NEW EXECUTIVE OFFICER

The Liebe Group would like to congratulate Chris O’Callaghan on his appointment to the Executive Officer position.

Chris has worked with the Group as R&D Coordinator for almost three years and is looking forward to the challenge of taking on this executive role.

We wish Chris all the best with this exciting transition.

DIAMOND PARTNERS

The Liebe Group would like to acknowledge and thank Department of Agriculture & Food WA, Grains Research and Development Corporation and the Farm Weekly for their valued support.
Well, here I am for my first EO report. The office has certainly been a busy place over the last few months. Sophie has gone on Maternity Leave and has stepped down from the EO position hence the reason for me writing this report.

I extend all my well wishes to Sophie & Blayn as they embark on a new chapter of their lives which will be a very rewarding one as well as providing plenty of challenges along the way.

I would like to sincerely thank Sophie for the hard work, passion and dedication she has put into her time as Executive Officer. She has done a brilliant job, leading the group through a time of numerous changes, with both staff and projects, and the huge uncertainty that surrounds this. She is stepping down, leaving the group in a very healthy position with 3 new major projects, 1 new staff member, and a large array of new opportunities for members moving forward into 2010. I would also like to thank her for the time she has spent preparing me for the transition through to Executive Officer, this has helped for a smooth changeover.

Sophie will still be working closely with the group as treasurer, working a flexible 1 day a week in this role.

Our new R&D Co-ordinator, Nadine Hollamby, is starting on the 4th of November and we are looking forward to getting her settled into the role. With harvest fast approaching she will be out harvesting many trials and demonstrations as well as starting to co-ordinate the Annual R&D Book. Nadine & I will endeavour to get around to as many members as possible during harvest, to allow Nadine to meet the membership and discuss current farming issues and R&D priorities.

The group is embarking on a new and exciting time, with new projects starting, new staff and an array of new opportunities. I urge members to keep their eyes out over the next few years for the many opportunities that will present themselves to you, which we are certain will continue to help you to grow and improve your business.

Well that is my first EO report out of the way so for now I would like to wish you all the best of luck for harvest, I’m sure it is going to be another rewarding season.
LIEBE GROUP
GRDC Project Coordinator

The Liebe Group is a progressive and vibrant grower driven group from the Dalwallinu, Coorow, Perenjori and Wongan Hills Shires. We are seeking a highly motivated and enthusiastic person to coordinate a 3 year GRDC funded research project that aims to improve knowledge of stubble & soil management practices and their effect on productivity.

Applicants with agricultural experience or a degree in Agriculture or NRM will be considered. Good interpersonal skills, the willingness to work in a team situation and the ability to communicate both verbally and through written communication is essential.

THE POSITION: Under the guidance of a Management Committee the successful applicant will be required to carry out a range of activities including:

· Work with a Project Committee consisting of local growers and key industry personnel to direct the project and ensure all project milestones and outcomes are being achieved.
· Co-ordination of contractors, growers and industry to conduct relevant trials and demonstrations as directed by the Project Committee.
· Monitoring and measurements of trial and demonstration sites.
· Research & analysis of current practice, adoption trends, barriers to adoptions using relevant literature and conducting grower interviews.
· Produce case studies exploring growers experience with stubble and soil management given an array of different soil types and rainfall zones.
· Co-ordinate & produce relevant extension material relating to the project including media releases, trial reports, newsletter articles, management guidelines, field walks and a stubble and soil management forum.
· Work actively with local growers to prioritise research needs and contribute to the Liebe Group R&D Plan.
· Co-ordination of small Liebe Group collaborative projects as required.

This role will provide the successful applicant with an extensive network within the agricultural industry and offers a variety of work with an enthusiastic group of growers and a supportive staff team.

SALARY: Salary package to be negotiated depending on experience.

LOCATION: The Liebe Group Office is located in Buntine. Buntine is part of the Dalwallinu Shire, 270 km North of Perth.

FOR FURTHER INFORMATION & APPLICATION FORMS:
Contact Chris O’Callaghan on (08) 9664 2030 or chris@liebegroup.asn.au.
Applications close Friday the 6th of November 2009.
Precision agriculture (PA) has been available to Australian farmers for more than 10 years. In that time, the technology has improved and yield monitors attached to grain harvesters are now common. Variable rate controllers are increasingly more common, and computer processing power has increased to the point that precision agriculture can be implemented on a farm, if needed. From a technology availability point of view, there is nothing stopping farmers from adopting precision agriculture.

In theory, variable rate application pays because you closely match cropping inputs (fertiliser, herbicide, soil ameliorants) to the yield potential for that portion of the paddock. You only put inputs on where you get a return.

Researchers and extension personnel from CSIRO, Curtin University, DAFWA, the Liebe Group and SEPWA have been exploring the economics of PA in Western Australia as part of a GRDC funded project on the adoption of PA in Western Australia. As a result of these investigations, they have come up with a series of rules about the economics behind precision agriculture.

Rules to simplify decisions about whether or not to apply precision agriculture in your paddocks:

**Rule 1: Precision agriculture pays when the yield difference between two zones is 1 t/ha or more.**

The fertiliser calculators currently used by the industry all calculate the amount of fertiliser needed to grow a crop with a certain potential yield and soil fertility level.

