Manual for GAA Fieldworks

GAA

CELEBRATING 125 years OF THE GAA


KOMATSU

Foreword from Chairman of the Munster Council

Is pribhléid mór dom teachtaireacht a scríobh don leabhar speisialta seo. Is leabhar eolais tabhachtach é agus táim cinnte go mbainfidh sibh taithneamh agus tairbhe as a bhfuil ann. Ba mhaith liom mo bhuíochas agus mo bheannachtaí a sheoladh chuigh an t-údar agus do ghach duine a chabhraigh leis an leabhar iontach seo a chur i gcló. Molaim go h-ard an obair atá déanta ag Seán Ó Riain ar son Comhairle Na Mumhan le blianta fada anuas. Oibríonn sé go dian dicheallach ar son na cumainn agus tugann sé dea chomhairle i gcónaí do ghach chumann a chuireann fios air maidir le cúrsaí forbartha.

As chairman of the Munster Council I warmly welcome the publication of the Club Physical development manual. It will be of a great benefit to all groundsmen involved in the care of all GAA Pitches. The experience gained by this group of experts in all aspects of ground maintenance over the past ten years will ensure perfect playing conditions at all times. Over that period of time this group of dedicated people has supervised 37 new field constructions, on both poor and good quality soils and 38 pitch remakes including drainage, sanding and over-seeding, while a further 25 projects were pitch renovations that were damaged and compacted by playing activities. Ensuring that your field and playing surface is always in perfect condition requires a lot of time and attention from the person in charge as well as a sizeable amount of finance. So I would appeal to all clubs to have a copy of this magnificent and informative reference book available in your Club House.

On behalf of the Munster Council, I wish to thank most sincerely John Ryan – Chairman of the Munster Council Physical Development Committee and his fellow members for their time, commitment and attention to detail thus ensuring that all GAA Players will have top class playing facilities at all times.

Is mise le meas

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Seamus O'Gormain
Cathaoirleach Comhairle Na Mumhan

Foreword from Chairman

With the vast number of playing pitches now in use by the GAA and extra land being purchased, the need for good advice on management and construction was never more needed. It was with this in mind that the Munster GAA Council requested the Physical Development sub-committee to compile and produce a booklet dealing with this very important activity.

As Chairman of the committee, I enlisted the help of fellow committee members Michael Carroll, B. Agr. Sc. (Thurles), who has acted as Pitch Consultant to Semple Stadium for almost thirty years, and Liam Mullane, Agricultural Consultant (Newcastlewest). We then co-opted Jim Kiely, Soils Scientist (Fermoy) who is a vastly experienced and knowledgeable person in this whole area having formerly worked as a Soils Research Officer with An Foras Taluntias and later Teagasc.

We were also very fortunate to have secured the help and expertise of John Mulqueen, a native of west Clare who was a very eminent Soil Consultant and Research Officer with An Foras Taluntais and Teagasc. However, shortly after his decision to come on board with us, his health deteriorated and we were very saddened to lose him when he passed to his Eternal Reward. May He Rest In Peace.

Jim Kiely stepped into the breach. A man who has overseen more sportsfield constructions, and drawn up more specifications than anyone else, Jim led our small production team and painstakingly helped to put in place what we now present to you.

A very sincere thank you to all the aforementioned and to the other Committee members – Mick Dolan, John Fawl, John O'Leary and Ger Galvin – for their co-operation and assistance with this production.

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John Ryan

(Chairman Munster Council Physical Development Committee)

Foreword from Author

The main problems of Pitch Construction in Ireland are now identified with the difficult physical properties of many Irish Soils. The soils research work of Tim Gleeson and John Mulqueen (both of the Soils Physics section of An Foras Taluntais) led to New Soil Technologies for improving the quality of playing fields. These tried and tested technologies are the basis of the present manual. The same group of Irish Soil Scientists were first to recognise the benefits of Sand Top Layers as a method of constructing Sand Carpet Pitches. Later, sand came into use for routine Pitch Renovation.

Many of our Irish Sportsfield Contractors became the pioneers of Modern Pitch Development. They quickly adopted the New Soil Technologies and introduced new machinery which was more suitable for Modern Pitch Works.

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Jim Kiely

Soil Research Scientist

Construction of new GAA Pitches and the Improvement of Existing Ones

Jim Kiely

BACKGROUND

During the past 10 years we have been involved in 100 GAA pitch projects in all regions and counties of Munster. We have provided soil surveys together with work plans and supervision of the ensuing developments. There were **37 New Field Constructions** on both difficult and good quality soils. Thirty eight of the projects were **Pitch Remakes.** This category included elements of improvement such as drainage, aeration, sanding and over-seeding. A further 25 projects dealt with were **Pitch Renovations**. Renovations were carried out on pitch surfaces that were damaged and compacted by play activities. Here we carried out surface improvements by aeration, sand application and pitch overseeding.

The contents of this book will be arranged in the following sequence. At first we will describe the **Natural Elements** that have major influences on the progress of **Pitch Projects**. This would include regional **Rainfall**, the **Type of Soil**, and the **Quality of the Soil**.

Next we will explain drainage techniques, namely **Main Drainage** and **Slit Drainage**. Notes on **Lime and Fertilizers** then follows. **Pitch Seeding** and **Pitch Overseeding** are introduced. In a section entitled **Suitable Machinery For Pitch Works** there are notes on **Heavy Plan Items, Slit Machinery Aeration Machinery Levelling and Harrowing Implements** and **Seeding And Overseeding Machinery**. There is also a mention of **Specialised Sand Spreaders**.

At this point **Pitch Construction** is discussed. This includes **A Survey Of The Site, Pitch Construction On Wet And Dry Sites**, and **Pitch Construction On Wet Heavy Land**.

Next, the subject of Sand Pitches is covered. This section includes **Sand Carpet Pitches**, and **Sports Sand For Use on Pitches**. A section dealing with **Re-Making Existing Sportsfields** and **Pitch Renovation** then follows. There is a section on routine pitch maintenance needs in the form of lime and fertilizers. It includes **General Recommendations For Lime and Fertilizers, also Fertilizers Where Grass Is Not Collected**. There are notes on using **Ordinary Fertilizers** and using **Slow Release Fertilizers**. There is a section on **Maintenance Fertilizers For Sand Carpet Pitches**.

Then, there is a section on Mowing and Maintaining the Sward. This includes **The Routine Mowing Of Turfgrass Swards, Turfgrass Weed Control, Pitch Surface Repairs and Returfing Goalmouths**.

