The Guide To Good Ploughing

An essential checklist to maximise the agronomic benefits
Bad ploughing is a waste of time and money

Ploughing is an expensive operation but, if done well, is a cost effective tool in the fight against black grass. Many ‘min-till’ growers have reverted to rotational ploughing recently to help reduce their black grass burden.

This booklet is designed to help plough users maximise the agronomic benefit they receive from the ploughing operation.

Key Point:

The plough should bury all surface residue.
INTRODUCTION

Cultural weed control methods

It is imperative that operators understand the reason they have been asked to plough a field. When it comes to black grass control, there are two means of control by cultivation methods.

1) Min-till / stale seedbed

Keep the weed seeds as close to the surface as possible, and provide them with the correct environment to germinate, emerge, and be killed with glyphosate before the crop is drilled.

2) Plough

Bury all weed seeds to a depth at which they will not germinate.

The ongoing Agrii/Lemken cultivation trials are showing a combination of both to be the most effective measure in combatting black grass.
AGRII BLACK GRASS TRIALS

Good ploughing - a key component of successful black grass control

Intensive trials carried out by Agrii are showing that good ploughing is a key weapon in reducing black grass and increasing yield.

Battling black grass also needs a dynamic approach to establishment techniques, with a combination of procedures - including good ploughing - looking like the answer.

The Agrii trials started in 2000 at Rookery Farm, Stow Longa, in South Cambridgeshire. In 2010, after a year of high black grass seed return, Agrii R&D teamed up with Lemken UK to intensify the cultivation trials for the benefit of arable farmers.

The joint trials are now in their fourth year, and will be of at least five years’ duration. They include five separate tillage treatments in 370m x 24m blocks, including plough + press, direct drill, one pass (deep), one pass (shallow) and two pass.

Year one results

The first set of results, available from the harvest 2011 season, show the biggest impact in terms of black grass control was achieved with the plough (Figure 1).

The difference between poorer black grass control from early direct drilling and improved black grass control through good ploughing was about 12,000 seeds/m² in favour of ploughing. Considering every 100 black grass ears/m² equates to a decrease in yield of 1 tonne/ha, this is a significant result.

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Fig.1

Trial 11061 - Establishment Systems x Black Grass Herbicide Trial
Black Grass Control by Cultivation

P(Cultivation) = <0.001, LSD(Cultivation) = 8.38% (shown on error bars). cv = 17.8%.
Year two results

In the second year of trials (harvest 2012 season), only two cultivation approaches were used: ploughing or direct drilling to establish winter oilseed rape.

Where plough was followed by plough, black grass seed was ploughed back up and produced the worst result. Where direct drilling was followed by good ploughing, good control was achieved.

Add ‘best shot’ chemistry to the equation and compare margins over establishment plus chemical costs, and direct drilling does well - providing the chemistry is robust (Figure 3). Otherwise ‘mind the gap’ and beware of seed return.
So, when do you bring the plough back in? The answer is when it gets bad enough. It is crucial to know where your black grass seed is.

Year three trials

This year the trial is back into wheat, following oilseed rape, and once again includes a range of cultivation treatments.

After three years of work the Agrii trials have already generated an intriguing matrix of cultivation and black grass control interactions. In addition, they have underlined the fact that delayed drilling has the largest single effect on black grass numbers, something those planning to drill early each autumn should perhaps consider. Drilling in the second week of October reduced black grass burden by 50% compared with drilling in the third week of September.

If you are going to do anything about black grass it might well be wise to consider burying it. The thing not to do is a half way measure - don’t mix seed into the soil profile, as that will give you problems. Get the seed out of the germination zone with good, deep ploughing and then keep subsequent drilling shallow.

General conclusions so far

1. A plough anywhere in the system reduces black grass numbers.
2. Use good ploughing techniques. Poor ploughing is of little help as it will not bury the weed seeds.
3. Ploughing for a second year brings resistant black grass seeds back to the surface too soon for effective control.
4. Good ploughing followed by two years of direct drilling has reduced the black grass and increased yields.
5. Continual direct drilling or shallow min till allows black grass numbers to increase. These systems work well only if a good stale seedbed is achieved first and if the herbicide chemistry works well.
6. With resistance issues, cultivations are having a greater effect on black grass control than current pre and post-emergence chemical options.
How to set a plough to bury all of the weed seeds

Decide on the correct ploughing depth and set the plough accordingly. Ensure you work deep enough to bury all surface residues, but not so deep as to bring up subsoil.

