

Getting essential paddock jobs done without causing lasting damage

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A practical guide for drilling, spraying and fertiliser application when paddocks are wet

THE MAIN MESSAGE

Before putting any machine into the paddock, ask two questions: Can the soil carry it, and can the job still be done properly? If the answer to either is no, wait, lighten the load, change the route or use another application method.

This guide is for Southland arable and mixed-cropping growers deciding how to protect an existing crop, establish the next crop and avoid compaction during an unusually wet spring.

1. Start with the job that cannot wait

Not every job has the same urgency. Separate crop need from calendar pressure, then choose the lowest-risk way to act.

Job	Questions to ask	Possible response
Spraying an existing crop	Is the timing critical? Can the product still work if delayed? Are only parts of the paddock trafficable?	Wait for a safe window, omit wet patches, use planned wheelways, reduce carried water where label and coverage allow, or consider an approved aerial operator.
Applying fertiliser	Is the crop likely to use it now? Will spreading be even? Is there ponding, runoff risk or poor bearing strength?	Delay, split the application, use a lighter spreader, keep loads smaller, or use aircraft where agronomically, environmentally and economically suitable.
Drilling or cultivation	Can the tractor and implement travel without rutting or smearing? Can the implement hold depth and leave a sound seedbed or slot?	Proceed carefully, change the setup, delay or revise the crop plan.
Crop inspection or mapping	Can the information be gathered without driving the paddock?	Walk from firm access where safe, use existing maps, satellite imagery or a drone operated under the applicable rules.

AERIAL APPLICATION IS AN ALTERNATIVE, NOT AN AUTOMATIC ANSWER

A fixed-wing aircraft or helicopter may be the practical option for time-critical fungicide, insecticide or fertiliser when ground travel would damage the crop or soil. A spray drone may suit small, awkward or inaccessible patches, but limited payload and refill time make broadacre work difficult. Check product approval, application requirements, buffers, weather, contractor capability, cost and whether the crop benefit justifies the application.

2. Decide whether the paddock can carry the machine

Check the wettest likely route, not the driest corner. Dig to the depth affected by the tyre or implement and look below the dry surface.

Decision	What you see	What to do
GO CAREFULLY	Soil crumbles rather than smears. Wheelings remain shallow and stable. Steering, traction and application quality remain sound.	Proceed, but keep checking hollows, gateways and headlands.
TEST FIRST	The surface is drying, but the soil below still deforms. Wheel marks increase or the machine begins to struggle.	Make one short, lightly loaded pass in a carefully chosen area, then stop and inspect.
WAIT OR CHANGE	Free water, deep sinkage, shiny smears, worsening ruts, poor steering, rising slip, lodged crop or unacceptable spray/spread performance.	Stop. Change timing, route, load, machine or application method.

PHILIP WRIGHT: MOST DAMAGE CAN HAPPEN EARLY

Philip Wright noted in his presentation to FAR, that up to 70% of compaction damage can occur in the first pass. Do not make a long test run. Keep it short, light and away from the most vulnerable area.

Five-minute check

- Dig below the apparently dry surface. Does the soil break apart, or mould and polish in your hand?
- Check gateways, headlands, hollows, drain lines and the route to the refill or loading point.
- Mark no-go areas on the display, phone map or a paper paddock map.
- Agree with the operator what will trigger a stop: rut depth, wheel slip, poor steering, crop damage or unacceptable application quality.

3. Reduce the load and keep traffic under control

A sprayer or spreader may be lighter than a drill, but a full tank or hopper can still put a large load onto wet soil. The return trip to refill can cause as much trouble as the application pass.

Practical action	What it means on farm
Know the loaded weight	Count spray water, fertiliser, seed, front tanks, mounted equipment and ballast, not just the empty machine.
Carry only what is needed	Part-fill tanks or hoppers where practical. Balance lower weight against the extra refill trips required.
Remove unnecessary ballast	Keep enough weight for safe control and traction, but do not carry ballast that is not needed for the job.
Set tyre pressure for the actual load	Use the tyre maker's load and speed table for the tyre size and configuration. Do not guess.
Use the best route	Reuse suitable tramlines or AB lines, avoid vulnerable headlands and keep nurse vehicles, trucks and loaders on firm areas.
Reduce overlap and turning	Use section control and guidance where available. Avoid tight turns and repeated passes around wet patches.
Watch what changes	Rising slip, steering loss, deeper ruts, crop wheel damage, poor boom stability or uneven spreading are reasons to stop.

PHILIP WRIGHT: PRESSURE AND WEIGHT BOTH MATTER

Wright gave an ideal ground-pressure target of about 0.7 bar or less when trying to reduce compaction risk. Treat this as a machinery setup target, not permission to drive on soil that is rutting or smearing. Wider tyres and tracks can reduce surface pressure and sinkage, but heavy loaded axles can still damage deeper soil.

4. Protect application quality as well as the soil

Getting across the paddock is not success if the product is applied badly, the crop is flattened or the soil is left damaged.

For spraying	For fertiliser
Keep the boom stable and at the correct working height. Deep wheelings and poor steering make this difficult.	Check that the spread pattern remains even. Wheelings, slopes, wet fertiliser and inconsistent travel speed can affect distribution.

