



PRECISION RIPPING & DEVELOPMENT TECHNIQUES

MID-ROW MANAGEMENT & SOIL AMELIORATION

Soilworks Australia specialises in precision ripping and mounding technology to apply the best management practice in the establishment and maintenance of orchards and vineyards.

The company was formed following extensive research and trial which found that traditional ripping practices produced low soil breakout volume, soil erosion and rip-line subsidence. Traditional mounding techniques lacked precision and produced inconsistencies in soil volume within rows.

As a result, the patented Soilworks Establishment System was developed in conjunction with soil scientists, design consultants and mechanical engineers and is endorsed by the Commonwealth Scientific and Investigative Research Office (CSIRO) of Australia. Using precision farming techniques, the technology has applications across both green field and established sites with all work guaranteed to specification.

Why Rip?

The most common cause of soil induced vine or tree performance issues arises from either sub soil compaction not being addressed during the establishment phase or wheel track compaction. It is widely recognised that plants have a finite ability to penetrate hard soils and in cases of severe soil problems, may suffer from leaf senescence or poor canopy development. Deep tillage (or ripping) enables plant roots to explore greater soil volume and allow water penetration into the soil profile, therefore increasing water availability. As a result, root aeration and drainage is improved and roots gain access to previously inaccessible reserves of soil nutrients increasing the crop or yield potential.

Why Mound?

In shallow soil profiles, duplex soils or poor sub-soils, it can be difficult to achieve adequate soil depths to maximise yield potential. In soils that are low in organic matter, mounding under the row concentrates organic matter in the root and irrigation zone improving soil porosity and crop growth. Mounding accesses soil nutrients from the mid-row which were previously inaccessible. With effective mounding, soil profiles and volumes can be greatly increased, enabling shallow soils to be utilised thus increasing the overall plantable area.

Benefits of Using Soilworks Advanced Ripping & Mounding Technology

- Cost effective
- Better returns
- Provide optimum soil conditions for plant growth
- Reduced soil compaction
- Maximise water penetration into the soil profile
- Increase uptake of nutrients
- Improved fruit quality and yield potential
- Uniformity in fruit ripening
- Better balance
- **PROVEN RESULTS**

Proven CSIRO Results

2002 Commonwealth Scientific and Investigative Research Office of Australia

“Ameliorating soil constraints to improve performance of established vineyards”. The use of the mid row Vibrosoiler led to a 14% increase in yields in medium textured soils that were suffering compaction problems and a 7% increase in yield on light textured soils.

Dr Dean Lanyon
RESEARCH SCIENTIST, CSIRO

SOILWORKS TOOLS & APPLICATION

Using effective Vibrosoiler mid-row ripping and mounding with the addition of ameliorants (lime, gypsum, fertiliser, organic matter), we can successfully enhance vineyard production to optimise your sites potential.

Soilworks Mid-Row Vibrosoiler

The patented Mid Row Vibrosoiler is a twin vibrating winged keel ripper with an effective ripping depth of 600mm (2ft) and can be fitted with various wing sizes and shapes ranging from 140-250mm (5-10 inches) to tailor amelioration to specification. The unit is fitted with crumble rollers, harrows, level bar and fertilizer box enabling complete ripping in a single pass thus creating a clean finish in 95% of the mid-row. Generally no post ripping cultivation is required.

When set to mixing the Vibrosoiler can blend soil profiles down to 300-400mm (12-16 inches) and delve clay into the soil profile. If issues such as drainage or deep pans exist we can fit a single tine centrally mounted on the Vibrosoiler and rip down to a depth of 750mm (2.5ft) within the mid-row.

Note: Professional advice should be sought prior to ripping as it is critical not to mix poor sub soils (sodic, dispersive and slaking soils).

Sub-surface Irrigation Installation using the Vibrosoiler

An attachment to the double-tine Vibrosoiler, this unit enables drip-line to be laid at depths up to 500mm and within 250mm of the planting row.

