



Technical

Seedbed preparation and improved soil management

Extremely variable weather during this harvest has highlighted the need for a non-prescriptive approach to soil management. Cultivations need to be considered on a field-by-field basis, and are highly likely to vary across the farm according to conditions found.

Autumn tillage following wet weather

Many farms experienced wet conditions at some point during harvest; this could well have limited the opportunities for making any autumn cultivations at the most appropriate time, and in optimum conditions. Careful examination of the soil profile in spring will be needed, to best manage cultivations ahead of establishing this season's beet crop. Where drier conditions followed a wet harvest, the usual 'plough heavy land when it is dry, and it will stay dry' maxim, which favours early autumn ploughing, may not be totally valid. That being said, unless moisture after the wet period was removed by volunteers or a catch/cover crop, soil moisture at plough depth has potentially not been reduced by any time delay. However, on medium soils, such a delay could certainly have benefits, especially if moisture has been

removed following harvest. Supplementing volunteers with an economic cover/catch crop mixture at relatively low seed rates can assist ploughing and management of deeper levels of compaction, provided that the canopy is controlled. In that situation ploughing or non-inversion tillage can benefit from working the soil at times when it is at the most appropriate level of moisture.

In all cases on heavy and medium soils where the primary tillage is carried out in autumn, it is vital to aim for a level and a 'half way to a seedbed' surface which can take weather, but will not need excessive spring cultivations before drilling (Pic. 1). In these situations moisture can be conserved, and importantly, weathered tilth, formed before cultivations in spring, is retained evenly on the surface. This contrasts to a weathered, unlevel surface where natural tilth is then lost



Pic. 1 – Pressing after ploughing to get 'half way to a seedbed'.

into the hollows when making the seedbed. In turn, this leaves patches of wetter exposed soil and an inconsistent seedbed after cultivation, both in terms of moisture and aggregate size.

Soil levelling

Where fields have been set up under less than ideal conditions this autumn, it may be possible to cultivate on the frost to level and create a more consistent surface; provided the soil is firm enough to allow machinery to travel without further damage. This then can create a better surface finish ahead of the final seedbed pass in the spring. Such operations usually require minimal pressing at these times. Where pressing could be a benefit, this should be by a wide-spaced, ring-type press leaving a corrugated finish. Another option, although likely to be too late for this season, is to consider ploughing followed by loosening where damage is deep. This operation on heavy and medium-to-heavy soils creates a level corrugated finish (provided an appropriate press-type roller is fitted to the soil loosener) and usually gives an efficient loosening action at depth, provided it is dry enough at that level. This is a result of the loosener having to lift only a shallow depth of soil below the plough layer, which is usually drier if compaction has limited water infiltration.

Effective ploughing in spring is possible on lighter soils, and is necessary on those which are prone to slumping. Where loosening is needed deeper than plough depth (a likely occurrence following harvest damage in wetter conditions) a set of subsoiler 'bottoms' (Pic. 2) can be fitted to the plough provided:

- the soil is dry enough at depth for effective operation of the looseners to shatter the soil.
- the plough can be pulled without undue extra effort that would result in high levels of wheel slip and surface damage (note: fitting looseners to alternate bodies is also an option).
- this does not limit the use of a press roller with the plough if that is normal procedure.



Pic. 2 – Loosener units fitted below the plough bodies.



Pic. 3 – Integral plough and press for lighter soils,

Note: the use of a wide-spaced ring press (at appropriate times) on lighter soils also provides a more level, consolidated surface (Pic. 3). This assists seedbed cultivation, and retains moisture whilst also giving a stable surface to resist wind erosion and capping where there is a time delay before drilling.