RAINFALL PATTERN

Wet weather affects every aspect of sportsground development. There are wide variations of annual rainfall across Munster. The southern coastal areas of Cork/Waterford get only 800 mm of rain and many parts of west Munster get closer to 1600 mm or more. The mid Munster region gets about 1000mm to 1200mm. Higher rainfall areas have fewer dry days and there is great difficulty in getting the ground to a fit state for the start of pitch works. The lower rainfall areas have a much greater number of dry days in which to carry out pitch construction and improvements.

NATURE OF THE SOIL

In our climate, well drained soils are much easier to work and manage than similar but poorly drained ground. There is a wide variety of soils in the regions of Munster. Sportsfields can be developed or reconstructed with some ease on light textured tillage soils. E.g. the limestone tillage area of East Cork. Light textured tillage soils underlain by gravel also occurs in parts of Tipperary.

The Carboniferous Shale soils of West Munster are difficult to work with or to improve. They are mostly wet fields with poor soakage and a heavy (silt and clay) texture. The best time to start work on heavy wet ground is the June/July period. At this time, evaporation (the drying power of the long days and some sun) is at its highest and the chances of drying out heavy ground are at their best.

Of course, we can get wet summers like 2007 and the unusual summer of 2008. The summer of 2008 was so bad that I have not seen any pitch works that were finished off. Much of the 2009 summer had a much higher than average rainfall also.

PHYSICAL PROPERTIES OF SOILS

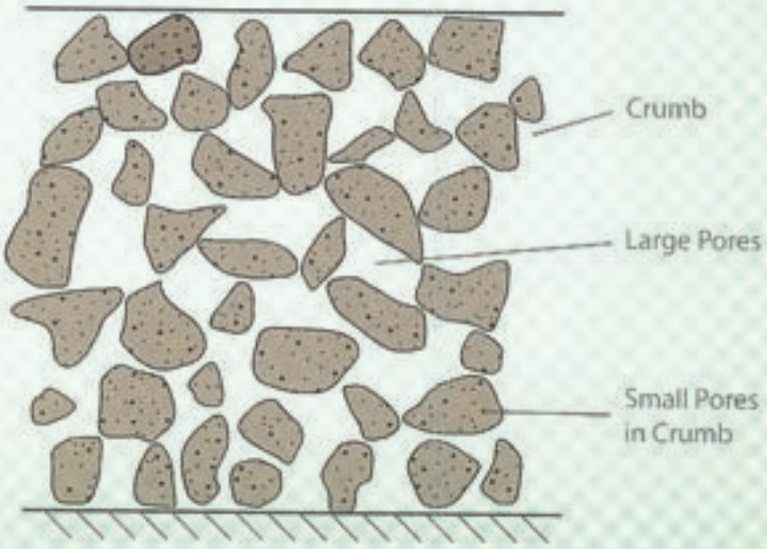
The ease of pitch construction and the opportunity to renovate and reconstruct sportsfields is helped by having good soil physical properties. **Texture** refers to the content of sand and finer particles in a soil. The **Sandy Loams** and **Loams** have the highest content of sand particles. Such soils are usually well drained and easily handled in average weather conditions. Heavy soils such as **Clay Loams** and **Silty Clay Loams** are fine textured. Usually in Ireland, heavy soils are difficult to work, because they have poor water soakage and dry out only very slowly.

Soil mass is made up of mineral particles bound together by organic matter from decayed plant materials. Topsoils in particular are composed of compound particles or **crumbs** separated from each other by **large pores**. There are also smaller sized pores within the soil crumbs. The large pores allow the downward soakage of surplus water. The small pores store water for plant growth. The whole complex of soil crumbs and the pores is known as **Soil Structure**. A well developed stable soil structure is the basis for a high quality pitch surface. Soil structure is also apparent in the topsoils of heavy wet sportsfields. On the heavy wet soil this structural development is weak and unstable and easily damaged by overplay. The structure of both dry fields and wet field can be broken down by **overuse** particularly use in wet weather conditions. When topsoil structures are damaged by play, the soil pores and the good soakage conditions are both lost. The soil then become compressed and often is also puddled. The grass roots cannot then penetrate the compact subsoil and the rooting becomes confined to the surface.

Mechanical aeration is the method used for loosening and breaking up over compacted subsoils.

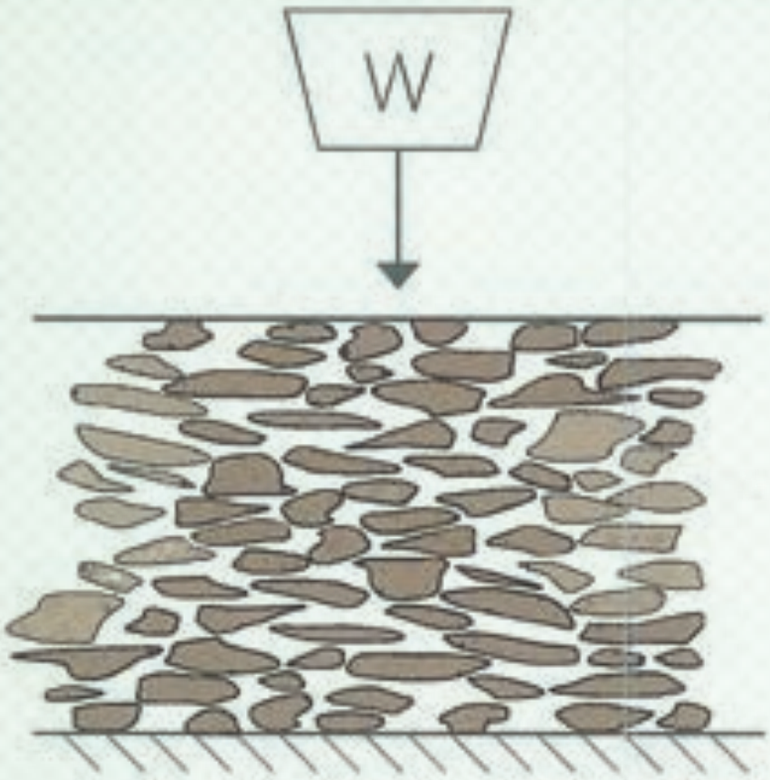
Good Crumb

Good top soil structure with crumbs and large pores also smaller poes within the crumb. The Large pores permit the rapid percolation of rainfall. The smaller pores provide good water storage



After Compaction

The same top soil showing structural degradation following the compaction with the loss of pores. This causes poor percolation, water logging and too hard a medium for deep grass rooting.



