



Natural turf – why it remains the best choice for football and playing surfaces

Prepared by Euroseeds to continue the discussion on the benefits of using natural turf for municipal and club sport and leisure surfaces over artificial turf

NATURAL OR ARTIFICIAL?

If you're considering investing in the installation or renewal of a municipal or club sports surface, perhaps the most important decision you must make is to choose between natural and artificial turf. Decision makers take many different factors into consideration when deciding on whether to install or renew turf pitches: these can be practical, climatic and financial, alongside public, political and personal considerations. There's no denying that the arguments are compelling on both sides, and it may seem like a tough decision – but it isn't. Natural turf brings a multitude of benefits, from its unbeatable environmental credentials to the commonly-held belief that 'the beautiful game' simply cannot be played on anything but a natural grass football pitch.

That said, football's international governing body, FIFA itself, has lent its support to artificial turf in recent years,

aiding product development and giving rise to its more accepted, widespread use. The technology has, indeed, improved, overcoming many of the problems associated with early-generation pitches. But it is also true that the natural solution has come in great leaps and bounds. Thanks to the ongoing endeavours of plant breeders within both traditional and innovative new species, grass seed solutions have been introduced. They provide desirable characteristics such as wear, drought and disease resistance. Maintenance regimes have also been much improved.

The 2010 FIFA World Cup in South Africa is a terrific illustration of this. Natural turf was the predominant playing surface across the tournament's stadium pitches and training grounds, despite the fact that FIFA discussed playing on the artificial turf due to the country's exceedingly hot and arid conditions. But, in practice, and for the most part, natural turf turned out to be better option – a great result for grass!



HOW NATURAL TURF CAN HELP CUT YOUR CARBON FOOTPRINT

One of the strongest arguments for installing natural turf is that it is by far the most sustainable, and environmentally- and carbon-friendly option. We are all responsible for a cleaner and greener future of our planet and have our part, no matter how small, to play. It is up to individuals to make positive choices, be that recycling household waste, cycling to work or, indeed, choosing natural over artificial turf in a professional capacity.

What's more, with many clubs and municipalities actively seeking to cut their carbon footprint or become carbon neutral, installing and preserving natural turf pitches can be a vital to this. To illustrate – for every artificial pitch that is installed, a natural pitch needs to be established to compensate for the greenhouse gasses produced and neutralise the carbon. Deforestation is, quite rightly, one of the most condemned acts against our environment. But you may be interested to learn that the annual oxygen production and carbon dioxide fixation from one hectare of grass exceeds that of one hectare of forest.

Grass is vital to carbon sequestration – the process of removing carbon from the atmosphere and depositing it in the soil reservoir, which is third only to the other carbon sequestration reservoirs: the earth's outermost surface, the crust, and underground oil and gas reserves. This means that each year, hectare by hectare, turf grass will sequester more carbon into the soil than woodland. For instance, a football pitch measuring around 10,000 m² or 1 ha is capable of capturing and sequestering an average of 12t of CO₂ per year.

NATURAL CHOICE

With municipalities and sports clubs under increased pressure to make the most of their sport amenities with minimal with minimal efforts and investments, many decision-makers are swayed by promises of artificial turf manufacturers to have longer playing hours, less maintenance and lower costs.

Do these statements, together with the prevalence and approval of artificial turf use, prove it to be a superior, more modern choice?

As the voice of the European natural grass seed industry, Euroseeds strongly believes that this is not the case, and is keen to promote the benefits of choosing natural turf wherever and whenever possible. Here, we will explore the advantages and benefits of choosing natural turf.



Conversely, the artificial yarns or fibres that make up artificial turf are manufactured predominately from petrochemicals – one of the main contributors to global warming. Indeed, 2010 research conducted by the University of Berkley in the United States concluded that “artificial turf releases more greenhouse gases in its production, transportation and processing than the maintenance of natural turf ever would.”



Better still, a 2008 study by Ranajit Sahu on the carbon sequestration potential of managed turfgrass in the United States concluded that “managed lawns sequester, or store, significant amounts of carbon, capturing four times more carbon from the air than it is produced by the engine of today’s typical lawnmower.” The study also finds that “well-managed turfgrasses, which are cut regularly and at the appropriate height, fed with nutrients left by grass clippings, watered in a responsible way, and not disturbed at the root zone, actively pull pollutants from the air, creating a greater carbon benefit.”

