

"The "Aqueel" system has the potential to reduce soil erosion and irrigation costs"

# THE AQUEEL AND SOIL EROSION

## One third of arable soil lost

**Soil erosion is a serious environmental threat, which combined with other problems, is risking the long-term future of agriculture worldwide.**

In the last 50 years it is estimated that the world has lost over one third of the land available for cultivation. That loss is



accelerating rapidly and it is known that some 10 million hectares of land are lost to agricultural production each year worldwide.

## As little as 3% fall is all that is needed

Parts of mainland Europe are also very badly affected, especially in the more mountainous regions.

Even in the UK where the climate is supposed to be moderate, serious soil erosion is on the increase, and with it increased damage to its rivers and the neighbouring environment. Serious erosion is evident on slopes with as little as a 3 percent fall, which puts the majority of the arable land in England at some risk.



On steep hillsides this risk is compounded if agricultural practices do not work with the local environment, but against it.

## 17 tonnes per hectare per year is lost

On average, ECAF (European Conservation Agricultural Federation) has estimated that

the total soil erosion in Europe is in the region of 17 tonnes per hectare per year. To put this figure into perspective, it is known that only 1 tonne per hectare of arable land is created each year, so soil is being lost very much faster than it can be created.

The only way to compensate for these losses is the addition of outside materials, which, in turn may be subject to erosion. Irrigation is required in many parts of the world if crops are to be produced at all. Much of this precious commodity is being lost to erosion before achieving any benefit for the farmer, who is also losing the soil and nutrients necessary for growth.



## Cost to everyone outside farming

There is also the cost to the general community, who bear the charges for increased insurance premiums, the rebuilding of homes, roads and bridges and the increase of flood risk due to higher river levels. Erosion also has a political element. Governments cannot sit by and watch as increased public pressure mounts to reduce the damage caused to their properties and the general infrastructure by erosion, without feeling the need to introduce more legislation which will force action to prevent it.

## More negative press for farming



Public opinion has also been focused on the problems of erosion by the Press who have, in some cases, fuelled the perception that modern farming methods are one of the key factors behind the present levels of damage to property and river systems. Whether this is true or not, it adds to the debate. More important it adds to the requirement for positive action to be taken to reduce erosion and the effects of it.

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# THE AQUEEL AND WATER MANAGEMENT

## The problems of water

Water, as rain or as irrigation, falls on the surface of the soil, infiltrates through the soil layers and is utilised by the crop being grown. However, this valuable commodity may be lost as run off before being fully utilised.

### This causes many problems:

- Water is lost from the cropping area.
- The lost water is a carrier of crop nutrients and therefore the growing crop cannot perform efficiently.
- The nutrients lost from the soil surface can become pollutants with adverse effects on the environment.
- Soils can be lost from the cropping area resulting in crop loss and to major soil structure and erosion problems.

## Streaming and streams

Water erosion is one of the most destructive types of erosion. The effect of falling water on the soil surface can lead to streams, which gather together, carrying with them the lighter soil particles. This can be catastrophic and take years to recover from, if recovery is possible at all.

## Manage the problem

There is a need to develop farming practices and systems that work with the fact that erosion is a naturally recurring process, and must be managed with the negative effects of it being controlled. Too much water is not always the problem. So often there is not enough water, or what there is comes at the wrong time.

## Wastage no longer acceptable

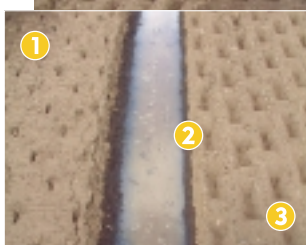
If irrigation is possible or desirable it may be very costly and therefore, what water is available must be fully utilised. Wastage is no longer acceptable economically or environmentally.



**NON AQUEELED SURFACE**  
Note surface water and extensive run off problems



**AQUEELED SURFACE**  
Increased percolation of water and vast reduction in run off

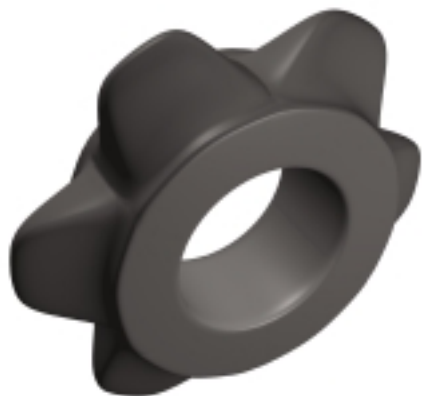


- 1 NON - AQUEELED BED**
- 2 Consolidated and stable bed avoids collapse after high levels of irrigation**
- 3 AQUEELED BED**



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# AQUEEL - WHAT, WHY AND HOW?

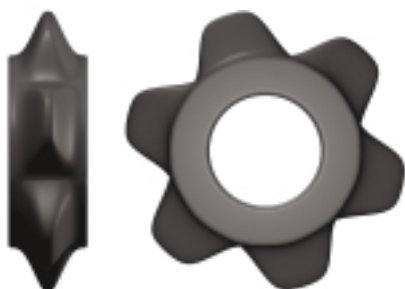


## A unique answer to the problem

The "Aqueel" is the trade name for a unique means of creating indentations in a loose soil surface. These indentations act as reservoirs for the storage of water. The Aqueel wheel makes a continuous row of indentations that can be multiplied along an axle to make a roller, the length being compatible with the machine it is attached to.