When there is a large difference in yield, the fertiliser rate required to grow a 2 t/ha crop and a 3 t/ha crop differs markedly. For example on a soil with 4 kg/ha of P, the 2 t/ha crop will require 8 kg/ha of P while the 3 t/ha part of the paddock will require 12 kg/ha of P. Similarly if there was 10 kg/N/ha in the soil, the nitrogen requirement for the 2 t/ha crop would be 30 kg/N/Ha while the 3 t/ha crop would require 70 kg/N/ha. The nutrient response curves, that is the $ return expected from grain for the $ invested in fertiliser, are different for a 2 t/ha crop than a 3 t/ha crop (Figure 1). As a result it pays to put less inputs on the 2 t/ha crop than the 3 t/ha crop. It is also essential to put enough nutrients on the 3 t/ha crop to achieve 3 t/ha.

In contrast if there is only a 0.5 t/ha difference between the zones, the difference in fertiliser rates would be small and the benefit from re-allocating resources from an unproductive or low yielding zone to a high yielding zone is so small as to not be worth it (Figure 2).

For comparison, in a 3 zone paddock where yields vary by 1 t/ha, the return from PA is around $12.40/ha, assuming current fertiliser and wheat prices. In a similar 3 zone paddock, where yields vary by 0.5 t/ha, the return from PA is around $2.70/ha.

The reasons for this difference become evident when the nutrient response curves are inspected (Figure 1 and 2). The difference between the curves in the first paddock, with 1 t/ha yield difference is substantial, and each zone requires a distinctly different fertiliser regime. In contrast, the nutrient response curves for the second paddock, where yields vary by 0.5 t/ha are much more closely aligned and the payoff is minimal. It is probably not worth worrying about PA on this paddock.

**Rule 2: If soil tests suggest there are substantial differences in nitrogen and phosphorous, PA can pay.**

If a paddock has been uniformly fertilised for many years, and one part of the paddock consistently yields poorly, it is likely that fertiliser levels in that part of the paddock can be reduced without economic penalty.
Providing the soil pH is not too high (< 7.5) phosphorous will accumulate in these low yielding areas. The inputs on these low yielding areas can be reduced, thus improving the return in these areas. In addition, in the high yielding area, there may be less nutrients. This means these areas have been under fertilised and crop nutrition is restricting yield and therefore reducing overall profit.

Variations in nutrient status often suggest some other constraint is limiting crop yield. For example, soil acidification may limit root penetration and reduce yield. The net effect might be an accumulation of phosphorus over time. In this situation, PA may pay if ameliorants are applied to the area with high nutrients and low yields. In addition, a previously low performing area may be transformed into a high performing area.

**Rule 3: Don’t worry much about how you zone**

Zoning is part of the PA process and with a wealth of information available from yield maps, EM38 surveys or satellite imagery it is tempting to agonise over the shape, size and boundaries of management zones. In reality, year to year variation in yield makes zoning an imprecise science, and for this reason, unless the difference in yield is large (> 1 t/ha) and obvious, there is no need to split up the paddock. Therefore, if you can not tell, with the naked eye, just by looking at the yield map that an area is poor and another area is good where the scale on the map is set at 0.5 t/ha increments, then there is no need to worry about minor (~ 0.2 t/ha) variations in crop yield. Zone boundaries should be created using the simplest and easiest tools. This will vary from person to person, but if it works and you are happy with the method, stick to it. There is no right or wrong way, if you create a zone, and it concurs with your view of how the paddock performs, then it is good enough to make management decisions with. An analysis by CSIRO showed that unless a farmer confused a high performing zone with a low performing zone, the cost of ‘getting a zone boundary a bit wrong’, in terms of mis-placed fertiliser rates was less than $1/ha. It is extremely unlikely that anyone would confuse a very productive zone with an unproductive zone. In addition, most machinery is so wide, that there is no point obsessing about the precise location of a zone boundary. If it moves by 10 or 20 meters, it doesn’t matter, in part because the machinery can not cope with this level of detail anyway.

**Rule 4: Not all paddocks need PA.**

Not all paddocks have a lot of variation in yield or much variation in soil nutrient status. These are paddocks that do not require PA, and can be uniformly fertilised. Just because you have the technology to split a paddock up into zones and manage them differently doesn’t mean you should. In a recent economic analysis of a farm in WA CSIRO calculated that PA would return the farm an average of $8.78/ha. However out of 17 paddocks, 12 returned less than the $8/ha more when managed with PA. The remaining 5 had enormous variation and returned between $12 and $20/ha when managed with PA. These were also some of the largest paddocks on the farm. In this situation, the farmer only needs to concentrate on managing the variable paddocks.