COST BENEFITS

Natural turf is very cost-effective compared to artificial, as the below Euroseeds figures reveal. Annual costs for an artificial surface are high; often far higher per playing hour than a natural surface due to the considerable initial investment costs.

Maintenance costs for natural and artificial surfaces are, in fact, very similar, contrary to claims that using the artificial one saves on maintenance. Indeed, many turf professionals report an increase in maintenance costs after installing an artificial pitch – it’s certainly not the case of installing an artificial pitch and leaving it at that.

Cost comparison between natural and artificial turf pitches

	Natural grass turf	Natural grass turf +3% artificial fibres	Artificial turf + rubber infill
Approximate playing hours	450	750	1,000 to 1,500
Investment costs	€80,000 to €150,000	€220,000 to €250,000	€430,000 to €500,000
Lighting costs	€42,000 (not essential for every pitch)	€42,000 (essential for every pitch)	€42,000 (essential for every pitch)
Fencing costs	€16,000 (not essential)	€16,000 (essential)	€16,000 (essential)
Maintenance costs	€8,000 to €10,000	€10,000 to €15,000	€10,000 to €15,000
Electricity costs	N/A	€7,000	€7,000
Interest @ 6%	€4,800 to €9,000	€12,000 to €15,000	€25,800 to €30,000
Average lifespan of top layer	15 to 25 years	15 to 25 years	8 to 12 years
Depreciation costs: top layer (i.e., 60% of investment)	€2,400 to €4,500	€6,600 to €7,500	€25,800 to €30,000
Depreciation costs: technical sports layer + bottom layer with 25-year lifespan	€1,280 to	€2,400 €3,520 to €4,000	€6,880 to €8,000
Total annual depreciation costs	€3,680 to €6,900	€10,120 to €11,500	€32,680 to €38,000
Recycling costs	N/A	€10 m ² = €75,000	€10 m ² = €75,000
Total annual costs	€16,500 to €26,000	€39,000 to €48,500	€75,500 to €90,000
Total annual costs per playing hour	€37 to €58	€52 to €65	€63 to €75



COUNTING THE COSTS OF ARTIFICIAL VS NATURAL TURF

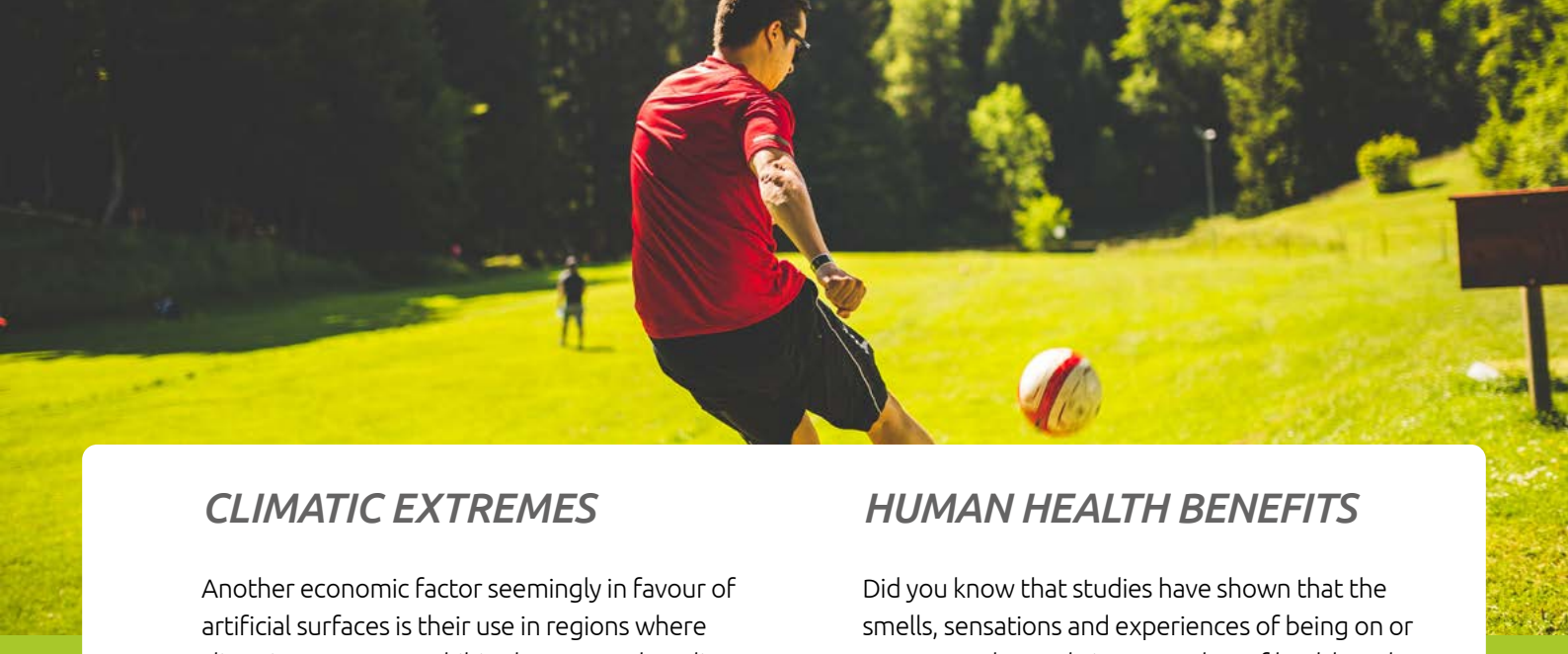
Other cost factors to consider:

- To make an artificial pitch investment worthwhile over the course of its lifetime, a pitch needs to be played on for over 1,000 hours per year. But, think about it: that means at least 3 hours of play or training, 7 days a week, all year round. Come rain, wind or shine. How many football and sports clubs, and municipal sites require that level of use?
- What's more, to make full use of the available 1,000 hours of playing/training time, adequate lighting, probably in the form of expensive flood-lighting, is needed so that the pitch can be used in the evenings and darker winter days. Electricity costs for this are high and are set to rise as energy prices spiral.
- Artificial surfaces are often said to have a lifespan of 15 years. But, so far, no such surface has remained in-field for that length of time. It is now thought that a 10-year life-expectancy is more realistic. This increases annual costs considerably, because the depreciation costs per year are very high, and this, in turn, raises the question of how they are recycled at the end of their life. The cost of recycling just a single square metre of artificial turf is cited at €10 – that means recycling an entire football pitch could cost as much as €750,000!
- When making competitive comparisons, many artificial turf stakeholders and users fail to take factors such as the introduction of new and improved grass varieties and species into account and over-calculate maintenance costs as a result. Natural turf costs are also impacted by climatic conditions and the intensity of use – not to mention the skills and resources of the grounds team.
- While natural turf renews and repairs itself, an artificial surface will deteriorate and depreciate, regardless of how much you spend on maintenance, from the day it is installed until the day it is replaced.

So let's compare these options.

The cost of a rubber infill pitch – i.e. a current generation artificial surface as recommended by FIFA under its two-star system – is between €488,000 and €560,000, including lighting and fencing. For this investment, your pitch will yield up to 1,000 hours of playing/training time per year (though few venues achieve this level of usage, as we explore below). Compare this to the costs associated with the installation of a natural pitch. A natural grass pitch strengthened with artificial fibres will yield 750 hours of use per year and costs between €278,000 and €308,000, including lighting and fencing. A 100% natural grass pitch yields 450 hours and costs between €80,000 and €150,000. Grass is by far the most cost-effective option, plus it yields (not to mention, more realistic) annual usage hours.

Of course, playing surface investment costs vary from country to country across Europe, depending on material and labour costs, climatic and soil conditions, market supply and demand, and the specific requirements of the venue. Nevertheless, these figures provide a useful cost analysis guideline, with natural turf invariably proving the most prudent investment in terms of cost.



CLIMATIC EXTREMES

Another economic factor seemingly in favour of artificial surfaces is their use in regions where climatic extremes prohibit play on good-quality natural grass surfaces all year round. Indeed, this is precisely why FIFA has lent its support to artificial surfaces via its FIFA Quality Concept For Artificial Turf, which seeks to promote their more widespread and successful use where appropriate.