Use the depth wheel and top link to set the plough level from front to rear.

Use the wing stops to set the plough level from left to right.
Skimmer setting is critical

Skimmers are one of the most critical parts of a plough. They should scrape all surface residue and place it in the bottom of the open furrow. If the skimmer is too shallow, surface residue may be left on the surface. If the skimmer is too deep, there will be too much material in the furrow bottom, and the furrow slice will not be fully inverted.

The skimmer is placing the surface material in the bottom of the furrow.

The skimmer should scrape all material from the surface and place it in the bottom of the furrow.

Badly set skimmers won’t bury the weed seeds.
Furrow slice must be fully inverted

Once the skimmers have moved all surface material into the bottom of the furrow, the furrow slice must be fully inverted to bury that material. This will ensure the weed seeds are properly buried to a depth at which they will not germinate.

A fully inverted furrow slice will cover the weed seeds and prevent them from germinating.

If the furrow is not fully inverted, weed seeds will germinate and emerge as a result.

If soil is stuck to the mouldboard, the furrow will not be fully inverted.

A slatted mouldboard should be used if soil is prone to sticking.
A plough body relies on a ‘hinge’ to turn the soil. This hinge is an uncut piece of soil, which is used like the spine of a book to turn the furrow (page) over. Without a hinge, the plough body will tend to ‘push the soil sideways’ instead of fold it over.
A press will help to close the furrow

Sometimes soil conditions make it difficult to fully invert the furrow slice. Pressing can aid furrow closure. Most manufacturers offer a choice of presses to suit soil type. 45° rings should be used to firm sandy soils. 30°rings are better on clay soils, as they will cut the clods as well as close the furrows.
Large ploughs don’t pull straight

A tractor requires a balanced load to pull in a straight line. Traditional (small) ploughs have a similar width to the tractor so provide a balanced load (see pic 1). Modern ploughs, with more furrows and greater furrow width, have a wider working width than the tractor (see pic 2). If the tractor wheel is in the furrow the load will be offset to the tractor. The driver may find he has to steer one way to fight the steering force generated by the plough.

The LEMKEN OptiQuick system shifts the headstock sideways to counteract the offset load of large mounted ploughs. The top link will not be straight, but the side load will be removed reducing power requirement and wheel slip.
On-land ploughing

Ploughing ‘on land’ moves the tractor sideways in relation to the plough (see pic 1). This can result in an offset load in the opposite direction. Ploughing ‘on land’ should ideally be retained for ploughs of 6 furrows or above, and the tractor should be kept as close as possible to the centre of the plough.

Picture 1.

This 5 furrow plough will create a very offset load on the tractor. There will be a tendency for the tractor to veer towards the furrow.

Keep the tractor as close as possible to the furrow wall, without causing it to collapse.

This 6 furrow plough leaves the tractor almost in the centre of the plough. The load will be more balanced.
Rotational ploughing top ten

As the Agrii/Lemken trials are showing, ploughing is effective in reducing black grass and increasing yield - especially when part of a rotational cultivation system. It must be good ploughing though, so keep these top ten tips in mind for successful ploughing.

1. Understand why you are ploughing - to bury all the weed seeds to a depth at which they will not germinate.
2. If you can’t plough consistently well, don’t plough at all.
3. Target rotational ploughing at fields with particular black grass problems.
4. Once ploughed down, leave the weed seed buried by reverting to shallow tillage.
5. Make every opportunity for good pre-planting autumn Roundup control count.
6. Maintain a robust pre-em programme to minimise the pressure on post-ems.
7. Use highly competitive wheat varieties to combat in-crop weeds.
8. Keep the pressure firmly on black grass in every cereal break.
9. Plough again when and if black grass levels build up badly.
10. Be prepared to sacrifice performance in some fields in some seasons to get on top of bad black grass.
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