PITCH AERATION

Soil compaction is more than an increase in soil density or hardness. All the large pores together with soil cracks and other soil crevices are squashed and broken down. The **soil porosity** is then greatly reduced. The compaction and lack of major soil pores greatly reduces soil aeration and the natural drainage. The reduced permeability leaves water on the pitch surface. The roots of the better grasses are now confined to a shallow surface layer. There is an increase in weeds and poor quality grasses.

Aeration is the process that can reduce the effects of topsoil compaction. **The aim of the aeration is to increase the ratio of voids to solids in the damaged soil**. Voids may be defined as cracks and other various crevices that can be created by aeration machinery. Aeration improves surface drainage and increases the air supply to grass roots.

THE MAIN DRAINAGE NETWORK

In general, Ireland and Munster has high rainfall and low evaporation levels (capacity to dry out soils). In the "Summer Season", ie. April to September, it is the difference between rainfall and evaporation that keeps a pitch surface in good dry condition. In the "Winter Season" i.e. October to March, the soil will be damp or wet because there is little or no evaporation. Then the state of ground conditions will have to rely on natural or artificial drainage. In addition, many of our fields are impermeable to rainfall and are therefore reliant on a good quality drainage system.

All **Pipe Drainage Systems** need to have a **Main Drain** or **Carrier Drain** to channel the drainage water from the general drainage arteries into an **Outfall** or **Outlet**.

In a new pitch construction the **Main Drain** follows the main slope along the line of play. The depth of the drain is about 600 to 800mm. It can carry a 110mm or a 160 mm perforated drainage pipe depending on the expected outflow from the lateral drains. In the **Main Drain**, the pipe is covered with 10 to 20 mm gravel and in some cases good quality broken stone will also serve. In some new pitch situations where there is a danger of seepage or springs from higher ground a **Perimeter Drain** is installed all around the four sides of the pitch. Such a drain is at least 600 mm deep and it carries a 110 mm pipe. This perimeter drain is filled almost to the top with gravel or stone. The final 100 mm to the surface is grit or coarse sand. **Perimeter drains** are never covered over with soil. In a situation where **Perimeter Drains** are installed, one part of the drain system can then become the **Main Carrier Drain** which takes the water from the lateral drainage system.

The **Lateral Drainage** follows the crossfall in the case of a new planned pitch construction. Usually, they are installed across the width of the field every 5 to 10 metres. They are 450 to 600 mm in depth with a 60 mm or 80 mm pipe. The trenches are filled with gravel but the final 100 mm is a coarse sand material. **The joining of the lateral drainage pipes into the main drain pipe should be carried with great care. A good quality professional joiner should always be used**.

Drainage pipe laid in Lateral

Drainage piping for placement in drains

Excavating a Lateral Drain

Pitch with a number a Lateral Drains in place

SLIT DRAINAGE SYSTEMS

Lateral drains alone will not suffice as a drainage an improvement method for the heavy poorly drained pitch sites. Here a further closely spaced drainage network is required. In the past, this intensive system was provided by **Gravel Mole Drainage**. In recent times gravel moles have been largely replaced by a **Slit Drainage** arrangement. Slit drainage removes surface water from topsoils before it has a chance to puddle the surface. The **slits** create a direct link between the surface and the underground drain pipe network. Slit drains are cut at right angles to the lateral pipe drains. The Slits are cut

by a rotating disc and the spoil is delivered into a tractor/trailer in one operation. Slits are 50 to 75 mm wide and about 250 mm deep. There would be 1 to 2 metres between each slit. They are filled with small gravel, 6-10 mm in size. The upper 50 to 100 mm of the slit is topped with coarse sand. The newer models of the slit drainage machinery have the capacity to create and fill the slit in one pass. **It is important to note that there should be no earth present in the slit drain interface with the porous fill of the lateral drain**. Slit drainage can be put in place at the time of new pitch construction. They can also be installed into existing pitches if a lateral drainage system is already in place. There are also at least two systems of slits in use which we will call **Micro-Slits**. They are also known as **Gravel Band Drainage**. They are very narrow grit or sand bands varying from 8 to 25 mm in width and with depths of 100 mm to 350 mm. They are put in place using a trenchless system and are installed when the soil is moist. These micro-slits are not a substitute for the **ordinary excavated gravel/sand slits**. In our climate, they do not have the capacity to rapidly remove water from the surface in periods of heavy rainfall. **Micro-slits** are however useful for rejuvenating ordinary excavated slits when they become capped with soil. **Soil capping can occur when slit drained pitches are used in wet conditions. When this happens there is soil puddling and mud flows and the slits become smeared with soil**.

Packing the Gravel fill of the Slit

A Slit Drain with Gravel Fill

Slit Drain bein Topped with sand

Brushing and Levelling the Sand in the slits

LIME AND FERTILIZERS

The establishment of a good sward on **New Sportsfields** is very dependent on using adequate amounts of suitable **Lime and Fertilizer** inputs. It is strongly recommended that a **Soil Analysis** be undertaken. The results will show the nutrient levels in the soil and they will form the basis of decisions on **Lime and Fertilizer Inputs**. If **lime** is needed it can be applied as **Ground Limestone** or in the New **Granulated Lime** form. Very often granulated lime is now the choice. It is dust-free and can be applied via an ordinary fertilizer spreader. A small low ground pressure tractor can be used, and thus surface ruts and soil compaction are kept to a minimum.

The **Potassium (K)** and **Phosphorus (P)** inputs will also be guided by the soil analysis. The **P and K together with the Nitrogen (N)** can be applied, at the recommended rates of a compound, such as **10:10:20 NPK**. Further dressings of N will be needed when the seeds are established. At this stage there is often a response to **Sulphur**. A nitrogen source such as **ASN** will supply both sulphur and nitrogen. **Overseeding** is now a central part of **Pitch Remakes** and **Pitch Renovations**. All the above remarks on **Lime and Fertilizers** also apply to the requirements for successful overseeding.

The fertilizer needs of seeding new **Sand Carpet** pitches requires special attention. Unlike normal topsoil, **pure Sand** does not have or release any plant nutrients. Sand is also easily leached by rainfall and there are large fertilizer losses from **New Sand Carpet Swards**. New swards on **New Sand Carpet** pitches need about 50 per cent more fertilizers than the amounts used on the normal soil pitches. On **Sand Carpets** the fertilizers at seeding time are often divided into two split applications. Half is supplied before seeding and the other half is put on when the "seeds" have emerged. The use of **Slow-Release** fertilizers is now a common practise on **Sand Carpet Pitches**.