## How and why the aqueel works

By creating indentations in the soil surface with a known volume, small reservoirs are



formed. The volume of this reservoir is dependant upon the soil surface being worked and the expected rainfall intensity and duration.

The Aqueel's ability to create small indentations over the soil surface can result in as many as 192,500 indentations per hectare, each with a water capacity of up to 1 litre.

This has the effect of supplying all plants evenly, making maximum use of the whole volume of soil as a filtration medium for the water.

## The reservoir effect

The increased usage of the whole volume of soil also produces a reservoir effect, resulting



in an increase in the time taken for the water to reach a water course, with the benefit that water stays in one place longer and runoff is reduced.

## More effective irrigation

Where irrigation is practised, this is particularly beneficial due to the possibility of reducing water quantities by making better use of the water used. Irrigation water will tend to remain where it falls, rather than run to the lowest point, giving more even irrigation and better, more even plant growth.

Because the Aqueel has been designed primarily as the last in a series of operations, subsequent passes do not destroy the run off protection provided by the Aqueel. However, even in cases where a further operation is performed after the Aqueel has been used, some benefit can still be seen. The creation of indentations in loose soil does not cause compaction, which has a negative effect on water infiltration. Additionally, because the indentation operation is normally the last of a sequence, the weight of the unit becomes less important and it can therefore be considerably lighter than many conventional rollers.

## Water harvesting

For differing crop growing practices, such as ridge, furrow, flat or different row widths, spaces can be introduced between each Aqueel allowing any desired soil profile to be created, producing in effect a 'water harvesting' configuration.

## Self-cleaning

Additionally, the Aqueels unique self-cleaning properties make it particularly suitable for use in moist conditions or where blockage of contemporary rollers is a problem.



## Increased surface area - increased soil temperature

Soil warms up much faster due to the increased surface area created by the Aqueel, allowing subsequent operations to be performed sooner where necessary and speeding seedling emergence.

## Easy to maintain maximum performance

If and when Aqueel replacement is required, renewal of individual Aqueels is easy, and an operation that can be performed in any farm workshop.



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# AQUEEL - TECHNICAL INFORMATION

## Development

The Aqueel has taken 10 years of field testing and evaluation to reach maturity, following an initial idea from Mr Charles Creyke, who also invented the de-stoning system now used on the majority of potato harvesters. Over this 10 year period, the Aqueel concept has been assessed and tested under controlled laboratory and field conditions in addition to private field trials and development carried out by Simba International Ltd. Simba International will be pleased to discuss the Aqueel and its application with existing equipment users, manufacturers and agencies concerned with the need for reducing soil erosion and better utilisation of water.

## The Aqueel - Technical Information

- The Aqueel is made from a unique elastomeric Microcellular Polyurethane material which is self-cleaning, long lasting and with excellent abrasion resistance.
- The Aqueel can be used individually, made up into rollers, or incorporated into new machinery as part of the original design.
- It can be retro fitted to customers' existing equipment if required, i.e. on power harrows, bed formers or subsoilers.

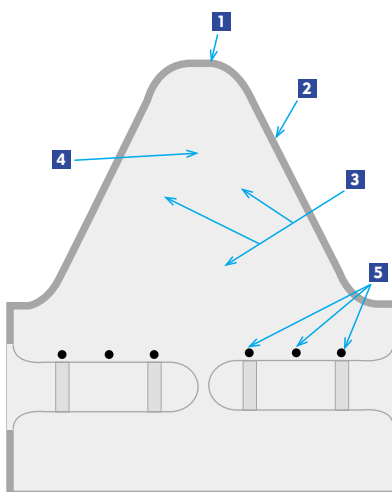
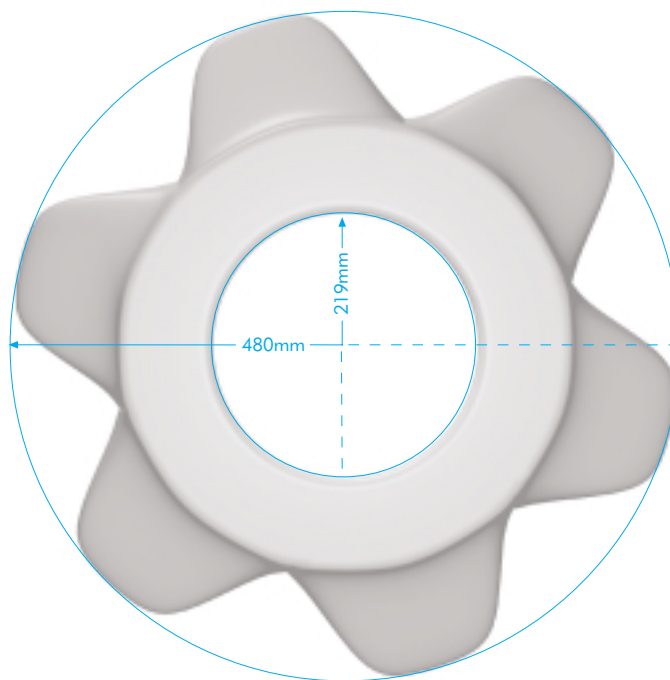
\*The dimensions of an individual Aqueel are:-

Outside diameter	480mm
Inside diameter	219mm
Width	115mm
Average weight	68Kg/metre
<small>(complete roller assembly)</small>	

When the Aqueels are mounted onto a roller and retained by bolt on end caps, there is a degree of friction between each Aqueel but they will turn individually and contra rotate as necessary when turning.