For spraying	For fertiliser
Do not reduce water volume below the product label or what is needed for effective coverage simply to reduce weight.	Do not apply into standing water or where runoff or drainage losses are likely. Consider splitting the dose rather than forcing on a full rate.
Use section control or manual shut-off around no-go areas. Record skipped patches for later treatment.	Use guidance to avoid overlaps and misses. Record untreated wet areas and return only when the soil can carry the machine.
If timing is critical, compare the cost of delay with the cost and performance of helicopter, fixed-wing or suitable drone application.	For aerial spreading, confirm product suitability, target accuracy, buffers, contractor capacity and whether the crop response will cover the additional cost.

5. Work out why the same areas stay wet

What may be happening	What to look for	Practical next step
The season is simply wet	The whole profile is wet after prolonged rain but usually drains well.	Wait for soil strength to return and reduce machinery impact when work resumes.
Water is collecting on the surface	Ponding in hollows, headlands or above a dense cultivated layer.	Check flow paths, surface shape and whether water is trapped by wheelings or a pan.
A drain or outlet is not working	Persistent wetness along known tile lines, ditches or outlets.	Inspect accessible outlets and seek drainage advice before major work.
There is a compacted layer	Roots turn sideways and water sits above a dense layer.	Dig first and confirm the depth and extent before considering repair.
It is a recurring wet zone	The same patch loses crop or cannot be travelled in several seasons.	Map it using grower knowledge, elevation, imagery and yield history, then decide whether drainage or a management change is justified.

Philip Wright's diagnosis and repair points

- Use a penetrometer to compare good and poor areas on the same soil type and at similar moisture. Always dig and inspect roots, pores and clods as well.
- Philip used 0-200 psi (0-1.4 MPa), 200-300 psi (1.4-2.0 MPa) and 300-400 psi (2.0-2.8 MPa) as practical presentation bands. They are not automatic FAR subsoiling thresholds.

- “If it’s not broken, don’t fix it.” Confirm where the restriction is, then target the affected area and depth.
- Only loosen when the soil is dry enough to fracture. If the leg leaves a shiny slot, conditions are wrong. Work just below the confirmed layer, retain undisturbed support between legs where suitable, and use roots to help stabilise the repaired soil.

6. Use maps and sensors to answer a paddock question

Technology is useful when it helps decide where to drive, where to wait, where to investigate drainage or where an aerial application could be justified.

Tool	Immediate use	Cost*	Key limitation
LiDAR / elevation	Low points, flow paths, catchments and ponding risk.	Low-Med	Does not show current soil moisture or strength.
Sentinel-1 SAR	Track wetness or standing water through cloud.	Low	About 10 m scale; requires ground validation.
Optical satellite / yield history	Crop stress, recovery and recurring production losses.	Low	Cloud and resolution; stress may have several causes.
Drone RGB / photogrammetry	High-resolution ponding, ruts, flow paths and crop damage.	Med	Flight, processing and ground checks required.
Drone multispectral	Compare crop stress and recovery.	Med	May add little over RGB without validation.
Soil-moisture + weather sensors	Track drying at depth and possible work windows.	Low-Med	Point data; trafficability needs local calibration.
EM / soil conductivity	Map changes in soil texture and drainage behaviour.	Med-High	Specialist interpretation; not a drainage map.
RTK/GNSS survey	Confirm grades, outlets and depressions.	Med	Best for targeted areas; requires equipment and skill.
Aircraft / helicopter	Apply essential inputs without ground traffic.	High	Cost, weather, logistics and application constraints.
Spray drone	Treat small inaccessible patches.	Med-High	Payload and refill burden limit broadacre productivity.

7. Operator checklist

When	Check
Before the job	Confirm how urgent the spray or fertiliser timing is. Inspect the wettest route, map no-go zones, plan filling and decide the stop rule.
Set up	Check loaded weight, remove unneeded ballast, use the tyre load table, part-fill if sensible and load tramlines or guidance.
Short test	Inspect wheelings, crop damage and soil after a short light pass. Check steering, slip, boom stability, drill performance or spread quality.
During work	Watch hollows, headlands and access routes. Avoid repeat traffic, overlaps and turning on vulnerable soil.
Stop if	Ruts deepen, soil smears, steering or traction declines, the crop is being badly damaged, or application quality is no longer acceptable.
After the job	Record skipped patches, machine setup, conditions and damage. Return only when fit, and investigate recurring wet areas before next season.

IF IN DOUBT, WAIT OR CHANGE THE METHOD

A narrow weather window is only useful if the soil can carry the machine and the crop treatment can still be applied properly.

Source and practical note

- Philip Wright, Wright Resolutions Limited. Soil Structure, Cultivations and Establishment. FAR Online Presentation and Discussion, 6 August 2024. The pressure, first-pass, direct-drilling, penetrometer and targeted-repair points above are retained as attributed guidance rather than universal FAR rules.
- This is a grower discussion guide, not a replacement for product labels, machinery manuals, tyre load tables, contractor advice or paddock-specific agronomy. Check current aviation, agrichemical and environmental requirements before aerial spraying or fertiliser application.

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