**Rule 5: If your Variable Rate Technology (VRT) fails, don’t wait, put the crop in**

Finally, many farmers have had trouble making the technology talk. Unfortunately, if the technology is performing badly or not at all, put the crop in with a uniform rate. The payoff from PA will be over-ridden by delaying sowing time. It is simply too risky to delay sowing to repair a VRT controller, or fix a software bug that is preventing one controller from ‘talking’ to another. It is essential that all the equipment ‘bugs’ have been sorted out prior to sowing, otherwise something will go wrong at the worst possible time.
A new tool - soon to be released  
**Towards a farmer and consultant friendly economic calculator**

To assist with some of the economic decisions around variable rate technology, CSIRO, DAFWA and Curtin University have been developing a PA economic calculator. This tool calculates the profit derived from a paddock when PA is implemented, compared to managing it uniformly. The calculator takes into account the fertiliser price (for nitrogen and phosphorous), the expected or potential yield of the crop for each zone, the response of the crop to fertiliser in each zone, the area of each zone and the grain price. All of these factors will influence the return from PA and it is difficult to perform all of these calculations with pen and paper. This tool will be available for release in February 2010 and is currently being evaluated by consultants in the industry.

![Figure 1](image1.png)  
**Figure 1.** The Nutrient response curves for Nitrogen for a paddock with 1 t/ha variation in yield between the 3 zones.

![Figure 2](image2.png)  
**Figure 2.** The Nutrient response curves for Nitrogen for a paddock with 0.5 t/ha variation in yield between the 3 zones.

**At a Glance - Rules to simplify precision agriculture**

1. Precision agriculture pays when the yield difference between two zones is 1 t/ha or more.
2. If soil tests suggest there are substantial differences in nitrogen and phosphorous, PA can pay
3. Don’t worry much about how you zone  
4. Not all paddocks need PA  
5. If your Variable Rate Technology (VRT) fails, don’t wait, put the crop in.
Fires are more likely to occur on farms during harvest given the movement of machinery and vehicles through cropped paddocks.

Many of these fires could be prevented by taking some simple fire safety steps, conducting regular maintenance checks and keeping headers clean during harvest.

Modern harvesters have many potential ignition sources which require regular servicing and close monitoring such as bearings, hydraulic lines, hot exhausts, turbochargers, electrical circuits and belts.

Dry straw, dust, chaff, oil and leaking distillate are the perfect fuel to start a fire. Keeping headers free of these fuels is important to prevent fires.

PRIOR TO HARVEST
- Conduct a thorough check and service of the header.
  - Pay particular attention to chain and belt adjustments, shaft monitoring switches and warning systems.
  - Run the machine at speed for at least 20 minutes, then keep it idling and watch, listen and smell for signs of an electrical or mechanical problem.
  - Use a laser thermometer to check the temperature of shafts and bearings. High temperatures may be caused by excessive bearing wear, so check and replace worn bearings.
- All stationary engines/motors on augers, field bins and fire fighting equipment should be serviced and run before moving into the paddock. Pay particular attention to the working of exhaust systems.
- Ensure that all portable fire extinguishers are serviced in accordance with Australian Standards.
- Service fire fighter knapsacks as required.
- Check with your local government for the current harvesting requirements.

AT THE START OF EACH DAY
- Relocate all fire fighting equipment to the area being harvested and check it is ready for use.
- Clean any build up of dust and straw in and around the engine with compressed air, especially after harvesting lupins.
- Never leave a header unattended in an unclean state after harvesting lupins.
- Complete daily greasing and service requirements.
- Check around manifolds, turbo chargers, radiator and electrical components to ensure no combustibles are building up.
- Check and clean brake linkages and park brake drums.
- Adjust the tension of all belts and chains.
- At least twice a day walk around the machine and watch, listen and smell to check everything is in working order.
- Refuel on bare areas or on fire breaks and wash off any spilt fuel or oil which may gather dust.
- Before refuelling a stationary motor always earth it to reduce the chance of ignition from static electricity.

AT THE END OF EACH DAY
- Check that there is no dust or material collected on the header, auger and field bin motors before leaving the header unattended.
- Isolate the power if possible.

PRECAUTIONS
- Extreme caution should be taken when moving and parking vehicles. Always try to drive on tracks and park on a clear area, as crop fires can start from hot exhaust systems and catalytic converters.
- Drag a metal chain to reduce static build up and prevent fires.
CANOLA CROPS (RAPESEED) POSE A HIGH FIRE RISK

Burning canola can be very dangerous as it burns at a higher temperature than grass or other crops.

FESA recommends in a canola fire that fire fighters:

- Carefully assess the situation.
- In the case of high fire intensities or excessive smoke, ensure a flank attack during suppression or use low fuel areas and fire breaks from which to attack the fire.
- Use a spray pattern to suppress the fire, especially during mop-up, as this reduces the chance of the fire flaring up.
- Canola windrows should not be hit with a jet of water, as this can spread the fire.

Care should also be taken to make sure the fire does not flare up from behind and trap you. This applies to all fires, but it is highly relevant in canola fires as they are harder to extinguish and mop-up compared to other crop or grass fires.

Avoid driving through canola paddocks, especially with vehicles that have low ground clearance, as canola can readily build up and ignite under the vehicle.