Seedbed preparation

Ideally, seedbed preparation on all soils needs to be a single pass if possible, provided moisture levels are appropriate for this. Judgement should be made field-by-field as conditions and soils are likely to be variable. Early preparation is best; however waiting for the soil moisture levels to become 'friable' to cultivation depth is more important than rushing to get a seedbed made. If the soil being cultivated can be rolled into a thin plastic worm between the palms of the hands, then it is too damp to create the fine aggregates needed by the crop. Cultivations under these conditions are likely to reduce seedbed porosity overall, and especially at the depth of the cultivation pass. The result is a coarser, cloddier finish which will not achieve consistent and efficient germination. Here, provided drainage is effective, a three or four day delay before cultivation can produce a far more effective seedbed than rushing in when soils are too moist.

Other key points to note when preparing the seedbed are as follows:

- The use of a spade to check to below plough depth is **essential** to understand the ideal requirements for the field as a whole, and parts of variable fields too.
- Minimise tractor axle loadings **provided the correct weight balance between front and rear axles is achieved, and the tractor overall weight is suitable for the power needed to pull the cultivator**. An imbalanced tractor will result in higher levels of wheel slip for either

the front or rear wheels, or if a twin tracked crawler, uneven soil contact for the tracks which exacerbates peak loadings through the track idlers and drive wheels.

- Minimise tyre pressures – **this is more important than axle loadings** since the tyre pressures determine the extent and severity of the soil damage and porosity reduction in the wheeled zones. In turn, this then limits seedling root growth and moisture availability in drier conditions. If wet, the compromised porosity risks temporary waterlogging. Axle load determines how deep problems are pushed, but pressure determines severity, so low pressure with a higher axle load just pushes a small problem deeper; it still remains a small problem. Ideally, VF type tyres will allow the lowest pressure operation without risk of tyre damage (Pic. 4).



Pic. 4 – VF tyre contact patch at low pressure (foreground) and conventional pressure (background) on same axle.

- If using dual wheels, these must be set at their lowest, safe-operating pressure (and equally for all wheels on the same axle), otherwise the benefits of using them are completely negated.
- Eradication of wheelings is **far less effective than avoiding the problem in the first place**. Compacted soil with reduced porosity cannot be 'undone' by eradicators: metal cannot restore soil to its previously porous aggregated state, this is down to natural actions, roots, and soil biology to sort over time.
- Consolidated soil responds to cultivation far more efficiently than loose soil. The 'bulk strength' of consolidated soil is higher and allows clods to be pushed into this bulk and be broken down, provided moisture levels are low enough for the soil to

be friable. Here, consider a front-mounted consolidating press ahead of a rear-mounted cultivator if conditions require. This balances the required ballast on the tractor in the most efficient way.

- Minimise working depth of the cultivator, provided sufficient tilth is created for the drilling operation. Sometimes slightly shallower operation creates finer tilth and less clod where soil at the deeper levels is too moist for ideal cultivations. In this situation default to a shallower setting, and only increase depth if needed and if this results in more tilth being created.
- Avoid a disc-action or intensive power harrow action at seedbed depth if soils are damp or moist as this has a high risk of smearing; here, 'less can be more'.
- Tine angles (if variable) should be set to give the most appropriate tilth. Steeper (more vertical) rake angles shatter and sort aggregates, whereas shallower rake angles lift and loosen more effectively and can be better when conditions are more damp.
- Minimise levelling actions provided this produces a sufficiently level seedbed with a consistent finish. Moving soil comes at a cost, and is better done well ahead of the final seedbed pass if possible.
- Roll after drilling if the seedbed is cloddier than ideal, although not if heavy rain is forecast.

Reduced tillage

In reduced tillage situations, including strip-tillage, it is often possible to travel sooner in spring and with less damaging results than in a fully cultivated situation. Such operations can also be combined with inter-row cover or companion crops to further improve the management of seedbed moisture levels and stability (Pic. 5). Appropriate management of plant residues is essential, both at harvest and when cultivating and drilling. Such techniques will provide effective results as long as drainage and soil structure is in good order, and soil biology has developed to better cope with residues and residual herbicide effects in the resulting seedbed. Clearly, in these situations the drill needs to be appropriately equipped.



Pic. 5 – Drilling into a strip-tilled prepared seedbed with soil cover.