The maximum weight that can be applied to an Aqueel is 75kg or 600kg per metre. The recommended maximum width for a single Aqueel roller is 4 metres.

\*All data approximate



- 1 Tough resilient outer skin.
- 2 Chemical impregnation for self cleaning.
- 3 Micro cellular polyurethane core.
- 4 Unique profile design for optimum performance.
- 5 Heavy duty reinforcing matrix to enhance performance.

The Aqueel is made from recyclable micro-cellular polyurethane for balanced performance. Modern manufacturing techniques ensure an environmentally friendly product that does not use CFC's in the process.



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# AQUEEL - FOR 21st CENTURY FARMING

## The need to control water, pollution and erosion

The concept of "Reservoir tillage" has been known for centuries, but each method had some limitations that detracted from its universal use and acceptance. Terraces, benches and dyke systems have all been tried with limited success. What was required, was a system that would combine the surface water capability of the plough with the fine tilth required for profitable plant growth, at an acceptable cost.

- The Aqueel is a self-cleaning tyre or roller that does not require a scraper system and therefore has excellent wet weather capability.
- It does not use as much horsepower as conventional scraped rollers and is generally lighter.
- The Aqueel is versatile and can be added or integrated into a wide variety of implements including power harrows, drilling and planting systems, subsoilers, bed formers and ridging equipment.
- The Aqueel is environmentally friendly. It reduces the effects of wind and water erosion by stabilising the soil surface, increasing its surface area and forming mini reservoirs that will enable maximum utilisation of water and other inputs, whilst minimising losses to the surrounding environment.
- The Aqueel enables wet soils to dry out faster and warm up quicker, speeding seedling emergence
- The Aqueel reduces the potential for capping on light sandy soils



Rabe/Accord power harrow drill



Jones Bedformer - onions



Sugar beet establishment



Standen potato planter



Cousins 'V' form subsoiler



Simba Flatliner 300 subsoiler



Simba Aqueel press roll



Dowdeswell Front plough press

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## AQUEEL - PRESS RELEASE

### Driving with the brakes on

Anyone who's ever drilled in the wet will know the feeling that Philip Lee describes as 'driving with the brakes on'.

It is the feeling a tractor driver pulling a press or packer roller gets when mud collecting on the implement jams the scrapers, and instead of consolidating the seedbed the soil is dragged along with it, greatly increasing its power requirement and also ruining the quality of the finished seedbed.

Mr Lee used to find this a real problem on the 1,250 acres he farms in Norfolk when sowing cereals behind root crops in late autumn, but believes he has found a solution in Simba's Aqueel self cleaning packer roller. Mr Lee has had one Aqueel fitted between their four metre Rabe power harrow and Accord drill combination last autumn, replacing a 500 millimetre diameter steel scraped roller, and has achieved significant



benefits in its first year. They have also had one fitted to their Cousin's subsoiler, which has produced promising results in limited use thus far.

### The Wetter the Better

Seago & Lee farm some 750 acres of mainly sandy soils at Home Farm, Quidenham, where they grow malting barley, carrots, onions, parsnips and potatoes; with a further

500 acres of medium and heavy soils a few miles away at Banham, where they grow a mixture of milling and feed wheat, and sugar beet:

"Between the two farms we have everything from heavy clay to blowing sand. Our basic cultivation system is just two passes - ploughing followed with the use of a combination drill.

"We have to subsoil three years in five on the lighter land because of the amount of root crops we grow and the heavy traffic the land takes. On the heavier soils we fit a Claydon Furrow-Cracker to the plough, and subsoil one year in five."

They needed an efficient system to enable them to drill after the roots harvest. In this situation a roller that continually blocked, and on which the scrapers need repeated adjustment to cope with changing soil types, was a major drawback:

"We had looked at other drilling outfits and configurations, but felt that our current systems were better suited to our soils and cropping system. We did also look at a selection of packer rollers, but nothing else we saw convinced us it would work as well in the wet as the Aqueel, or enable us to keep going so far into the autumn. "Our steel packer roller worked very well in September, but struggled come November and December, when it filled up with mud. With the Aqueel things are very different. It does not matter how wet it gets, it still runs clean. In fact the wetter the better: it carried more soil when working in slightly damp sandy soils than it did when we ran it on much wetter, heavier types.