For example, the very hot and dry conditions in South Africa led FIFA to consider artificial turf as the way forward for The 2010 FIFA World Cup. A logically sound decision, you might think, for hot and arid regions such as this.

However, the investment isn't such an attractive one when the irrigation costs to keep the surface cool and playable are taken into account. And with water being such a precious resource, and, in particular, clean drinking water being in short supply in developing countries, the notion of 'wasting' water in the name of football is unacceptable to many. Not when more sustainable, natural grass solutions are available.

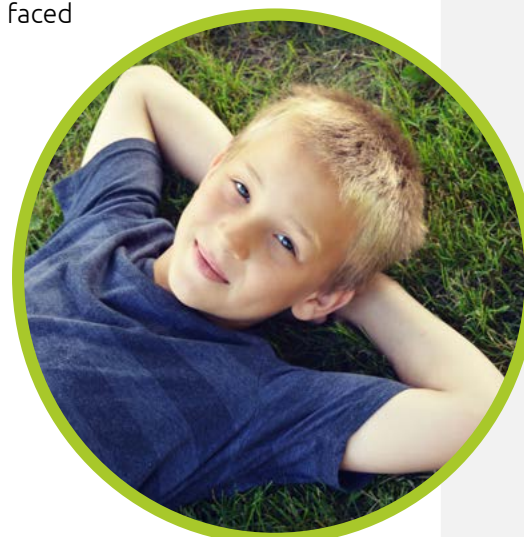
Very cold and arctic regions, on the other hand, require under-field heating systems to keep the surface ice- and snow-free in order to get maximum usage. This carries a hefty price-tag in terms of initial outlay and ongoing maintenance costs. While the top professional sports venues may require year-round, all-weather use (hence the rise in under-soil heating for grass pitches too), smaller clubs, schools and municipalities should bear in mind that it is hard to prioritize heating system with a modest budget.

HUMAN HEALTH BENEFITS

Did you know that studies have shown that the smells, sensations and experiences of being on or near natural grass bring a number of health and well-being benefits? It can reduce stress levels and even reduce your heart rate.

That's because grass is alive, vital, fresh; it grows – it makes people feel happy and healthy. Many players and sports professionals prefer it. Spectators prefer it precisely because it brings a little unpredictability and excitement to a game that a sterile, artificial surface aims to eradicate. Parents often prefer their children play on natural surfaces. Grass stains and dirt are all part of 'the beautiful game'.

These may be evocative arguments, but they are true. (And on the subject of parents' preferences, a major cause of complaint among parents whose children play on artificial pitches is the damage to their washing machines! This is due to the rubber crumb collected on clothing, which can wreak havoc on washing machines over a cumulative period. A seemingly trivial point, perhaps, but a very real problem for parents.) Rubber granulating in the water and sewer system is another serious problem faced by communities due to rubber granualtes being spread to the surrounding areas.





HEALTH AND SAFETY CONCERNS

There is a number of health and safety concerns surrounding the use of artificial turf. There is evidence that playing on the early-generation artificial surfaces brings a slightly higher risk of injuries, such as turf toe, anterior cruciate ligament injuries, foot lock, turf burn and concussion. The jury is still out on the new-generation pitches in terms of risk of injury as they have not been in use long enough.

But studies have shown a higher incidence of MRSA (methicillin-resistant *Staphylococcus aureus*) infection among American football players who play and train on artificial grass. This is because it's believed the 'carpet burns' caused by artificial turf create an entry point into the body for MRSA bacteria. Natural turf, on the other hand, contains an array of beneficial bacteria, which self-sanitise the surface and absorb human bodily fluids like sweat, spit, vomit, blood and urine, etc, as well as animal excreta and algae that could otherwise cause infection.

Some manufacturers promote the absence of bacteria in artificial turf as a positive aspect, but how widely and regularly are pitch sanitation products used and how effective are they? And how healthy are they for both humans and the environment?