PITCH SEEDING

The establishment of an evenly spaced vigorous sward of grass is the end of any **new pitch construction**. The establishment of a fine and **very firm seedbed** is crucial. There are a number of specialised rakes and levelling machinery items that are used by pitch building contractors. As a result there is now very high standard of pitch seedbeds. The main grass seeds used for seeding pitches are the special **Dwarf Ryegrasses**. They have been specially selected for Sportsfield use. A grass mixture for pitch seeding usually consists of at least **three selected varieties of dwarf ryegrasses**. There are a number of specialised **Sportsground Seeders** now in use. Some of the seeders punch a network of holes in the ground which are ideal for accepting seeds. The seeds are then lightly covered by the same seed spreader. It should be emphasised that most of todays seedings are carried out with half the seed rate put in the length and the other half seeded across the width of the field.

Stone Removal during Pitch Works

Seeding a new pitch

Cambridge Roller after Seeding

OVERSEEDING

The improvement of existing swards on established fields is now carried out by an **Overseeding** process. The development of improving grass covers by overseeding them is increasing in popularity. One of the main reasons for the increase in pitch overseeding is the high standard and efficiency of the new **Overseeding Machinery** that is now in use. For example, there is a **Slit Type Overseeder** that produces slits as close as 30 mm to accept the seeds. Also there is a **Disc Seeder** which sows lines of seeds at 50 mm spacings. Overseedings is carried out by seeders sowing the seeds in a number of passes. Often there are three overseeding runs when one third of seeds are sown in the length, a second one third across the width and a final third across the diagonals. The three passes give rise to a diamond shaped seeding pattern. New and excellent sward covers are established by multi-pass sowings.

SUITABLE MACHINERY FOR PITCH WORKS

In the last 10 to 15 years, a number of plant contractors in Munster have become experienced and specialised in **Pitch Development Skills**. We have worked closely with many of these **Pitch Contractors**. We have provided site studies and pitch development plans in co-operation with many of the **Pitch Contractors** that are now working in the **Munster Region**. We have found that the combined efforts of the good contractors and ourselves have resulted in achieving a very high standard of work in the Pitch **Development Projects nowadays**. We have also been involved with the **Pitch Contractors** in selecting and sometime importing suitable new **Pitch Making Machinery** for use in the Irish situation. With the help of the contractors we have arranged demonstrations of **Pitch Development Machinery** in many parts of Munster.

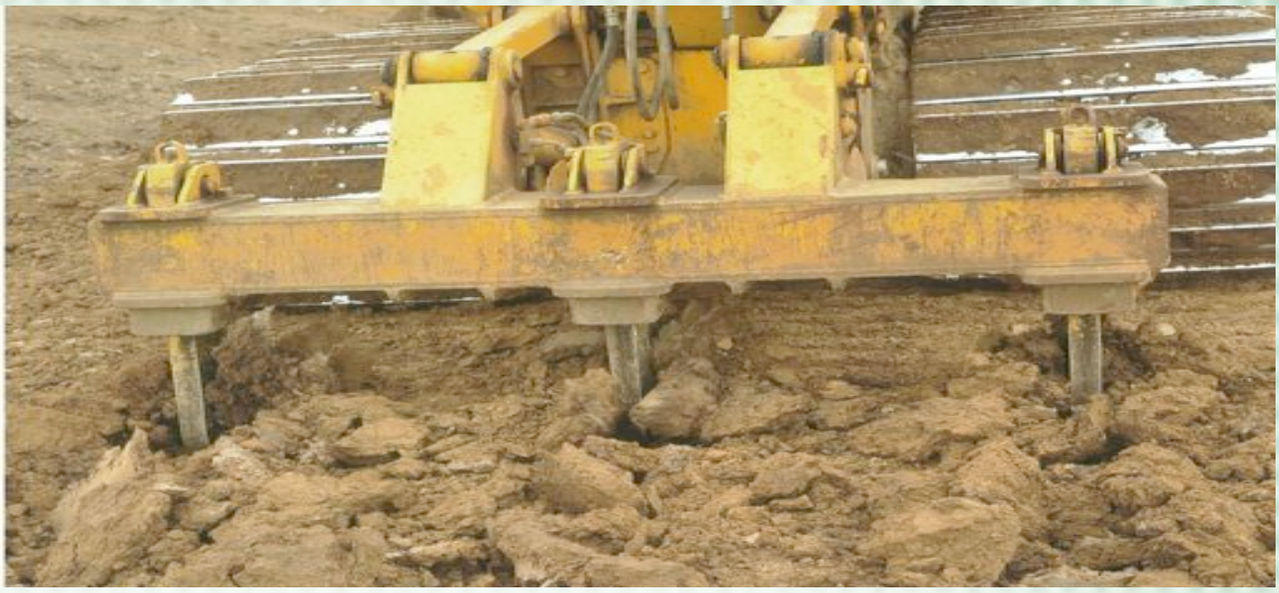
At the present time we would strongly recommend that GAA Clubs making a start on

Pitch Developments should contact and liase with **Neighbouring Clubs** who have already completed **Pitch Improvement Works**. We can assure any GAA clubs embarking on the pitch improvement journey that the knowledge and advice they need can be found by making contact with other clubs that are situated within a 20km radius of their field base.

HEAVY PLANT ITEMS

Use only low ground pressure dozers with automatic dual grade laser control systems. Dozers should be fitted with a **Ripper** capable of reaching a depth of at least 500mm. **An Excavator** is also needed for the **Lateral** and **Perimeter Drains**. The Excavator should also be linked into a **Laser System**.

Low Ground Pressure Dozer Note Wide Pads and Ripper



Ripping Compact Subsoil

Laser Station and Dual receivers on Dozer

Pushing Back the Topsoil with Lazer Controlled Dozer.

SLIT MACHINERY

A Rotating Disc Type Trencher removes a slit of soil and delivers the spoil into a tractor and trailer unit. The trencher can have a **Gravel Cart** joined on just behind the **Digging Wheel**. This assembly is essential to fill the slits with gravel on tilled ground where there is a danger of slits breaking up.

Slit Trencher with Stone Cart close to Digging Wheel

Slit Drainage in New Pitch Construction

Centre Slit Flanked Right and Left by completed Slits

AERATION MACHINERY

The **Verti-Drainer** is probably the most common and useful machine to deal with deep seated compaction. Verti-draining is similar to **Hand Forking**. The tines of the Verti-Drainer penetrate the soil and while in the ground they perform a heaving action which breaks the sub-base of the compact topsoil. If Verti-draining is well done the **Lift Action** does not break or tear the surface. The beneficial action of verti-draining is best achieved by the use of a **very slow tractor forward speed**. It can take 7 or 8 hours to verti-drain a full sized GAA pitch.