### Nothing can stop us

"When the steel packer roller blocked in wet conditions it left the seedbed full of lumps rather than being fine and even as we required. In wet conditions we were forever having to crawl along the packer adjusting the scrapers, which was very time consuming, not to mention wearing out masses of scraping blades." By contrast the Aqueel has proven its ability to run clean in virtually all conditions, which has had significant benefits, both to the quality of work, its speed, and for the tractor pulling the combination: "If we can drill in the conditions we did last

autumn then nothing can stop us. The Aqueel ran in conditions that would have stopped anything else. We reckon it has saved between five and ten horsepower, which, on a 125 horsepower tractor, is significant. The roller consolidates the power harrowing and leaves it much more level, giving the drill coulters and covering harrow a surface in which they can work effectively."



### In the longer term

They have only used the subsoiler with the Aqueel fitted on a small acreage, with promising results: "It seems to do the job we wanted, which is to consolidate the surface and imprint the dimples so that the surface is more weatherproof. We used it on one particularly wet patch and the riveted surface seemed to dry out much quicker than if we had used a conventional packer roller and left it totally flat.

"In the longer term, we want to run through the fields after we have harvested crops like onions and carrots, and leave the surface pitted so that if we get any rain between then and planting it will not go running off the fields, even though there is no vegetative cover.

"The fields will have had a lot of traffic, so we need to pull them up with the subsoiler. With the old roller, any rain would tend to seal the surface and any rainwater would flow across the surface. Using the Aqueel will leave a much more weatherproof surface so that it is safe until such time as we can plough and drill."



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JOURNAL: CROPS

REPORTER: GILLY JOHNSON

DATE PUBLISHED: 18th AUGUST 2001

# AQUEEL - PRESS ARTICLE

## Beeting to the min till tune

Is sugar beet the most difficult crop to convert to min till systems? Not according to the latest trials, as Gilly Johnson discovers

No, it's not a giant plastic hair curler - if you're familiar with such things... The Aqueel is a 'guaranteed' no-stick rubberised packer roller, which indents the soil with a pattern of ridged ditches. And it's proving to be a revolutionary new weapon in the continuing battle to find reliable systems for establishing sugar beet without a plough.

Two beet establishment trial sites this year are under way - managed by British Sugar with help from Monsanto and Simba. One is on typical East Anglian beet soil - a sandy loam - at Saxham, Bury St Edmunds, which is part of the trials series done by distributor Agrovista. The other is on Kauper marl at Kneesall, Lincs.

Comparisons are being done between plough and min till variations; some plans had to be adjusted following the wet winter. This year another option sits alongside the plough versus discs treatments: the Aqueel, a packer invented by Yorkshire potato farmer Charles Creyke and sold by Simba. At Saxham, the Aqueel went in straight behind a Flatlift subsoiler put through at a depth of 14ins, just a day or so prior to beet drilling.



**The longer roots on the right is from the Aqueel plus Flatlift plot - this should translate into higher yield, says Agrovista's Colin Myram**

The packer leaves indentations in the soil, and each of these have the capacity to hold about a litre of water, so preventing soil erosion by excess water as well as keeping moisture where it is needed. The ridges also protect against blow, and could be an alternative to cover crops on high risk sites. The soil shaping persists between the rows for some time, and can be seen until the beet leaves meet.

Yield results will not be available until harvest, but test digs at Saxham in the summer showed clear visual differences in root growth between the pre-drill treatments, which were autumn discs only, plough with Germinator cultivations, and flatlift subsoiler at 14 inches followed by the Aqueel. The discs-only plot was rock hard, and

the greater savings are seen from min till on the heavier soils," he says. "However, weighing up all the benefits, including the environmental ones, I'm sure that there are good arguments for min till techniques in beet on all soils. The plough can be a quick fix when you hit weather problems, but min till may give better soil structure in the



**Nothing sticks to the Aqueel roller. Soil ridges retain moisture and prevent blow.**

roots had struggled to go down, demonstrating that compaction is a potential problem for min till systems. But the best treatment at Saxham, judging by the look of the roots, will be the flat lift subsoiler, plus Aqueel, says Agrovista's Colin Myram.

There's a warning note: weed control may need more attention with min till; pansy appears to be escaping the glyphosate and so post-em treatments could require adjustment. "On min till plots you tend to end up with more overwintered weeds, but there's likely to be fewer polygonums because the seedbed isn't as fine," says Philip Ecclestone of British Sugar.

At Kneesall, the wet autumn and winter have really tested min till tactics; in mid Jan ploughed land dried up best, and so when early vigour was scored, the beet given all the min till treatments came off worst because of the wet. However, Mr Ecclestone is not convinced that this effect will last through to yield, and guesses that min till will still work out as the best route to profit. Importantly, there are no differences in plant numbers. Although the plough dried things out well and the beet got away faster, I believe that if it is droughty and the plants need moisture later in the summer, the min till crop will do better and catch up. "On the lighter land, the costs of ploughing are less. So

long run, he argues. "If you're practising min till elsewhere in the rotation and you want to include beet, there's no reason why it shouldn't work. Follow good straw management; keep stubble height low and aim to do the primary preparations before Christmas."

After a few years of min till, the soil structure improves and it does become easier, he says.