Soilworks Mid-row Vineyard Moulder (Patent pending)

Consisting of three sets of grader blades, the mid-row moulder is capable of building “V” shaped mounds up to 300mm (1ft) high leaving a flat “V” floor. Using the multiple grader blades the mid-row remains flat without a wave (single grader blade) this enables any further tractor passes to be undertaken at an increased speed. Compared to a disc moulder, the grader

blades on the Soilworks moulder will mound more soil volume and allow finite control, scalping only the top soil as required and not the underlying layers.

ASSESSING YOUR VINEYARD REQUIREMENTS

There are various tools available in the industry, such as soil surveying, yield mapping and plant cell density mapping to identify and measure potential areas for improvement. We can use this information in conjunction with the Soilworks Establishment System to maximise your crop yield potential.

Precision Viticulture

The purpose of soil surveys and remedial soil plans is to identify soil types, potential problems and amelioration requirements to improve uniformity of soils within blocks for the even ripening of fruit, which requires accurate soil map translation to the ground.

Use of Yield Mapping & Plant Cell Density Mapping - an effective tool in optimizing yield

When annual crop yield maps or plant cell density maps are overlaid with the soil mapping, the correlation is often quite surprising. This process allows precision remedial maps to be developed annually to fine tune a site. Soilworks has software that enables soil maps to be downloaded to a computer in the tractor and ripping depths to be adjusted to soil map specification in real time. This facilitates amelioration of soils to specification.

Sodic Soils

Vibrosoiler ripping and mounding with the use of soil ameliorants, gypsum and organic matter, can dramatically improve sites by ripping in gypsum and incorporating organic matter into the soil profile. In circumstances where there may be a pan or impermeable layer creating a perched water table, deep ripping in the centre of the row can assist with drainage. Where viable top soil exists, combining it with organic matter and “V” mounding can be effective. The “V” mound acts as a rainfall catchment enabling salts to be flushed through the soil profile.

Note: Professional advice should be sought prior to ripping as it is critical not to mix any nasty sub soils (sodic, dispersive and slaking soils).

Lateral Soil Breakout & Minimal Root Pruning

The vibrating winged ripper can loosen soil into the root zone with minimal root pruning. It produces a greater soil volume breakout up to 3 to 4 times, up to 2.4 metres (8ft) per tine. Because of the wide breakout, fewer roots are pruned.

Vineyard Compaction

Most vineyard compaction occurs between 200 – 400mm. We have found ripping from 450mm (18 inches) depth to be effective in addressing issues of mid-row compaction. We generally aim for 600mm (2ft). If issues such as drainage or deep soil pans exist we can fit a single tine centrally mounted on the Vibrosoiler and rip down to a depth of 750mm within the mid-row.

WHERE DO I START – SOILWORKS MID ROW MANAGEMENT PLAN

Prior to commencing your Soilworks Mid-row management plan, the block should be assessed by an independent soil surveyor and soil pits dug along rows to highlight the areas requiring remedial action. Soil tests should be undertaken in both top soil and sub soil and from this a remedial soil plan can be developed which may include ripping and mounding and the addition of ameliorants.

Mid-row Management Strategy

The Vibrosoiler mid row ripping pass needs to be thought of in terms of the overall mid-row vineyard management programme for the season. Ripping is generally conducted on alternate rows post harvest after a few inches of rain. Post ripping traffic should be kept to a minimum and ideally all tractor passes undertaken from the un-ripped row. Prior to commencing ripping, growers should undertake any herbicide spraying required, seeding of cover crops or other passes then rip and leave the mid-row to naturally re-settle for the winter period and aim do the first sprays of the season from the alternative row.

Important: Do Not Drive on Ripped Rows

We generally try to avoid any wheel traffic over the ripping as a single pass will re-compact up to 70% of the soil and leave wheel ruts close to the vine. Excellent results have been achieved working the vine row from the alternate row and rotating ripping seasonally.

Ripping Every Second Row

As an overall programme, ripping every alternative row every other year has produced excellent results. Some root pruning is generally encountered, however we generally space the tines to ensure only roots up to about, plus or minus, 10mm (3/8 inch) are ripped. However, some root pruning can encourage good, fresh root growth. This is a proven strategy. We have only encountered a setback on one occasion in heavy clay soil, ripping every row in a dry grown organic vineyard. However, the vines responded very well the following season (Penfold's Vineyard, Clare, SA).