The Agrivator is another example of an aeration machine. A special rotor system allows vibrating tines to penetrate the hardest ground. There is a spring mounted roller just behind the rotor. We have used the Agrivator to work in Sports-Sand during the renovation of badly marked Sportsfields.

The **Ground breaker** is another aeration machine that we have used with some success. This machine has a rotor fitted with special hardened **wedge shaped blades**. The

blades penetrate the ground at high speed. The topsoil is broken up, laterally, between the slits, by side forces that are produced by the blades. The **Ground Breaker** also produces a drainage network of narrow slits. An **annual aeration programme** is now routine on many heavily used sportsfields.

LEVELLING AND HARROWING IMPLEMENTS

These implements are used at different stages in the making of new pitches. Here too, automatic laser controlled graders and levellers provide an excellent seed-bed finish.

Laser Controlled Grader with Single Receiver

Laser Grader with Dual Controls

SEEDING AND OVERSEEDING MACHINERY

Specialised seeding machinery is an essential part of pitch development. They have been described in a previous section.

SPECIALISED SAND SPREADERS

The **Ultra** drop type sand spreader is widely used. The **Specialised Spinner Type** spreader is also in use.

SURVEY OF THE SITE

This is the most important step when planning a **New Pitch** or the **redevelopment of an Existing Pitch**. The nature of the underlying soil layers dictates most of the necessary inputs that are required in pitch works. We have shown that there is a very wide range of soil types in Munster. It is very necessary to have a close study of the **soil cross sections**. This is done by digging soil pits about one metre in depth. This is a very good time to get technical advice during these ground excavations. This is the time also to observe the natural soil drainage. The soil properties will dictate the drainage needs. It is also timely to observe any seepage water that may arise from the higher surrounding ground. Any **Springs** should be noted and marked. The presence of bedrock and the content of large boulders should be noted. Now too, a survey of site levels must be done. The outlet for drainage water can be selected too.

PITCH CONSTRUCTION ON WET AND DRY SITES

We will deal the construction elements which have a place on both well drained easy sites and also on poorly drained difficult sites. We will describe a number of steps in the construction process.

Pitch Works Site on Heavy Wet Field

Pitch Works Site on Well Drained Field

Vegetation should be sprayed off using a Glyphosate compound. If the old vegetation is destroyed at lease one month beforehand, the roots of the material will be partly decayed. Then it will be much easier to smoothly remove the topsoil when fresh roots of grasses are not holding it together.

Ploughing the field is the best pre-dozing cultivation. When the topsoil is reasonably dry it should be stripped using an **Automatic Laser Controlled Dozer Assembly**. Strip off topsoil only – no subsoil. Store topsoil in banks that have been shaped to shed rainwater – rick-shaped.

Next the subsoil platform is put in place. **Use a dozer with dual grade automatic laser levelling**. The dozer should have a mounted Ripper capable of reaching a depth of 500 mm. In a full size pitch, we allow for a fall of **one metre in the length and 0.5 metres across the width. In a sizeable cut and fill each layer of fill should be ripped before next layer is put in place**. However, ripping is very dependent on good weather. In very broken wet weather the soil layer become saturated if heavy rain follows any ripping runs. Any boulders or big stones should be removed during the cut and fill. Finally, when the platform is created to the planned levels, it should be ripped maybe twice. The final ripping should follow **the long slope**. Now remove all stones that are bigger than 50mm.

The topsoil is now pushed into place by a dozer that is equipped for laser levelling. The topsoil levels should follow the gradients of the subsoil platform. A layer of at least 200 mm of topsoil is desirable. When the topsoil is in place, the whole surface is lightly graded off preferably by a tractor with a **laser controlled Grading Box or one of the new automatic laser graders. A tractor with a low ground pressure tyre fittings should be used**.

At this point, the planned drainage system is put in place. We have already described both the **Lateral Drainage** and the **Slit Drainage** systems in a previous section. In a moderately well drained site the **Lateral Drainage** can go in at the time of construction. If a **Slit Draining System** is required it can be installed at a later date. When the drainage is completed the surface is lightly harrowed with a tractor using low ground pressure tyres. Then it is important to firm up the seedbed. There are special purpose levelling harrows that are suitable for providing such a firm seedbed. During the levelling, an aeration implement can also be used, in order to remove any compaction.

FERTILIZERS, SEEDS AND SEEDING

The final operation includes the spreading of the selected **Fertilizers**. Following this, there is the sowing of the **Sportsground** seed mix. Both the fertilizer and the seeding must be put in place by a tractor using low ground pressure tyres. The **Fertilizer** and the **Seeding** have been covered in detail in previous sections.

PITCH CONSTRUCTION ON WET HEAVY LAND

The general elements of pitch construction described in the last section also apply in the greater part to difficult **Wet Land Sites**. **Site Surveys** are even more important where the sites are poorly drained. Here, land drainage is the most important consideration. It is necessary to find all old drains and undrained areas that are subject to **Seepage and Springs**. A **Pipe Drainage System** is always needed and the drainage outlet point is an important issue. Also most wetland pitches are now provided with a **Slit Drainage** network that feeds into the **Pipe Drains**. **Lateral Drains** are more closely spaced on wet heavy land situations. The Pitch **Construction Works** or **Pitch Remake Projects** should, where possible, be carried out in mid Summer. Then the days are long and the natural drying power of the weather is at its highest peak. Nowadays many of the new pitches that are constructed on poor wet soils are finished off with a **Sand Carpet**.

SAND CARPET PITCHES

Research and experience has shown that the use of **Sand Toplayers** have great benefits for sportsfields. **Mr. John Mulqueen** introduced the idea of a pure sand top-layer. He worked with **Mr. Joe Prunty** a Sportsfield Contractor from Co. Fermanagh and in 1968 one of the first pitches with a sand top layer was undertaken at Queens University in Belfast. This system of sand pitch construction became known as the **Prunty-Mulqueen System**. Today, this system is covered by a patent. Now, a sand top layer pitch has become widely know as a **Sand Carpet Pitch**. **John Mulqueen** suggested that single grain sand in the **0.1 to 0.6 mm Size Range** should be used. He indicated that the **Average** grain size should be **0.2 to 0.3 mm**. a minimum thickness of 75 mm was suggested for the **Sand Carpet** but 50mm of sand cover was considered sufficient for ordinary less used GAA fields. A sand cover can also be built up by 5mm deep dressings of sand carried out in each of the summer months from May to September. In that way, a **Sand Top Layer** can be put in place in four years or so. This technique of **Gradual Sand Cover** can only be successful on fields with a good soil drainage. The drainage may be natural, or artificial drainage installed before the sanding process starts.