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# GROWER

JOURNAL: GROWER

REPORTER: ANISA GRESS

DATE PUBLISHED: 9th AUGUST 2001

## AQUEEL - PRESS ARTICLE

### Wheeling out the Aqueel

Field production of both edible and ornamental crops comes under a barrage of assaults which affect crop quality and quantity. But slumping of pre-prepared beds even before the crops enter the ground can also have



**Adrian with the Aqueel in the farmyard**

adverse effects on quality and bottom line profits. Growers who found slumping a source of considerable problems were onion growers Adrian Hatton and his father Peter, who farm 30 acres on onions for the pre-pack trade at Rectory Farm at Aversham, near Newark, Nottinghamshire.

If the edges of the bed slump it can affect the development of the outside rows of onions while also making it harder to run equipment like toppers and harvesters with the accuracy needed to ensure that the crop meets our customers' quality standards," explains Adrian Hatton. "We tried both a conventional packer roller and a crumbler roller. Neither did a really acceptable job. Even when it was slightly damp, the sandy based soils stuck to the rollers. As a result the rollers' diameter increased, the scrapers jammed and the kit ended up bulldozing instead of cultivating," he adds.

Lincolnshire based Simba International has been looking at this problem for some time and last year launched a suitable solution to the problem - the Aqueel. The Aqueel press roll is a self-cleaning roll made from a durable, flexible compound which levels and consolidates the surface of the bed leaving a network of small indentations - 190,000/ha.

When it rains the indentations act as reservoirs, each one holding one litre of water, while air escapes through the ridges around them. This encourages the rapid percolation of the water through the soil, rather than it running across the surface. The ridging also increases the surface area of soil, helping it warm up quicker in the spring, and start

getting spring-sown crops off to a faster start. According to Simba International the Aqueel can also significantly reduce the danger of soil erosion which is an increasing concern to the Environment Agency and local authorities because of pollution caused to rivers and roads

conventionally formed beds.

Adrian Hatton's comments echoed the results of Simba International's own tests.

"It has proved highly effective. The Aqueel proved totally self-cleaning and un-blockable. It left the soil surface a little looser than other alternatives, but did a better job of tightening the soil to the required consistency a few inches below the surface," he says.

Adrian Hatton is considering using the Aqueel to prepare land for sugar beet, where the rivetted surface should help protect seedlings against wind damage.

"On our soils (sand-based), if the wind picks up sand particles from the flat surface it can shot-blast young plants, stripping the wax off their leaves or in severe cases, ripping the leaves clean off the plant. A rough surface should cause friction, which will reduce the surface wind speed and so help cut the severity of this damage. Gerry Tull, who owns and runs a five acre nursery alongside a landscape contracting business in Owlesbury near Winchester has also found slumping a problem for his field grown cut flowers.

"The flower seeds we use are the size of gold dust and about the same price. With such a large investment we need near enough 100% germination and that only happens when what I call a 'perfect seed-bed' is prepared," explains Gerry Tull.

He has found that cultivating the 'perfect' seed-bed is not a problem - it is the finishing off that has proved difficult. The seed-beds need a fine tilth and a perfectly level finish which is a problem as soon as it rains. "We fitted the rings to a roller to the back of a rotavator ourselves and it has done an excellent job. We could prepare the beds some

by the removal of soil from fields. Erosion is reduced because the indentations prevent mass movement of soil (including herbicides and nutrients) which can happen during heavy or continuous rainfall. Even with less severe rain, incidences of ponding which leads to capping and the need for further cultivation, can be reduced. Irrigation trials in Europe and the US have also illustrated that



**Adrian Hatton showing the divots in the finished beds formed by the Aqueel**

savings on irrigation water can be made because more water actually ends up in the soil rather than running off the tops.

Irrigation trials staged by Simba International Ltd have confirmed the beds' ability to hold water better than

weeks before planting and they would stay intact. In the future we will put in two spacing rings in the rows where we are sowing the seed, so the seed is at a consistent depth, while the seed-bed around them is protected from erosion and water wash by the divots."

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# AQUEEL - WHAT, WHY AND HOW?

## The need to control water, pollution and erosion

The concept of "Reservoir Tillage" has been known for centuries, but each method had some limitations that detracted from its universal use and acceptance. Terraces, benches and dyke systems have all been tried with limited success.

What was required, was a system that would combine the surface water capability of the plough with the fine tilth required for profitable plant growth, at an acceptable cost.

Prototype Aqueels were produced and over a 10 year period were tried in the field as well as in laboratory conditions, resulting in the following comments and observations:

## On Sloping Soil

**Oct '93** **Dr T.R.Harrod**  
(Principal Research Scientist)  
S.S.L.R.C. Cranfield University

A preliminary bench test was constructed using a capping soil on a 12° slope, where 48mm/hr rainfall intensity was applied, resulting in 20% water run off with no Aqueel treatment and no run off whatsoever with the Aqueel treated surface.



*Dr. Tim Harrod pictured in 1993 doing trials on a sloping surface at Cranfield University.*

## Field Scale Evaluation

**Oct '95** **W.D.Basford MI AgrE.**  
(Senior Consultant)  
A.D.A.S. Gleadthorpe, Notts  
**S.J. Groves Bsc.**  
(Research Consultant L.R.C.)  
Meden Vale, Notts.