Another downside of artificial turf in terms of human health and player comfort is that it gets far, far hotter than natural turf. A US study comparing a test venue's average temperatures between 7.00am and 7.00pm showed that the artificial surface heated to 47°C, with a high of 69°C; compared to natural turf's 26°C, with a high of 32°C. While the irrigation of the artificial pitch does reduce temperature, it quickly rises again. Even in shade, the artificial turf has a higher surface temperature than the natural one. This can result in increased fatigue, aggravated skin and fall injuries and – in the extreme cases – melted footwear, blisters and burns.

On the subject of irrigation, clean water is preferable to irrigate the artificial turf. However, recycled, collected or reused water can be used as well. The higher mineral and salt content is not necessarily toxic to the turf plants.

Likewise, weeds and fungi can invade established artificial pitches. The artificial turf also needs de-icing in the winter if a play is to go ahead, particularly where under-pitch heating hasn't been installed. Artificial turf is, therefore, by no means a maintenance-free solution, with the effects of herbicide, pesticide, de-icer and other chemical inputs on human and environmental health being unknown.

STATESIDE STUDIES

The artificial turf originated in the USA and so we must look to the United States – where the number of artificial surfaces is greater, as is the experience of playing on them – for concrete facts and figures on the health and safety concerns. Numerous studies have shown that playing on artificial surfaces can directly contribute to these kinds of injuries:

- **Turf toe**, or first metatarsophalangeal joint sprain, is a painful jam or hyperextension of the big toe. According to the Foot Health Association of America, although this condition can occur on natural grass, it is more common on the artificial turf.



- **Anterior cruciate ligament (ACL) injuries** have been the subject of some major US studies over the years, with research showing the problem is more prevalent on artificial turf than natural. Injuries are believed to be linked to shoe-surface traction, which is higher on the artificial turf than on the natural one. The National Football League (NFL) has compiled the most recent data on injuries, but unfortunately results are confidential. However, recent figures in an American orthopaedic journal reported 27% higher ACL and lower limb injury rates for NFL games played on artificial turf, with 88% ACL injury rates and 32% higher ankle eversion sprain rates. There seems to be some evidence that the injuries become cumulative and increase as athletes spend more time playing/training on artificial turf.

- **Foot lock** is a well-known problem among those who play on artificial turf. Indeed, many municipalities with artificial turf facilities actively encourage users to wear long-cleated (ie, 11mm or longer) or densely-cleated shoes to reduce the risk of foot lock.

- **Concussion** has been a key concern since artificial surfaces were installed in the States, with some sports stars playing on first-generation pitches famously suffering career-ending concussion. A number of US studies have shown artificial surfaces are, unsurprisingly,

significantly harder than natural. Yes, the technology has moved on, but ongoing concerns made the US Congress announce that it was looking into the problem after a 2010 study showed that the concussion rate on the artificial turf is 27% higher than on the natural one. The US Consumer Product Safety Commission stipulates that an artificial playing surface should have a G Max rating (which measures surface hardness) of between 100 and 140. A rating of over 200 is dangerously unacceptable. However, few municipalities and schools, etc, can afford this annual testing, which is essential to ensure the safety of a harder sand-based system. Therefore, how many are risking these significantly higher concussion rates?

- **Turf burn** comes about when a player 'slides' an exposed area of the skin across artificial turf. Because the artificial turf has a lower coefficient friction rate than natural grass – especially when it's wet – the player slides a greater distance, thus generating heat and producing a painful injury that is partly abrasion and partly burn.



To conclude on what we can learn from these stateside incidences, let's look at the outcomes of the NFL Players Association (NFLPA)'s 2010 Playing Surfaces Opinion Survey. This biannual survey saw 1,619 active NFL players from all 32 teams in the league show their overwhelming preference for playing on natural grass – their preferred playing surface, in fact, since the survey was initiated in 1994. In total, 69.4% of respondents prefer playing on natural grass surfaces. In contrast, only 14.3% prefer an artificial surface, with 9% indicating no preference.

When asked if they believe that artificial surfaces are more likely to contribute to injuries, 82.4% say 'yes', while 89.1% feel artificial surfaces cause more soreness and fatigue. A staggering 89.7% say they feel artificial surfaces are more likely to shorten their playing careers – something they cannot afford, given that the average career of an NFL player lasts a mere 3 years.