Ripper Spacing

It is important to see lateral breakout within 4 - 6 inches of the vine stump to remove any compaction spikes between the wetted root zone and wheel track compaction of the mid-row. This conclusion was reached after probing soil sites with a penetrometre to determine correct ripping spacing.

However, some clients rip as close as possible to the vine, as the vines lift an inch and posts move as the Vibrosoiler goes past. Some of our best results have been achieved using this method (CMV Farms, Langhorne Creek).

Timing of Ripping

For effective ripping sub soil moisture is required. The subsoil needs to be moist but still crumbling, (sub plastic), when the subsoil smears like potters clay the soil is too wet.

There are two windows of opportunity as follows:

1. Post Harvest after a few inches of rain. Immediately post harvest followed with deep irrigation and fertigation ripping can give post harvest root flush a good opportunity for growth, however we rarely have enough soil moisture post harvest.
2. During early Spring the soil moisture is generally ideal and best ripped within a month of bud burst to capitalise on fresh root growth.

In low rainfall zones, soil conditions are often ideal through winter.

Surface Preparation

For the most effective results, some prior soil preparation will most likely be required.

1. Without cover crop seeding – It is recommended spraying out any vine row weeds with a wider spray strip so the rippers pass over sprayed ground, this will leave a cleaner, less clumpy finish with less root ball.
2. With cover crop seeding – cultivate shallow down to approximately 50mm and sow the cover crop the day before ripping. The rippers will leave a clean finish in 95% of mid-row and 70-80% of the cover crop will germinate.

Addition of Soil Ameliorants with Vibrosoiler

The Vibrosoiler can incorporate top soil, organic matter and ameliorants through the soil profile as required. Using our fertiliser box, fitted with a screw drive, we can incorporate lime, gypsum or organic matter to a depth of 300-400mm, the ameliorants are fed onto the wing and blended through the soil profile, as opposed to other systems where ameliorants sit in a concentrated strip often too concentrated for roots to access the nutrients for some time.

1. The Mid-row Vibrosoiler fertilizer box is capable of storing approximately 300kg volume. This is best utilised for small amounts of fertiliser or organic matter required to be incorporated at root depth.
2. For large volumes of lime, gypsum and organic matter, the best approach is to firstly spray out the vine row weeds in a wider strip and drop fertiliser or organic matter along the wheel tracks and cultivate into the soil using a rotary hoe with the centre blades removed. Using this method the Vibrosoiler can effectively work organic matter down to 300mm. This was the approach used in the CSIRO trial and has proven effective on many sites.

REMEDIAL MOUNDING

Mounding in combination with ripping can effectively re-invigorate most vineyards. Mounding can be used for two purposes, either increasing top soil depths or to draw organic matter into the vine row. The ideal mound shape is “V”-shaped allowing less erosion with half of the soil falling inwards and, most importantly, acts as a catchment for rainfall allowing salts and toxins to be flushed from the soil profile.

Mound Sizes

In most vineyard rows, a workable sized mound is approximately 750mm x 300mm (30 x 12 inches) this requires a minimum 2.4m (8ft row).

How Much Soil Do I Need?

Effective mounding can only use the depth of good top soil available. Care must be taken to limit the mounding and pre-cultivation to the depth of organic top soil. Throwing bleached, poorly structured or toxic sub soils into the mound can seal the mound and release toxins.

What if I need more Soil?

If a greater volume mound is required than top soil available, we can plant a cover crop over a couple of years and “grow” more top soil through natural improvement of organic levels - we then re-mound.

Mounding Soil Preparation

The ideal time to commence mounding is post harvest in autumn about the same time when sowing of cereal grain crops is undertaken.

Mounding Procedure

1. Spray out mid-row with herbicide;
2. Spreading of ameliorants;
3. Cultivate with disc, 2 passes; the first pass is shallow to cut the root ball, the second pass at a lower top soil depth;
4. First mounding pass;
5. Second mounding pass - in opposite direction filling to strainers;
6. Light cultivation to prepare planting bed; and
7. Sowing of cover crop.