In a field scale evaluation using a computer controlled mobile linear irrigator where it was established that:

1. Each Aqueel indentation had a capacity of up to approximately 1 litre.

2. There is a potential density of 192,500 indentations per hectare.
3. There is a potential surface water capacity of 192.5 m<sup>3</sup> per hectare, equal to 19.2mm overall.

The evaluation was carried out in a field having a 5% slope and rainfall intensities of 39, 73.2, 126, 165 and 185mm per hour were applied. On the basis of the maximum rainfall intensity to be expected in 1 hour once 5 years of 19.8mm it was concluded that the Aqueeled surface would retain water well under all European expected rainfall and irrigation rates.



*Prototype at National Soil Research Lab at Purdue, USA. The inventor of the Aqueel, Charles Creyke is pictured second from left*

## In the USA

**May '98** **Dr D Norton (Principal)**  
National Soil Erosion Research Lab.  
Purdue, USA  
**Dr M Nearing (Senior Soil Scientist)**  
National Soil erosion Research Lab.  
Purdue, USA

The scientists carried out laboratory tests on the Aqueeled soil surface using a Loess soil with a 10° slope and a rainfall intensity of 4" per hour (101.6mm) concluding that the Aqueel has overcome the obstacles associated with previous implements designed to achieve reservoir tillage.

**Sept '98** **Dr G.R. Foster**  
(U.S.D.A. A.R.S. College Stn. Texas)

(Dr Foster has been responsible for the development of the Revised Universal Soil Loss Equation, R.U.S.L.E., the Water Erosion Prediction Project, W.E.P.P., and has now been commissioned to achieve commonality in residue and roughness relationships and enhance the application of RUSLE and WEPP for the U.S.D.A.)

After seeing the Aqueel operating on a field scale in conjunction with irrigation applying water at an intensity of 4" per hour, he stated that the limitations of former reservoir tillage systems had been overcome and that the soil surface roughness created by the Aqueel was equal to that of mouldboard ploughing. So, a roughness value "R" of 2" should be used when calculating R.U.S.L.E. and

the "P" factor - contouring should be a credit, 4" rather than 6" if no Aqueel treatment was carried out.

**June '99** **Dr A.J. Parsons (Dept. of Geography)**  
Leicester University  
**Dr D Favis-Mortlock**  
(Climate Change Unit)  
Oxford University

An experiment was carried out on saturated Leicestershire sandy loam soil to assess the potential effects of the Aqueeled soil surface on water run off and sediment field when applying excessive rainfall intensities. Results Indicated:

1. A 50% reduction of sediment loss (g/litre of run off).
2. A 60% reduction of total sediment loss (kg/m<sup>3</sup>/30mins)
3. A 75% reduction in run off velocity (metres/sec.) when compared with a non Aqueel treated surface.

## The AQUEEL has combined two historically opposed principles.

A seed bed/soil with a low tilth index - Which optimises seedling emergence, subsequent crop growth and ultimate yield, whilst at the same time maximising the satisfactory functioning of minimum quantities of herbicides through increased absorption to the soil particles so reducing the potential for loss.

And soil surface roughness that can increase the soil surface water storage by up to 100% with consequential soil surface water run off reduction.

This is particularly relevant to the power harrow's capability of producing a fine, flat soil /seed bed in one operation, which is both an attractive feature to the farmer and an identified cause of soil surface capping, soil surface water run off and consequential pollution.