REGULATIONS: FIRE SUPPRESSION EQUIPMENT

Farmers and harvesting contractors are required to comply with the Bush Fires Regulations of 1954 and in particular the key points below relating to harvesting activities:

- Section 32 - A person shall not operate any harvesting machine or header in any crop during the prohibited burning times or the restricted burning times unless a fire extinguisher is carried on the machine.
- Section 38A (4) - A person shall, when required by a local government, provide a plough or other specified machine, appliance or fire fighting equipment in or in the vicinity of any land or paddock where harvesting operations are being carried on.
- Interpretation 3 - “fire extinguisher” means a device which comprises:
  (a) a container filled with at least 7.5 litres of water and
  (b) a pump capable of discharging that water and which is in a sound and efficient condition.

To comply with Bush Fire Regulations regulations, FESA asks that you have the following fire fighting equipment serviced and readily available at all times during harvest:

- Two nine-litre stored water fire extinguishers or knapsacks for initial fire attack on dust, straw, stubble or grain fires.
- A nine kilogram dry chemical powder fire extinguisher for initial fire attack on an electrical, fuel, rubber belt or hydraulic fluid fire.
- A mobile farm fire fighting unit comprising of a tank with a minimum capacity of 400 litres, a powered pump, reel, hose and nozzle. Keep this unit parked on bare ground, in or near the harvesting area for quick access.
- A long handled shovel and rake.
- A tractor with a plough, grader blade or scarifier attached.

OTHER EQUIPMENT AND PROCEDURES

- All headers, vehicles and homesteads should be equipped with two-way radio communications channelled for district contact (carry mobile phones if service is available).
- At the homestead, have a list of emergency contact numbers.
PERSONAL PROTECTIVE EQUIPMENT
It is very important to carry appropriate protective clothing that is ready to wear.

The following should be carried as a minimum:

- Sturdy boots
- Cotton or woollen long trousers
- Long-sleeved shirt
- Goggles
- Gloves

To report a life-threatening emergency call 000. For further fire safety information: visit www.fesa.wa.gov.au, phone 1800 199 084, email fesa@fesa.wa.gov.au or contact your nearest FESA office.

HARVEST FIRE PREVENTION - DAILY CHECKLIST
Craig Goodhill, Area Manager Mortlock, FESA

HARVEST FIRE PREVENTION – DAILY CHECKLIST

- **FIRE DANGER RATING** - what is it today and what is the fire weather forecast?
- **NO HARVEST BANS IN PLACE** - monitored throughout the day.
- **FIREFIGHTING CLOTHING** - minimum long sleeved shirt and trousers made from natural fibres, sturdy shoes or boots, gloves, goggles and hat.
- **FIREFIGHTING EQUIPMENT** - in place and working.
- **TWO-WAY RADIO** - working and on correct channel.
- **OIL OR FUEL LEAKS** - none evident.
- **EXHAUST SYSTEMS** - in good order, with spark arrestors in place.
- **BEARINGS AND PTO’S** - in good condition.
- **BELTS** - in good order and at correct tension.
- **FOOT AND HAND BRAKE RELEASE** - working correctly.
- **REFUEL** - on bare areas after a short cool down period.
- **BUILD UP OF CHAFF, STRAW OR DUST** - removed from headers, utes and other vehicles.
- **BE AWARE AND RESPOND** - to the ever changing conditions.
Pulse Australia is assisting DAFWA to investigate the relationship between Potassium, Manganese and the resultant level of alkaloids.

Potassium is known to have a large influence on alkaloid production. We suspect that manganese does as well, but we need some help in determining just how much.

I would like to receive a 1 kg sample of lupins used to sow this year’s crop. Of particular interest is seed that was poor in establishment and vigour, indicating a low level of manganese. The seed will be tested for the levels of potassium, manganese and alkaloids to see if there is a relationship between all three.

The lupin seed should be from a known paddock rather than a mixture of seed from varying paddocks.

Please label the seed with:
- Variety
- Yield of the 2008 crop
- Broad details of previous potassium and manganese fertiliser use
- A recent soil test result would be very useful

**If you can help, please send a small sample of this year’s seed lupins, about 1 kg, to the Liebe office in Buntine. It doesn’t matter if it has a fungicide dressing.**

**For further information please contact Alan Meldrum from Pulse Australia on 0427 384 760.**

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**USE OF MOULDBOARD PLOUGHS & ROTARY SPADERS ON SANDPLAIN SOILS - OPPORTUNITIES & RISKS**

Stephen Davies & Peter Newman, Research Officers, DAFWA Geraldton

Interest in the use of mouldboard ploughs and rotary spaders to lift the productivity of poor performing sandy soils has been growing in Western Australia. It is proposed that these tools can be used once every 10 or more years, primarily to manage herbicide resistant weeds and ameliorate non-wetting sands. However, these tools also provide an opportunity to fix subsoil acidity and compaction. While early results from the use of these tools has been encouraging many questions remain about the long term impact that one-off use of these implements may have on productivity, soil water repellence, weeds and other soil properties. Each implement modifies the soil in unique ways and because of this they each have strengths and weaknesses depending on what you want to achieve.