Today also, sand dressings of 150 to 200 tonnes are applied to sports ground during **Surface Renovations**. These are badly damaged fields that have been over-used in wet weather periods. In that situation the sand dressing is worked into the surface by aeration equipment.

In the past 10 years we have supervised the installation of a number of sand pitches in West Munster. These sites were mostly heavy Shale Land with very poor drainage. Often too, they were high in organic matter and of a Peaty nature. Following very intensive **Lateral** and **Slit Drainage**, a **Sand Carpet** was placed to a depth of 100mm. Most of the heavy pitches with sand carpet are now well maintained. They get a top up of sand every few years and are aerated every year.

SPORTS SAND FOR USE ON PITCHES

There are two main sources of sand in Ireland. One is the inland fluvio- glacial deposits which are found in many inland parts of the country. The second source of sand which is found mainly in Co. Wexford and is known as **Wexford Sand**. Wexford Sand comes from ancient sand dune deposits. Today in Wexford, these sands are on inland sites. They were formed as **Sand Dunes** of a very ancient sea in the **Glacial Period in Ireland**. Sand dunes, because of the nature of their formation, display a uniform size range of sand particles. Most of our **Sand Pits** were formed during massive floodings in ancient **Glacial Times**. They have sand layers with a variation in sand size particles throughout the different layers present in the sand pit cross section.

It is generally agreed in Ireland that **Sports Sand should be in the 0.1 to 0.6 mm size range**. The following chart gives a picture of sand particle size distribution derived from a sieving analysis system.

PARTICLE SIZE DISTRIBUTION

Fine gravel 2-5mm

Very coarse sand 1-2 mm

Course sand 0.5 – 1 mm

Medium sand 0.25 – 0.5 mm

Fine sand 0.15 – 0.25 mm

Very find sand 0.05 – 0.15 mm

Silt and Clay less than 0.05 mm

A Pit of Sports Sand in Co. Wexford

Sand stored on field for use in Sand Carpet

Drop-type Sand Spreader

Spinner-type Sand Spreader

The **Medium** and **Coarse Sand Fractions** should account for the bulk of the sand material. The **Medium** and **Coarse** together should in the majority of cases, be **more than 60% by weight**. **Fine Gravel** plus the **Very Coarse Sand** should be less than **10 percent by weight**. **Fine Sand** should be at or below **20%**. The **Very Fine Sand plus The Silt/Clay** category should be low at about **10%**.

RE-MAKING EXISTING SPORTSFIELDS

We have carried out major redevelopment works on many existing GAA fields. The main problem identified on these pitches was bad soakage arising from very poor soil permeability levels. Due to the wet surface conditions the soil structure had broken down and topsoils were smeared and puddled. Some of these problem fields **were on heavy, poorly drained, soils that needed drainage in the first place**. In other cases, good dry soils were subject to compaction during pitch construction, and the subsoils were now tight and impermeable. Gradually, the surface had deteriorated.

In most cases these **Pitch Reconstructions** now required intensive drainage in the form of Lateral and Slit drains. In many fields, after the drainage had been finished, a start was made on the **application of Sportsand**. A dressing of 400-600 tonnes was applied in successive dressing over a number of years. Following each sanding, the field surface was aerated by Verti-draining or by other aeration implements. Following an input of suitable **Fertilizers** the existing swards were revived by **Overseeding**.

PITCH RENOVATION

The use of pitches in bad wet weather and also winter training sessions can severely damage the surface layers of pitches-even ones with good natural drainage. Many of todays GAA fields are in constant use throughout much of our "six month" winter wet weather period. Surface marking and the smearing and puddling of the sward can be easily seen in these fields.

The destruction of the topsoil structure and the fact that the soil pores are squashed and destroyed are not so readily appreciated. Then, the soakage of the sward is reduced and the sward is more or less continually wet and soft. Each season and each

match played in wet weather brings a further escalation of the destruction of the pitch surface. **If it is a heavy soil with deficient drainage then the degradation and the breakdown of the pitch is even more rapid and serious**.

When **Topsoil Structure** is damaged, the soil and sward situation can be improved by a number of inputs which we call **Pitch Renovations**. The main steps are the application of **Sportsand** combined with some form of **Soil Aeration** which is usually done by **Verti-draining**. Usually it is also necessary to **overseed** the pitch. An application of Lime (if needed) and a **Compound Fertilizer** are essential parts of the **Overseeding Process**. If the sward has a very high weed content a **Herbicide** must also be used.

Verti-draining Machine in action

Aeration of Surface after Sanding

Agrivator also used for aeration

GENERAL RECOMMENDATIONS FOR LIME AND FERTILIZERS

Soil Fertility levels should be checked by a **Soil Test** every five years. The test will give a picture of the soil nutrient levels. Then, a fertilizer programme can be planned. It can give optimum plant growth and at the same time protect the environment. A soil test will indicate if **Lime** is necessary and how much to apply. The **Major Nutrients** required for healthy growth are **Nitrogen, Phosphorus** and **Potassium**. On many sites there is also a response to Sulphur. If the levels of Phosphorus and Potassium are low they should be raised up to a satisfactory level over a number of applications. Once the levels are built up annual maintenance levels only are necessary.

FERTILIZERS WHERE GRASS IS NOT COLLECTED

On many natural soil pitches the grass is not collected. Clippings are left on the pitch to decompose and return some nutrients to the soil thus reducing the levels of fertilizers that are needed for healthy growth. There are different options available for use depending on the type of fertilizer you want to apply.

USING ORDINARY FERTILIZER

To stimulate good grass growth in Spring and depending on soil fertility levels, you could apply a compound fertilizer containing nitrogen, phosphorus and potassium e.g. 18:6:12 at around 1 to 1½ bags per acre or 2½ - 4 bags per hectare. You could also use any other equivalent compound. Apply in February/March depending on weather conditions. Some fields benefit from the use of a compound that includes **Sulphur**. This should be followed in most instances, depending on grass growth, by 20 units per acre (25kg per hectare) of straight **Nitrogen** at two monthly intervals until mid August e.g. three quarters of a bag of 27.5% N per acre or 2 bags per hectare. A **Nitrogen Source** that also supplies **Sulphur** e.g. ASN is most suited to some field situations.