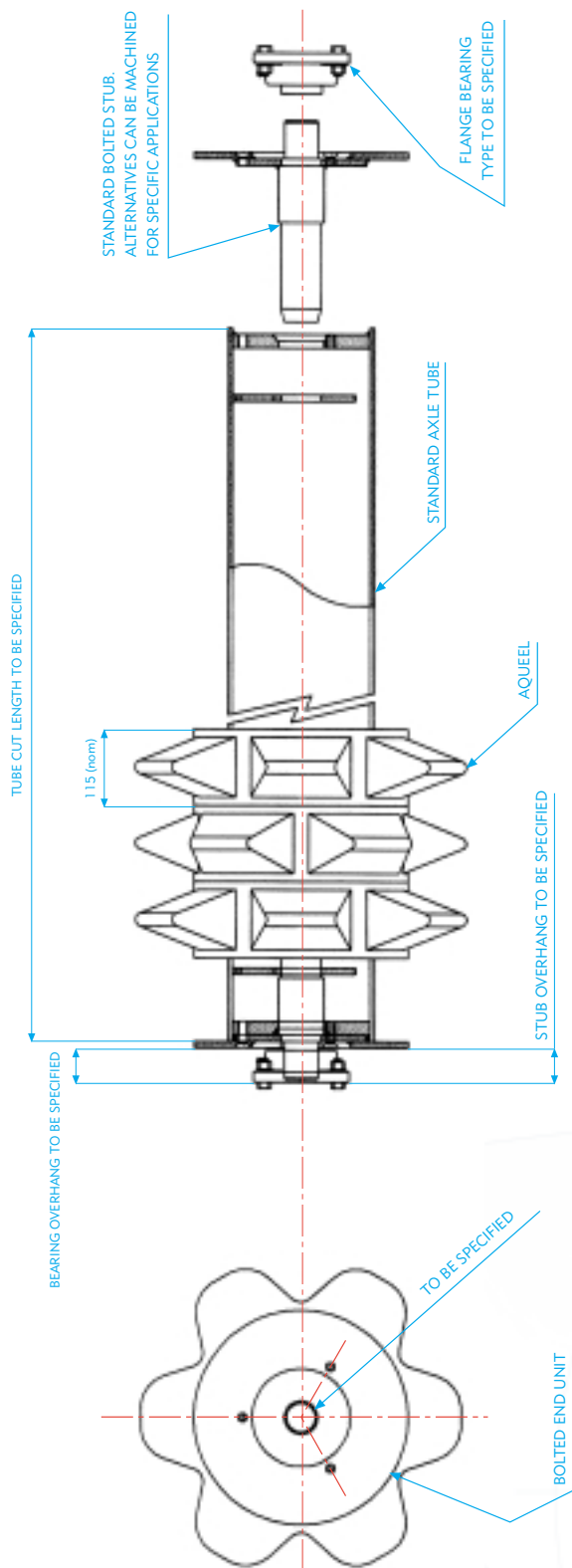


*Dr. Tim Harrod pulling a prototype Aqueel press by hand and demonstrating that the Aqueel can be human powered for use in developing countries*

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# AQUEEL - TECHNICAL INFORMATION

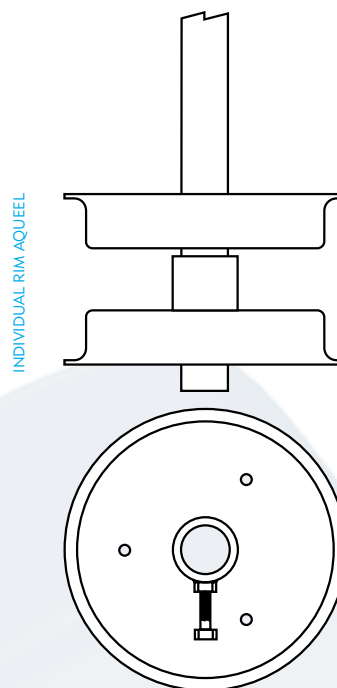
MOUNTING ARRANGEMENT OF AQUEELS ON STANDARD ROLLER



A RANGE OF STANDARD ROLLER WIDTHS AND FLANGE BEARING MOUNTINGS ARE MANUFACTURED. SIMBA ARE ALSO ABLE TO SPECIFICALLY MANUFACTURE ROLLERS TO CUSTOMERS REQUIREMENTS AND CAN ENGINEER THE AQUEEL SYSTEM TO SUIT SPECIFIC CUSTOMER APPLICATIONS AND MACHINES.



Single rimmed Aqueel on Potato ridges.



Single rimmed Aqueel can also create indentations for inter row applications in vegetable and root crops.



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## AQUEEL RELIEVES PLANTING PRESSURE

Come rain or shine, every day is a potential planting day for Lincolnshire vegetable producer Chris Bradley. Which is just as well, as with 250 acres of cauliflowers, calabrese and other brassicas grown for supermarkets, he needs to stick to planting schedules to ensure a consistent supply of product to the customer.

Mr Bradley and his father Richard farm 500 acres at Fishtoft, near Boston, with a rotation of alternate wheat and vegetables. The land is mainly silty, and becomes difficult to work when wet and very dusty if worked when



**Chris Bradley digs into the Aqueeled bed to check consolidation**

dry - the latter being a particular problem when transplanting plugs in dry conditions.

But both problems appear to have been solved by using a new Aqueel roller from Simba International Ltd. The Aqueel is a self-cleaning press roll made from a micro-cellular polyurethane material. While firming and consolidating the seed-bed, it also presses a lattice of divots into it.

These retain water where it falls, so that rain and irrigation water stays on the bed rather than running across the surface and either causing capping or marginal erosion. The divots also ensure that wind passing over the bed



**Closeup from the side**



**The Bradley's Aqueel in work**

swirls and eddies, thus cutting its surface speed and greatly reducing its ability to lift and transport soil particles. Chris feels the new roller will have benefits in both wet and dry conditions, enabling him to keep working in the former situation, and making life bearable for employees working in the planting rig in the latter.



**Conditions are much better for the Bradley's staff on the planter**

He got an early illustration of the Aqueel's value as an un-blockable roller this July: "We had a large amount of rain on Tuesday, and were able to resume planting on Thursday, when most people in the area were stood still until the weekend.

"Our old steel roller would pick up soil and block in wet conditions, and we spent a fair amount of time un-blocking it to continue working. The Aqueel runs clean in pretty well any soil type and conditions. That is probably its biggest single benefit.

"We form the beds in which we grow cauliflowers and calabrese from early March through to mid August, and plant the crop in modules. In dry planting conditions the staff in the planting rig used to wear goggles and masks to protect their eyes and mouths with goggles and masks to protect themselves against the huge volume of dust kicked up by the tractor. This year their working conditions are much improved."