**Soil inversion using a mouldboard plough**

Commercial scale mouldboard ploughs create furrows to a depth of 35-40 cm. Scalpers remove the topsoil and push it into the base of the furrow ahead of the mouldboard plough blades which then fold subsoil on top of the buried topsoil, effectively inverting the soil. Consequently the topsoil ends up buried under a layer of subsoil (Fig. 1).

**Topsoil dilution using a rotary spader**

Rotary spaders bury of some of the topsoil but the rotating spader tines also mix some of the subsoil and topsoil together to a depth of ~30 cm or more if a bigger spader is used (Fig. 2). In effect the spader dilutes the topsoil through the top 30 cm of the profile blending some subsoil through the topsoil.
Weed seed banks
Both spaders and ploughs bury weed seeds and the evidence from field trials and demonstrations sites suggest they can both substantially reduce weed numbers. The mouldboard plough is likely to be more effective because of the greater depth of burial of the weed seeds while the spader is likely to leave some seeds shallow enough to emerge. Weed numbers following mouldboard ploughing are typically reduced by >90%. In a research trial at Badgingarra wild radish numbers were reduced by 98% or more by mouldboard ploughing when the soil was wet and >60% when using a spader or mouldboard plough when the soil was dry, which results in poorer inversion and some soil mixing (Fig. 3). Other shallower cultivation treatments resulted in lower levels of wild radish control and addition of clay seemed to marginally improve control for those treatments which were more effective at incorporating the clay (Fig. 3).

While these tools provide an excellent opportunity to substantially reduce the weed burden ongoing best-practice management of weeds using integrated weed management tools is required after their use to prolong the benefit and keep the weed seed bank at low levels.
Water repellence

Water repellence in soils is caused by waxes from plant residues which coat the sand particles. These waxes are hydrophobic and cause slow and uneven infiltration of water into the soil. In general water repellence is directly proportional to the organic matter content and inversely proportional to clay content. Sandy topsoils often contain considerable organic matter as a consequence of the return of plant residues, such as crop stubbles, to the soil surface and if they have less than 3% clay they are particularly susceptible to water repellence.

When mouldboard ploughs invert the soil the subsoil that has been brought to the surface has very little organic matter in it (Fig. 1). Consequently this soil is completely wettable and water placed on the surface will instantly soak in. If the soil inversion has not been fully achieved some water repellence can still be evident where the topsoil remains at the surface.

With rotary spaders the topsoil is mixed with some subsoil so some organic matter remains near the soil surface (Fig. 2) and this can result in the topsoil remaining slightly repellent after spading. The water droplet penetration time of untreated topsoil from a pale Badgingarra sand was >6 minutes compared to about 10 seconds for spaded topsoil and 0 seconds for a soil inverted with a mouldboard plough.

Some research has shown that mixing water repellent soil with non-repellent soil can make all the soil non-wetting and possibly increase the depth of non-wetting soil. This may be a risk with rotary spading of soil when no other amendments, such as clay have been applied, however initial evidence suggests this potential problem is not occurring. Because of its mixing action the rotary spader can be used to incorporate surface applied clay. However spaders may bury the clay too deep leaving insufficient clay in the topsoil to effectively fix the non-wetting topsoil over the long term. Using the spader at a shallower working depth may reduce this risk and other implements that mix to shallower depths, such as rotary hoes, are also effective at incorporating clay.

**Table 1.** Laboratory measured water droplet penetration times for various treatments applied to pale deep sand at Badgingarra.

<table>
<thead>
<tr>
<th>Cultivation</th>
<th>Water droplet penetration time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nil amendment</td>
</tr>
<tr>
<td>Control</td>
<td>&gt;420</td>
</tr>
<tr>
<td>Rotary hoe</td>
<td>75</td>
</tr>
<tr>
<td>Rotary spader</td>
<td>11</td>
</tr>
<tr>
<td>Mouldboard plough</td>
<td>1</td>
</tr>
</tbody>
</table>

It is not yet known what will happen to the buried water repellent topsoils. It is hypothesised that the waxes that cause water repellence will be broken down by wax degrading microbes, particularly because the buried topsoil stays wetter for longer and the abundant root growth observed in these buried topsoils is clear evidence that these are biologically active soils. It is also unclear how long it will take the ameliorated topsoils to become non-wetting again as crop residues are returned to the surface. This is likely to depend on the amount and possibly type of residues being returned and the amount of clay in the topsoil.

Subsoil acidity

Both implements can be used to bury lime to treat subsoil acidity but they also can bring acidic subsoil to the surface and if this occurs the soil surface will need to be limed. The rotary spader is more effective at mixing lime through the top 30 cm of the soil, thereby rapidly fixing subsoil acidity. Note that liming rates may need to be increased to account for the greater volume of acidic soil that needs to be neutralised when
lime is mixed to 30 cm. By comparison the mouldboard plough leaves lime in a layer at the base of the furrow and while this lime can then move deeper it will be necessary to still apply lime at the surface to treat the acidic subsoil above the inverted lime.