CUTTING-EDGE NATURAL TURF SOLUTIONS

Just as the artificial turf sector has sought to resolve issues such as an increased risk of injury and concerns about sustainability, etc., associated with the early-generation artificial pitches, our industry has worked tirelessly to introduce new and innovative natural turf solutions.

Thanks to rigorous and ongoing European and global breeding, research and development programmes, together with advances in turf management techniques, today's natural turf solutions improve year-on-year, providing outstanding wear-, shade-, disease-, drought- and heat stress-tolerance, excellent tensile strength, faster establishment and many more desirable characteristics besides.

Here are just a few of the major breakthroughs in grass seed breeding and natural turf solutions, as well as better grounds maintenance, made in recent years:

- According to the figures from the Dutch recommended list, perennial ryegrass – the main grass variety used in sports and amenity applications – has improved its **wear tolerance** by 1% year-on-year. This means that a sports field yielding 330 hours play per year in 1975, would, last year (2010), have benefitted from an additional 117 hours of extra play, bringing the total possible hours of play per year to an impressive figure of over 450. What's more, some modern pitches use a special soil construction that can support up to 750 hours of play and training.
- Breeding has also vastly **extended the growing season** for natural grasses. There are varieties available now that achieve very early growth after the winter and long into the autumn, aiding repairs and renovations all year round, regardless of conditions. The result is a stronger performance right through winter as well as an improved winter colour.



- The recent development of a very **fast-establishing** turf-type of annual ryegrass capable of germinating in temperatures as low as 3.5°C means germination and growth can be achieved quickly and year-round – even in cooler autumn and winter months. Famously used on the training pitches at The 2010 FIFA World Cup, this unique annual ryegrass was praised by an independent sports turf expert working for FIFA as being “of an exceptionally high standard”. The wear tolerance of top-quality grass varieties are also being enhanced by mixing **artificial fibres** into the topsoil. Or – alternatively – by combining real grass with artificial grass, woven together into a fibre surface, as per the Desso system. These provide a very strong and stable surface, less prone to divots. As a result, they offer all the benefits of natural grass combined with the support from artificial fibers.
- Last, but by no means least, the issue of shade – a real problem for some of our top stadia – has been solved, thanks to the introduction of **shade-tolerant** species and varieties, not to mention the use of lighting rigs.
- And it's thanks to breeding innovations such as these that many playing surfaces consisting of old swards, which have not been renewed for years, will likely see a dramatic improvement simply by **overseeding and rejuvenating the population of grass varieties**. By overseeding with a higher seeding rate, compared to a moderate rate of 15 to 20g per m², surfaces will also benefit from a faster establishing sward, higher density and, in turn, improved wear tolerance and playing performance. It is, therefore well worth investing in new seed or experimenting with overseeding often over the season with a low seeding rate before considering a full replacement of a pitch, be it artificial or natural.
- Great progress is also being made in terms of **fertilisers and soil treatments**. Many grass seed companies are now offering seed pre-treated with fertiliser, with this ready source of nutrients capable of aiding establishment over traditional fertiliser broadcast techniques. Likewise, fibre pitch coverings are able to increase soil temperature germination, aiding establishment beyond the grass-growing season.

As a result, whatever the sport or application – be it municipal/grassroots level, or professional – and regardless of usage requirements, local/climatic pressures or individual considerations, there is a natural turf solution to suit and succeed. The natural solution scores on all fronts; environmental, financial, longevity and safety, plus players and spectators alike prefer it!

**Natural turf
is natural choice.**



EUROSEEDS' MISSION STATEMENT

Euroseeds is the voice of the European seed sector, representing the interests of those active in research, breeding, production and marketing of seeds of agricultural, horticultural and ornamental plant species.

Today, Euroseeds, with more than 36 national member associations from EU Members States and beyond, represents several thousand seed businesses, as well 67 direct company members, including from seed related industries.

Euroseeds' mission is to engage, on behalf of its members, with all relevant European decision makers in order to represent their interests and to contribute to:

- *Fair and proportionate regulation of the European seed sector*
- *Freedom of choice for customers (farmers, growers, industry, consumers) in supplying seeds as a result of innovative, diverse technologies and production methods*
- *Effective protection of intellectual property rights relating to plants and seeds.*

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