Colin Adams, General Manager of Simba's Components Division, suggests the Aqueel's ability to improve moisture conservation may be responsible for this:

"Dry soils do create a lot of dust when worked. Retaining moisture helps bind soil particles together, and would reduce the amount of dust created by operations like bed forming and - in this case - planting. This would also help protect the soil against wind erosion as well". One important aspect of the implement's effectiveness is that many of the divots survive the drilling operation: "While the rig does destroy the divots in the planting rows, those between the rows survive, which helps us make optimum use of any water - an important issue as we have no irrigation



**The Aqueel at work**

The divots also protect young plants from the damage which can be caused by particular material being picked up by the wind and blow into them, which can strip the wax of immature leaves, and - in severe cases - even rip leaves clean off the plant.

He expects the implement will also help retain bed shape and structure: "The bed-former fluffs the soil up, but if we get a lot of rain after bed-forming it tends to slump and 'go sad', so there is not as much air-space in the soil, in which case we have to re-make it. We hope the Aqueel will prevent this happening as well."

"The "Aqueel" system has the potential to reduce soil erosion and irrigation costs"

## POWER OVER WIND AND WATER



**Sand blowing from behind the position from which the photograph was taken would have previously blown right across a level field. Once Aqueeled, it falls to the ground within 20 yards of the field boundary**



**Lane's Aqueel at work in Colorado**

Soil erosion - both by wind and water - are global problems to which Simba's Aqueel roller offers a potential solution, as the following farm stories illustrate:

At Normanton Larches Farm, Worksop, Nottinghamshire, Richard Limb's 430 acres of light sand-based soils grow excellent crops of potatoes, sugar beet, carrots and onions, but are prone to erosion.

Using the Aqueel has helped control the problem: "In the spring bare land is prone to sand-blow. Preventing it is valuable benefit. We irrigate 75% of the farm and improving water retention is also a major advantage".

He saw graphic evidence of the Aqueel's ability to reduce sand-blow this spring, when sand lifting from one field which had not been finished with the Aqueel blew across a track and into a field which had been subsoiled and Aqueeled ahead of being finished for onion beds.

Instead of travelling the whole width of the field, as it would have done over a conventional, flat-pressed surface, the sand all dropped to the ground within 25 metres of the field boundary.

The Aqueel fitted to his potato planter features a half-height lug, which makes an indentation that holds over half a litre of water. The edge ring features a full-sized lug, which helps firm the bed's margins and hold it together. "Full depth lugs might cause extra greening of the salad potatoes we grow. The half depth lugs work very well and



**Solo and Aqueel press in a one pass system - Colorado, USA where consolidation of the soil surface and reduction of wind erosion is very important.**

still retain a lot of water. They also help trap fertilizer on top of the bed, so it is more accessible to the crop than if it falls in the gullies between the beds".

A second Aqueel - fitted throughout with full sized lugs - runs behind the rotary cultivator used to finish sugar beet seed-beds: "Ploughing after potatoes would bring all the stones back up into the seed-bed, so we sub-soil to remove compaction finish off with the Aqueel".

The crop was drilled into this seed-bed, with much of the lattice pattern remaining intact to help protect the emerging



**Cultivating land before sugar beet drilling can consolidate the surface, avoid capping and reduce extensive wind erosion.**

plants, which might otherwise can be shot-blasted by sand, de-waxing their leaves and sometimes stripping them clean off the plants.

IN THE SAN LUIS Valley, Colorado, Chris Lane uses an Aqueel to negate the threat of winds reaching 50mph which whip across the valley floor each spring.

That wind has already removed thousands of tonnes of topsoil from the valley floor and piled it in huge dunes at the foot of the Rocky Mountains, which tower 14,000 feet high on both sides of the valley. To compound the problems, annual precipitation is just seven inches - most of that falling as snow.

In this scenario, the Aqueel is now playing an important role in his cultivations for the alfalfa and barley he grows in six circles of between 120 - 160 acres, each served by a centre pivoting irrigation system. This May one severe windstorm removed enough soil to remove 80% of young alfalfa crops.

This spring the soil was too dry for the Aqueel run behind his drill to press a perfect lattice pattern, but the divots



**In conjunction with potato planters the Aqueel will firm the bed with the indentations being capable of retaining irrigated water until the crop is established.**

it did create were still highly effective - as was the consolidation it achieved.

Chris noted that emergence on the Aqueeled land was a couple of days later, but the better soil-to-seed contact achieved and better root development mean the crop looked much healthier, while the divots were very effective in helping protect the seedlings against wind damage.

He predicts the Aqueel will become standard equipment for many American farmers:

"In high winds the soil literally causes a fog - especially in the potato-growing areas of the valley, where it is very sandy - which severely damages the crop. Personally, I would think the Aqueel is going to be a huge step forward for agriculture in many countries, and standard equipment for many farms".

The Aqueel is already chalking up sales all over the world, says Colin Adams, General Manager of Simba's Components Division: "We have made sales all over Britain, as well as in Australia, New Zealand, Saudi Arabia, France, Germany and Scandinavia. Models range from 8m wide ones being used on 16,000 hectares of irrigated field crops in Saudi Arabia, to one less than a metre wide being used on a five acre nursery in Hampshire".