**Subsoil compaction**

Both the mouldboard plough (Fig. 4) and rotary spader cultivate (loosen) the soil to a depth of 30 cm or more thus effectively removing any subsoil compaction that occurs within the working depth, similar to deep ripping. This soil loosening can leave the soil very soft which may result in problems controlling seeding depth. This may lead to poor establishment, particularly after mouldboard ploughing. Commonly used commercial spaders have power harrows that effectively firm the soil surface after spading, improving the reliability of crop establishment. After loosening, these soils can also be susceptible to compaction and paddock traffic needs to be managed carefully, preferably with the use of controlled traffic (tramlines).

![Soil penetration resistance (KPa)](image)

**Figure 4.** Soil cone penetrometer resistance in untreated, deep ripped and mouldboard ploughed soil in a yellow sandy earth near Northampton.
Other potential benefits
It is likely that as a result of the mechanical disturbance of the soil and burial of plant residues that the risk of root and leaf diseases is reduced. As a result of this reduction in disease risk and the reduction in weed numbers some research is going to be conducted to see whether the inclusion of mouldboard ploughing after several cereal crops would provide an opportunity to grow several more cereal crops in the subsequent year thus increasing the frequency of cereal crops in the rotation for a period of time.

Crop productivity
The early results from several trials and demonstration sites indicate that substantial yield gains are obtained in the first few years after mouldboard ploughing (Figure 5). On average a 40% yield response was obtained over a number of crop types. These yield increases were accompanied by substantial increases in overall crop biomass. The only negative yield response observed was a consequence of seeding canola too deep in ploughed soil resulting in poor crop establishment. The early stages of cereal crop growth is often slow in mouldboard ploughed soil as the seedlings are essentially growing in nutrient poor subsoil. Growth and vigour of these crops increases substantially, however, as the crop roots access the buried topsoil.

![Figure 5. Yields of a range of crops from a number of mouldboard plough trials and demonstration sites 2007-08.](image)

While productivity benefits in the first few years after ploughing are quite reliable, provided there are no problems with establishment, it is not yet known how long these productivity benefits will last. There have not been any opportunities to assess the grain yield benefits of rotary spading, however, visual responses in current 2009 trials and demonstration sites look promising.

Possible risks and negative consequences
Apart from some of the potential problems already mentioned associated with burial of non-wetting topsoils, bringing up of acidic subsoil and poor establishment into soft soil the following issues have been raised as potential problems with use of these tools.
Soil erosion
Wind erosion and to a lesser extent water erosion are the biggest risks that arise as a result of using these tools. Both the mouldboard plough and the rotary spader completely remove all soil cover resulting in a high risk of wind erosion. To minimise this risk it is recommended that these implements are only be used when the soil is wet, at the end of seeding for example, and a cover crop should be sown immediately to minimise the time the soil is exposed.

Loss of soil structure
At this time we are recommending that these implements only be used in sandy textured soils. By definition these soils do not have secondary soil structure, which means they do not contain soil aggregates. Consequently in these soils there will be no damage to soil structure from using these implements but as already mentioned they will loosen the soil to the depth of working and reduce the bulk density of the soil making the soil much softer. Because of this there is a risk of re-compaction. Use of mouldboard ploughs and rotary spaders in loam or heavier textured soils may result in degradation of the soil structure and is not recommended.

Loss of organic carbon
Cultivation can result in the faster turnover of the labile component of the soil organic carbon, potentially resulting in some loss of organic carbon. It should also be noted however that these tools bury some carbon at depth and reduce the soil carbon levels in the topsoil. It is anticipated that this will result in an opportunity to re-build soil carbon levels in the topsoil and ultimately to increase the total amount of carbon stored in the top 30 cm of soil. Further research is required to see if this will be the case.

Loss of water harvesting and soil mulching benefits
Water repellent topsoil can provide opportunities to harvest water into furrows and can also be an excellent mulch to prevent water loss by evaporation. Amelioration of topsoil water repellence using rotary spaders and mouldboard ploughs may result in the loss of these benefits. Further research is required to quantify the true impact of this.

Summary
The early results suggest that the use of mouldboard ploughs and rotary spaders on poor performing sandplain soils which have a combination of problems such as non-wetting, herbicide resistant weeds and subsoil acidity is worthy of further investigation. Many research questions remain and there are some significant risks associated with the use of these tools, but it is possible to minimise these risks and maximise the advantages. One of the biggest questions is how long are we likely to see productivity benefits after using these tools and several trials established by the WA Department of Agriculture and Food are likely to help answer these questions over the next few years.

For further information please contact Stephen Davies from DAFWA on (08) 9956 8555 or at stephen.davies@agric.wa.gov.au.
Spray-topping
The timing of herbicide application is critical to the success of spray-topping. Spray-topping must be timed according to the growth stage of the target grass weed. This period extends from when the seed heads are fully emerged from the boot until the seeds reach the dough stage. Timing varies a little between glyphosate and paraquat. In general, the application window for both herbicides begins when all the heads have been extended out of the boot. However, the application window for glyphosate ends at the milky dough stage, whereas the window for paraquat application ends a little later, when the most mature heads begin to hay off. Seed heads that are still partly enclosed by the flag leaf may not be ‘topped’ and viable seed is likely to develop. The seed head of some grasses (eg Vulpia species) never fully emerge from the flag leaf.

