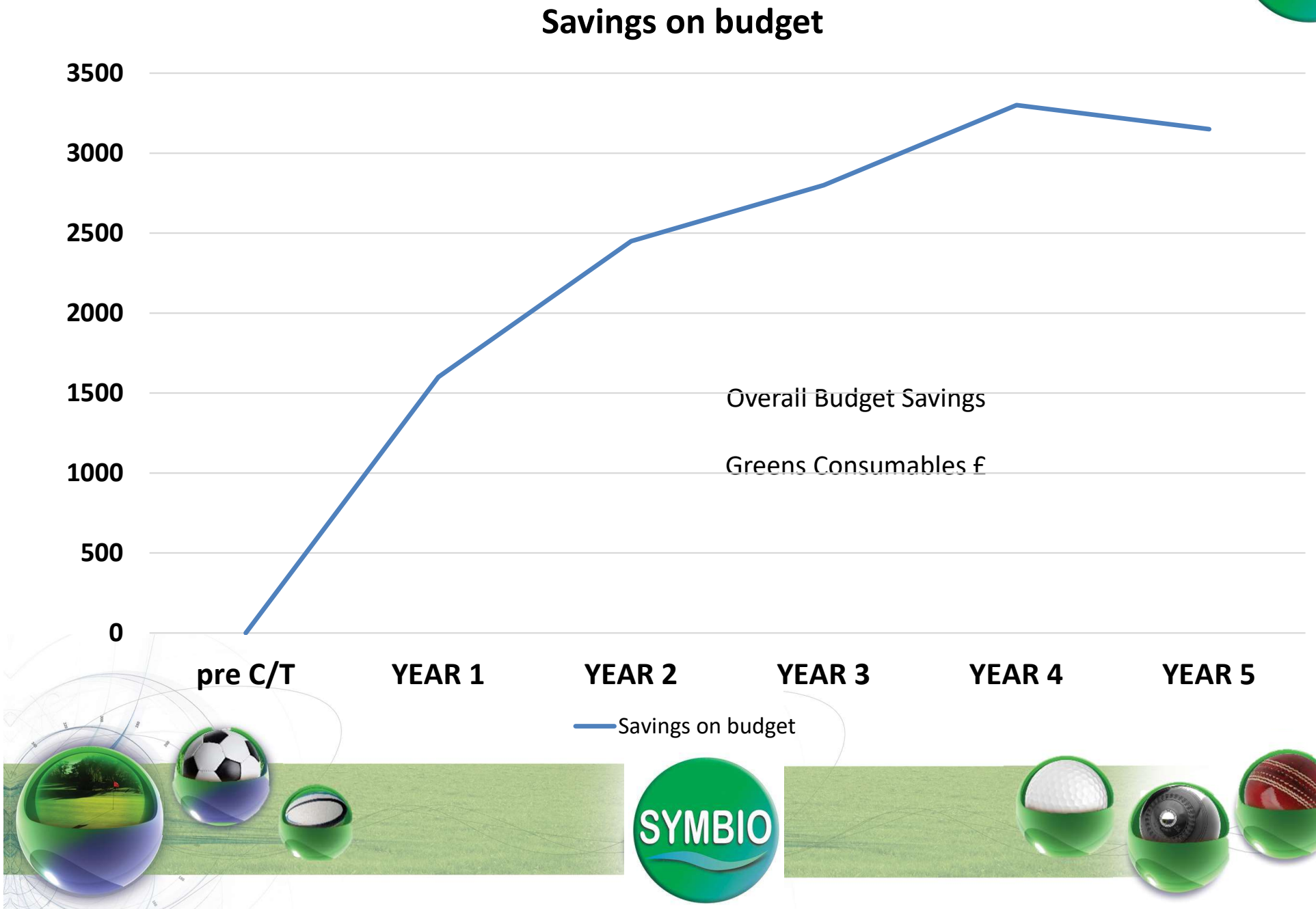


Reduction in use of Sand tonnes and Fertiliser Kg N/Ha



	previous	YEAR 1	YEAR 2	YEAR 3	YEAR 4
SAND	125	90	80	65	65
FERTILIZER	95	55	62	50	52

Cost Savings



Thank You

Jeremy

SYMBIO OVER 25 YEARS IMPROVING SOIL HEALTH