Note:-

1. Most pitches require between 96 – 120 units of nitrogen per acre per year. (120-150 kg nitrogen per hectare per year)
2. Where phosphate and potash levels are satisfactory use straight nitrogen at 20 units per acre (50 units per hectare) in Spring followed by 20 units nitrogen (50 units per hectare) at two monthly intervals until mid-August.

The quantities of **Ordinary Fertilizers** used must be increased where grass clippings are collected. The major N,P,K nutrients should be applied at roughly the following rates:-

150kg Nitrogen, 25kg Phosphorus and **120kg Potassium** per hectare per year (ie 120 units nitrogen, 20 units phosphorus and 96 units potash per acre per year).

USING SLOW RELEASE FERTILIZERS

Slow release fertilizers are more expensive than ordinary fertilizers. They have a role to play where labour is scarce and clubs find it difficult to get ordinary fertilizers applied at regular intervals throughout the season. There are at least two options suggested for the use of **Slow Release Fertilizers**.

Option 1 Apply slow release fertilizer at the Recommended Rate prior to mid September, followed by straight nitrogen at two monthly intervals from mid February to August. (This is the cheaper option)

Option 2 Apply a slow release fertilizer throughout the year, at the recommended rates and intervals – for the product chosen.

Established Sand Carpet Pitch. Some sign of Nitrogen Deficiency

Close up of same Sand Carpet Pitch

Established Sand Carpet Training Area

Newly Seeded Sand Carpet Training Area

MAINTENANCE FERTILIZERS FOR SAND CARPET PITCHES

These notes apply to full cover **Sand Carpet Pitches** that have a sand depth of 75 to 100 mm over the natural soil. A sand cover does not supply the natural nutrients as is the case in soil based ordinary fields. A Sand Carpet pitch, especially in the early years after making, does not hold on to fertilizers tightly against the elements of leaching. In addition grass clippings are collected on most sand carpet pitches. During the first few years in the life of a sand carpet pitch, earthworm population and other soil life are not present in sufficient numbers to assist in the decomposition of grass clippings and for that reason the grass cuttings are being collected and removed in many cases. In general, the annual **Fertilizer Maintenance Needs of Sand Carpet Pitches** is about **50 per cent** higher than natural soil pitches.

THE ROUTINE MOWING OF TURFGRASS SWARDS

The grass cover on pitches should never be allowed to grow tall, not even the first cut after sowing. Tall grass shades the base of the plant and this reduces the capacity of the grass to produce new Tillers. Tillering is the grass growth process that is responsible for thickening the sward cover. Neither should the turfgrass be cut down too bare – as this reduces the useful leaf area. Any **scalping** of the sward may kill off the Tiller Growing Points. The core aim of **Good Turfgrass Practice** is to mow a sward at regular intervals and at a suitably safe height. In the periods of rapid growth, say from mid-April to June, the sward should be cut about twice a week. Grass growth is of course very weather dependent but usually **Regular Mowings** are needed throughout the summer and into the Autumn/early winter. Gaelic players like to have a 20-30mm sward height for **Hurling** and a 50-70mm high sward for Gaelic Football. In all situations the mower should be raised by about 20mm in very dry periods and also in late autumn and into early winter.

The type of mower to use is often a discussion topic. In our experience Rotary Mowers require less maintenance. The Cylinder Mowers provide a type of finish that may be appreciated in **Provincial or County Grounds**. However in the case of the ordinary Parish Club the proper adjustment and the sharpening of the mower blades is of greater importance than the mower type used. **All** Mower Blades should be **Regularly Adjusted For Height and kept sharp**. It is useful to change the direction of mower travel in succeeding cuts. A cutting along the length to be followed by the next cut parallel to the width and maybe the next cut carried out parallel to the pitch diagonals. Changing the direction of alternative cuts leads to a more even and thicker sward cover by promoting improved grass tillering.

TURFGRASS WEED CONTROL

A high content of **Weed Species** is always a sign that the playing sward is not suitably managed. When the sward grass tillers are weakened or killed off, the grass sward then thins out and the **Weed Species** find it easy to move in. The death of grass tillers may be due poor mowing practise, not enough fertilizer used, or player sward damage such as pugging or divot removal. In general the **Rossette Weeds** are the ones usually seen e.g. Crowfoot, Dandelions, Daisies, Plantain and Yarrow. Also, there are swards where **Clover** is a problem which can give rise to a slippery surface. There are now many excellent formulations of **Amenity or Sportsfield Herbicides**. These can remove most or all of the **Pitch Sward Weeds** and also **Clover**. It is now mandatory to use only **Herbicides** that are approved and specified **for Amenity Area Use**. It is wise to purchase herbicides in the specialist outlets for herbicide sale. They are in a position to provide advice on suitable brands.

The best results from **Herbicides** are obtained when there is active growth following the application of maintenance fertilizer. The month of May is usually a good time for spraying as the soil has warmed up. Spraying should be done in dry weather. Do not mow swards for some days before or after herbicide use. Following **Weed Removal**, a pitch should be managed to improve the density and vigour of the grass tillers. Well managed grass covers will prevent, or delay, a further ingress of weeds.

Well maintained old pitch on natural soil

Close up of same sward

PITCH SURFACE REPAIRS

The surface of a pitch can be badly marked and damaged especially when matches or play practise occurs when the weather is wet and the soil is soft. **Divots** are **Sods** that have been sheared off the soil by the boots of players and they can be seen in abundance on some pitch swards. **Divots** if at all possible must be replaced and **Divot Repair** is most successfully carried out as soon as possible after matches etc. Divots have a better chance of establishing themselves when they are fresh. Where the divots are still

available they can be re-sited with the use of a small **Hand Fork**. The soil base should be loosened and then the divot can be pressed into place. Where the surface scars are large and the divots are missing the voids may be filled with a mix of soil and sand. The mix should also include some pregerminated grass seed. The germination of grass seed is easily carried out by placing seeds on a solid base. Then cover the seeds and lightly water them every day. The seed will be ready in about a week.

The use of heavy rollers to level out the playing surface is not recommended. Heavy rolling causes soil compaction and this stunts subsequent grass growth. Today a pitch surface can be successfully levelled by systems of **Pitch Renovations** that are now being used by a substantial number of Clubs. **Modern Pitch Renovation** includes items such as **Verti-draining** (aeration), **Sand Applications** and in some cases the pitch is then **Overseeded**. Pitch renovation has been described in detail in another section

Divots on Dry Pitch after Match in Wet Weather

Replacing Divots - See Fork

Surface Compaction causing waterlogging on Free Draining Soil

RETURFING OR RESODDING GOALMOUTHS

Many goalmouths are badly damaged and have become hollow or depression areas that hold water for most of the time. These areas are so compact that they have lost all capacity to transmit rainwater to the subsoil. Repairs to goalmouths begin with the loosening of the underlying soil. They should be dug and the soil loosened to as great a depth as possible. Then, good quality sports sand should be mixed with the soil with a view to improving soil structure and the water soakage capacity. It may also be necessary to install a Goalmouth Drainage System where the pitch is built on the heavy difficult soils.