Spray-topping as a lone tactic cannot control a wide range of grass species simultaneously. The success of spray-topping depends on the application of herbicide at a specific growth stage of the weed. It therefore cannot be successfully used to control seed-set in more than one species with one application (eg barley grass and ryegrass) unless the sensitive growth stage of both species occurs simultaneously. Alternatively and ideally, more than one application should be made to target different growth stages, but this increases the cost of the spray-topping technique. The timing of the application is important to achieve the best results. Here are some simple guidelines to follow;

- Order of maturity in grasses is Silvergrass → Barley Grass → Brome Grass → Ryegrass
- Grasses can flower over varying time periods e.g. ryegrass can commence and finish flowering within several weeks while barley grass can flower and produce tillers for several months and hence may require more than one herbicide application.

Key benefits
- Strategically timed spray-topping significantly reduces weed seed-set in pastures.
- Both paraquat and glyphosate can be used for spray-topping. The availability of these two herbicides for spray-topping allows for flexibility in MOA rotation, particularly in situations where either herbicide has been used regularly in past seasons or where resistance to a selective herbicide has developed in the target weed.
- Spray-topping is a very cost-effective tactic to reduce weed seed-set, thereby reducing the weed seedbank.

Harvest aids in wheat
Due to good soil moisture there have been a lot of radish flowers appearing in wheat paddocks this season. The two spray strategy, especially for radish could have been employed more widely this season due to several germinations of radish emerging throughout the season. It is also possible that multiple resistant radish and phenoxy tolerance is developing over larger areas as more cereals are grown. In any case, chemicals and integrated weed management should be used in these situations to prevent resistant weed seeds going back into the seed bank.

Consider these questions before making a pre-harvest herbicide application to your wheat crop:
- Does the increased harvest efficiency outweigh the expense of the herbicide, application, and lost grain from sprayer tracks?
- If the weeds are mainly in patches, is there enough wheat in the weed patch to justify the expense of spraying the weeds and harvesting or would it be more logical to harvest around the patches? This may be the case with weeds in areas where the wheat suffered winter damage or with huge populations of large radish.
- Will the herbicide provide enough control to desiccate the weeds before harvest? Often the herbicide label may not allow a high rate to control the large, mature weeds found in wheat crops.
Your options are –
1. Late 2,4-D spray – Low Volatile Ester 680 up to 1.7L/ha at the soft dough stage of wheat.
2. Reglone – 1.0-3.0l/ha – at crop maturity, generally the low rate is sufficient given good application.
3. Roundup Powermax – 0.9 -1.8L /ha – apply at hard dough stage of wheat; use the high rates where dense weeds/crops occur.
4. Roundup Powermax 0.9-1.8L + 4-500ml of Low Volatile Ester 680 – at the hard dough stage of wheat.

In option 3 & 4, use Amsul and 0.5% LI700 to improve uptake and speed of kill, do not use on seed crops. The correct choice of mix is more dependent on the growth stage of the radish rather than just the cost of the spray mix – in simple terms the choices below are;
Flowering radish and only a few pods (wheat at hard dough) = Use the Roundup based mix followed by harvest weed seed removal strategy.
Pods segmented, viable seeds with few flowers remaining (wheat at crop maturity) = Reglone and harvest weed seed removal strategy.

The current pricing of Roundup now makes option 3 and 4 more attractive, but keep in mind that it will be slower than Reglone to dry out the radish. Mix 3 or 4 should prevent any further plant growth after harvest. Obviously if you suspect these weeds have some level of phenoxy tolerance, option 2, 3 or 4 would be preferable.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Reglone Rate</th>
<th>WP (Days)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peas</td>
<td>2-3L/ha</td>
<td>Nil</td>
<td>Spray as soon as the crop has reached full maturity. Reglone helps overcome slow and uneven ripening and weed problems at harvest</td>
</tr>
<tr>
<td>Chickpeas</td>
<td></td>
<td>2 Days</td>
<td></td>
</tr>
<tr>
<td>Lupins</td>
<td>Nil</td>
<td>4 Days</td>
<td></td>
</tr>
<tr>
<td>Canola</td>
<td>1.5-3L/ha</td>
<td></td>
<td>Spray when 70% of the pods are yellow and the seed are browny/bluish and pliable. Canola ripens unevenly and is prone to pod shatter and seed loss. Direct harvest 4-7 days after spraying</td>
</tr>
<tr>
<td>Cereals</td>
<td>1-3L/ha</td>
<td>Nil</td>
<td>Spray as soon and the crop is fully mature and ready for harvesting. Under wet spring condition crops can periodically become weedy, which interferes with harvest. Reglone will control these weeds allowing more efficient harvest. Ensure that spray penetrates deep down into the canopy</td>
</tr>
</tbody>
</table>

Reglone at 1.5-3L/ha is the only product registered for aerial desiccation and for desiccating canola. Gramoxone and Sprayseed are not registered for desiccating canola. Gramoxone can be absorbed into the canola seed and will exceed the minimum residue limits allowable. Reglone is a fast acting product and will allow you to get the crop off and in the bin much quicker.