If used in conjunction with ripping procedures, ripping is best undertaken either between mounding passes or immediately following sowing of the cover crop.

GROWER SUCCESS STORIES

Prue Henschke – C A Henschke, Eden Valley, S.A. (client of 3 years)

“Fantastic results – the Vibrosoiler works!”

Andrew Pike- Pikes Wines, Clare, S.A. (client of 4 years)

Consistent results. “An excellent result despite the dry season and no irrigation being available”.

Bruce Chalmers – Chalmers Nursery

I would not develop a vineyard without it. We’ve had fantastic results in growth uniformity and early fruit maturity. One pass of the Vibrosoiler does more than cross ripping at two metre centres.” His approach is to first delve rows to 28 inches, add organic manure, then rip, mix and mound in a single pass with the Vibrosoiler. “With this approach we can successfully incorporate organic manures down to 700mm and mound about 750mm by 250mm, using around two inches of top soil into the planting mound, making use of all organics in our Mallee soils,” Bruce said.

Dick Brisky – Clare Valley, S.A.

Dick used the Mid-row Vibrosoiler in his minimally irrigated vineyard two seasons ago. In 2003 the yield was 2.4 tonnes, in 2004 it increased to 4.1 tonnes and in 2005 it increased to 7.9 tonnes, keeping leaves until after harvest. “Previously, we lost leaf in February with shriveled berries. Now bunch weights have gone from 25g to 95g, with fewer bunches. Our winemaker says it’s the best fruit the block has ever produced,” Dick said. “The lateral cracking into the vine row increases water permeability, giving roots increased access to water. Rainfall in winter moves into the clay for use during veraison. “When we ripped there were no roots in the mid row. I’d like to have another look and observe root activity now” Dick said.

Phil Reily – CMV Farms, Langhorne Creek, S.A. (Client of 3 years)

The Manager, Phil Reily, has experienced 2 to 3 tonne improvement in grape yields this last season in Vibrosoiled areas with water infiltration from the 25mm rain in Nov-06 penetrating down to 600mm in Vibrosoiled areas compared to only 100mm in non ripped areas.

His management practice allow him to stay off the ripped row for the bulk of the season and then rip alternate rows.

Ken McDougal – Liverno Olives, Shepparton, VIC

Ken had an alluvial soil issue. His olives were growing in 'pots' due to dispersive clays restricting root activity and water infiltration in the soil. The hard setting alluvial soils sealed off soil permeability. "We employed a standard ripper at establishment, found we had a problem and consulted widely to address the issues. We used the Establishment Vibrosoiler, ripping either side of the tree rows and in half a season we almost double the foliage," Ken said. "The mixing action altered the soil profile and allowed root and water penetration".

Troy van Dulken – Woodside S.A.

Troy experienced poor growth in a block with duplex soils, with a bleached horizon. He had the block assessed by a soil surveyor and soil pitted along the rows which highlighted the problems. A remedial plan was developed and work included mounding to 30cm in the bottom of the row and 15cm in the top of the row, then mid row ripping with the Vibrosoiler. "We've improved uniformity throughout the block, going from our worst block to our best, and moving upwards in fruit quality gradings," Troy said. "In the next few years I will ameliorate the entire block with the Vibrosoiler".

DEVELOPMENTS THIS SEASON

Vineyard Establishment

Penfolds Koonunga Hill Vineyard (Clare SA)	100 Acres
Henschke Vineyards	30 Acres
Pikes Vineyards (Clare, SA)	37 Acres
Taylor's Vineyard	125 Acres
Coriole Vineyard (McLaren Vale, SA)	15 Acres

Vineyard Mid Row Ripping

Fabal Vineyards	250 Acres
CMV Farms	225 Acres
Penfolds Koonunga Hill Vineyard	185 Acres

Orchard Establishment

Almond Investors Ltd	1000 Acres
Lake Cullulleraine (Tim Orr)	200 Acres
Timbercorp Pty Ltd	1980 Acres
Macquarie Bank Ltd	500 Acres
Boundary Bend Olives	1300 Acres
Nasmin	80 Acres
Kyalite Pitaschios	95 Acres

Forestry

Great Southern Ltd	4000 Acres
--------------------	------------