Following the digging and sand mixing the goalmouth area should be firmed and levelled. Then apply some compound fertilizer and mix it into the new base.

The **New Sods** should now be laid in a brick-pattern taking care not to stretch the sod as it is being laid. Any over lapping of the sods onto existing grass covers, should be trimmed off and the whole area lightly rolled. In dry weather the sod should be kept well watered for the first few weeks until the sod is well established. Traffic should be kept off the new returfed area for as long as possible. It is now possible to purchase good quality specially cultivated **Turfgrass Rolls**. Many Clubs also use **Sods** that are harvested from areas adjoining their own pitches. Even on well **Returfed Areas** small hollows soon develop in the centre of the goal mouth. These small hollows should be **Hand-Forked** and then built up with **Sports Sand**.

Goalmouth drainage and relaying sods

Re-turfing a Goalmouth

APPENDIX

I have been providing some technical help on the soil engineering aspects of **Pitch Development** for most of my professional life. Now I am seeing a substantial number of clubs who are using, or have used, up-to-date **Soil Science Technology** in **Making New Pitches** and **Improving Old Ones**. I am hoping that the experience on **Pitch Technology** that now resides in a number of Clubs can be passed on to neighbouring clubs which are now starting out on **Similar Pitch Improvements**. Maybe County Boards and the Munster Council could encourage Clubs to liaise with one another regarding the **Technology of Pitch Development**.

I would like to put forward some **Guidelines** based on past experience which could be useful in planning future projects. The need for these guidelines are based on observations of colleagues during many years working with Clubs.

1. HAVE A LONG TERM PLAN

The proposals for the improvement of pitches should be debated and put in place long before the start of the project and I would suggest that a **Five Year Plan** should at first be produced by the Club Executive. The plan should allow for a **Phased Development** for each part of the pitch improvement programme. This long term planning would allow sufficient time to identify and study similar developments by neighbouring Clubs that have been successfully undertaken. Sufficient time is also needed so that the costs and the cash flow required can be worked out for each **Part** of the proposed **Works**. It is always necessary to organise and carry out a **Fundraising Campaign** well in advance of the start of **Works**.

2. FINANCING PROJECTS

The **Costs** of financing **Field Developments** is seldom fully appreciated in advance. It is much higher than the level of funds usually seen in the running of a Club. It can cost anywhere between €100k and €200k to carry out **Pitch Remakes** or **New Pitch Constructions**. It should be emphasised again that **Fundraising** should be well organised and pursued vigorously. A number of Clubs, I am familiar with, have recently put in place a separate **Fundraising Committee**. This group would not be concerned with any other aspect of Club Management. Their sole duty is to organise and raise a **Reserve Fund** to cover present and future **Pitch Improvement**. Such a fund can only be used for development and never for day to day financial needs of the Club.

3. TECHNICAL ASPECTS

A substantial number of **GAA Clubs** have used the **Pitch Works Technology** that has been explained in this booklet. There are now roughly **100 New Pitch Works Projects** completed in many regions of Munster. Most of these projects had a good **Quality Outcome** and they can be of great use as examples or **Benchmark Sites** for future efforts to any Club starting out on a **Pitch Project** and needing **Advise and Reassurance**. They emphasise that **valuable knowledge and experience is available just down the road**.

4. THE SUPERVISION OF PROJECTS

It is important that **Club Executives** should engage in day-to-day contact with the Pitch Contractors. I would advise Clubs to select **One Person Only** to act as day-to-day contact between the **Contractor** and the **Club**. This on-site person would keep the Executive informed on the progress and quality of the work. However, the main task of the **Club Site-Contact** is to keep a record of the exact location of key elements of

the **Works**. The position of all drains especially **Lateral Drains** should be marked on the **Field Plan** and also by a **Permanent Field Marking**. The point where the **Lateral Drain** is joined into the Main Drain should be **Marked On The Site** in case some part of the drainage breaks down at a future date. Also the exact position of the nearest **Lateral Drain**. Many other items of the **Works** should be marked in a permanent manner on the new field site. At a future date when Club Executives are replaced by new members it is necessary to have **accurate records of field improvements** that can be easily passed to these new people.

5. CONTACTS WITH NEIGHBOURING CLUBS

I have already touched on how useful it is to make contact with neighbouring Clubs which have carried out Pitch Improvements in previous years. The on-going liaison with neighbouring Clubs is also very useful in identifying **Skilled** and **Experienced Pitch Contractors**. Fortunately we now have a number of very good **Specialised Pitch Contractors** serving Clubs in the province of Munster.

Metrication Guide

Length

1 Inch = 25 Millimetres (mm) approx
1 Foot = 300 Millimetres (mm) approx
10mm = 1 Centimetre (cm)
2.54cm = 1 Inch
100 cm = 1 Metre

Area

1 Acre = 0.41 Hectares
2.471 Acres = 1 Hectare
Hectares x 2.471 = Acres
Acres x 0.405 = Hectares
One Hectare = 10,000 sq metres

Weight

1 Kilograms (kg) = 2.2 Pounds (lbs)
1 Ounce = 28.3 Grams
1,000 grams = 1 Kg
1,000 Kgs = 1 Tonne
Kilograms x 2.2 = Pounds (lbs)
Pounds (lbs) x 0.454 = Kilograms

Volume

1 Gallon = 4.55 Litres
1 Pint = 0.57 Litres
1,000 Millilitres = 1 Litre
Litres x 1.76 = Pints
Litres x 0.22 = Gallons
Gallons x 4.55 = Litres

Dose Rates

Kg/ha x 0.8 = Units/Ac
Tonnes/ha x 0.4 = Tons/Ac
Litres/ha = Gallons/Ac x 11
Litres/ha x 0.712 = Pints/Ac
Litres/ha x 0.089 = Gallons/Ac
Pints/Ac x 1.404 = Litres/Ha

Official GAA Playing Pitch Dimensions Are:
Pitch Length = 140 – 160 Yards or 128 – 146 Metres
Pitch Width = 84 – 100 Yards or 77 – 91 Metres

Partnership Printing & Design (025-25-000)