Most importantly, collect seeds and pods from surviving weeds for resistance testing. Deliver seeds to Landmark and we can organise testing for you at a corporate discounted rate from Plant Science Consulting in South Australia.
Wheat
US export sales are very weak and stocks-to-use is estimated at 45.7%. This year’s carry out in the USA estimated at just below 1 billion bushels. To put this in context, stocks to use ratio was 27.2% in 2008-09 and 11.5% in 2007-08. At this stage the market is not expecting any change in US wheat plantings for the season ahead so given a normal growing season, wheat carry out could be similar next year. Last week wheat prices rallied to their highest price level since mid-August driven by active short covering by the funds. The existence of any further strength will be determined by any further short covering as the fundamentals remain bearish.

Canola
Canada has been experiencing logistics issues getting its canola harvest to port. Average loading time for a vessel is reportedly 2 weeks and for this reason basis out of Canada is strong. The estimate of the size of the Canadian harvest was recently increased by 3.5mmt which has been weighing on the market, along with the soybean factors discussed above.

Barley
Feed barley imports by Northern African countries are expected to be low this year due to a consistent season. Australian feed barley will likely have to compete against Ukrainian feed barley into Saudi Arabia at a freight disadvantage. Saudi Arabia has just re-commenced buying now that Ramadan is over, and Japan is also in the market for December delivery cargoes.

On the malting barley front, Canada has also had high production this year producing 9.5mmt. Europe will likely be self-sufficient for malting barley this year, although hectares may be down for the winter barley harvest as it has been dry. On the other hand, Argentina is unlikely to produce an exportable surplus this year. China has also grown a small crop and will require significant quantities for local brewers. Brewers in both EU and China are reportedly operating at only 50-60% capacity at the moment following the downturn in global markets.

Lupins
Soybean planting has commenced in Brazil, and will shortly commence in Argentina. In the meantime, the USA is the only major exporter with soybeans available for export between now and March or April due to production issues experienced in South America earlier this year. The USA harvest is in its early stages and record yields of 44 bushels per acre are anticipated. These record yields have added a somewhat bearish tone to the market over recent weeks. That, combined with rampant increases in the value of the Australian Dollar against the US Dollar has seen lupin prices come under pressure. On the positive side, China has increased its soy imports this year – the issue to watch is whether this is an increase in volume or just a change in timing of purchases. Given the fairly tight global balance sheet seen this year, the soybean market may prove sensitive to weather in South America until their harvest commences in March.

Oats
Canada is 90% though its oat harvest, the latest estimate pins this year’s crop at 2.90mmt. This has added to the bearish tone in the oat market which we expect to continue into the first and second quarters of 2010. Key event to watch in the oat market is the size of Canadian plantings next year.

Peas
Canada has delivered its second biggest pea harvest in recent years – 3.1mmt, adding to the global pea surplus. The market has fallen around $US 80/t over the past two months as the impact of this harvest has been factored into the world balance sheet. The European pulse harvest has also been large this year and Ukraine is able to export cheaply into markets in India, Spain and the Netherlands. India is set to import 1.5mmt pulses this year, the majority of these are yellow Canadian peas.

For more information regarding your grain marketing needs contact you local Grain Pool Regional Manager Claire Sullivan on 0408 909 533.
### Liebe Group Calendar

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
<th>Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>December General Meeting</td>
<td>Mon 14/12/09</td>
<td>Liebe Group Office</td>
<td>Management Committee</td>
</tr>
<tr>
<td>Liebe Group Christmas Drinks</td>
<td>Mon 14/12/09</td>
<td>Liebe Group Office</td>
<td>Everyone</td>
</tr>
<tr>
<td>Liebe Group AGM</td>
<td>Mon 15/02/10</td>
<td>Buntine Bowling Club</td>
<td>Members</td>
</tr>
<tr>
<td>Agribusiness Crop Updates</td>
<td>Thur 25/02/10</td>
<td>Burswood</td>
<td>Everyone</td>
</tr>
<tr>
<td>Liebe Group Crop Updates</td>
<td>Wed 03/03/10</td>
<td>Buntine Hall</td>
<td>Everyone</td>
</tr>
<tr>
<td>Liebe Group Women’s Field Day</td>
<td>Tue 22/06/10</td>
<td>Dalwallinu Recreation Centre</td>
<td>Everyone</td>
</tr>
<tr>
<td>Liebe Group Beer ‘n’ Burger Night</td>
<td>Thur 22/07/10</td>
<td>Nankivell’s Property, East Maya</td>
<td>Members</td>
</tr>
<tr>
<td>Annual Liebe Group Dinner</td>
<td>Wed 04/08/10</td>
<td>TBA</td>
<td>Members</td>
</tr>
<tr>
<td>Liebe Group Spring Field Day</td>
<td>Thur 09/09/10</td>
<td>Nankivell’s Property, East Maya</td>
<td>Everyone</td>
</tr>
</tbody>
</table>

### Take note of Liebe event dates

Please see the above Liebe Group Calendar for important dates in 2010.

Make sure you enter these dates in to your diaries now to ensure you are able to take part in Liebe events.