Best Practice

Cultivation techniques to protect soils

Sheet 24.0a

Direct drilling

Why change?

Direct drilling offers many benefits over traditional plough-based systems of crop establishment which include:

- lower costs and energy inputs
- less wear and tear on machinery
- improved soil structure and less risk of damage from machinery · reduced soil erosion and run-off
- increased beneficial invertebrates and earthworms
- decreased mineralisation of nitrogen and reduced leaching risk.
- reduced carbon footprint

Direct drilling can help reduce cultivation costs

Steps to Success

1. **Review** the current situation by considering whether economic and other benefits can be gained from a change to your system of crop establishment. Look at factors such as current machinery available, climate, soil type, residue management, cropping, and personal business objectives.

2. **Identify** potential opportunities for reduced cultivation using direct drilling on your farm. If your soil structure is good and you do not have a heavy infestation of black grass or similar then direct drilling is an option. Avoid direct drilling on poorly drained or wet soils.

3. **Calculate** the cost-benefit of these opportunities by comparing the cost of factors such as time, machinery, energy and agro-chemical losses for both systems. Remember that direct drilling can offer savings associated with improved soil workability, structure, reduced soil erosion, run-off and pollution risk. Be aware that research has shown that direct drilling can reduce yields and increase herbicide use but enable significant savings on cost of cultivations.

4. **Develop** an action plan to adopt a system of reduced cultivation using direct drilling on your farm:

- know the soils on your farm and consider whether reduced cultivation is an option. Consider partial adoption of direct drilling as a first step. Use the Agricultural and Horticultural Development Board (AHDB) Knowledge Library https://ahdb.org.uk/knowledge-library as guidance for soil management, and review annually
- plough only when necessary, such as when the soil is deeply compacted, to control resistant weeds or to meet the needs of specific crops, e.g. potatoes
- timeliness is the key to successful crop establishment using direct drilling. Avoid drilling when soils are wet to minimise the risk of smearing and compaction, both of which can reduce crop productivity and increase soil erosion and run-off
- plan your weed control. Develop a stale seedbed by discing or tined cultivation. Allow weeds and volunteers to germinate and then control them on subsequent cultivations, or by using a broad-spectrum herbicide sparingly
- drill the crop into the seedbed using a specialist drill
- use crop rotations to improve soil structure and fertility, and to aid weed control
- consider the use of machinery rings or contractors to increase work rates, save investment in machinery costs and ensure timeliness of operations.

5. **Check** your fields regularly for pests and plan pest management suitable for a direct drilling situation to minimise the cost of control.

Best Practice

Cultivation techniques

Sheet 24.0b

Direct drilling - practical examples

Direct drilling versus ploughing
Direct drilling is a system of seed placement where soil is left undisturbed with crop residues on the surface from harvest until sowing. Seeds are delivered into a narrow slot created by discs, coulters or chisels.

Direct drilling offers the potential for savings over traditional plough-based crop establishment systems due to lower costs associated with machinery wear, energy, soil damage, soil erosion, nitrogen leaching and agro-chemical losses.

Direct drilling also offers substantial environmental benefits such as increased soil fauna and habitats for birds, as well as a reduced risk of watercourse pollution.

Case studies in a Soil Management Initiative (SMI) booklet '***A guide to managing crop establishment', e.g. pages 26-27 show "a dramatic reduction in establishment costs and an increase in work rate – improved control of black grass and reduced slug activity" .*** Source: Cranfield University

Comparison of direct drilling versus ploughing

System	Depth cm	Cost £/ha	Time min./ha	Cereal yield%
Plough	15-35	100-135	150-220	100
Direct drilling	0	30-45	25-40	99.2*

Average yield relative to ploughing for a medium loam soil

When is direct drilling an option?
Improved soil management benefits all cropping situations. Direct drilling promotes soil stability, fertility and porosity, and can help to control weeds in some situations. In many circumstances direct drilling is preferable to ploughing.

Direct drilling is best suited to any stable soil that maintains its structure throughout the growing season. chalk and limestone, clays, silty clay loams and clay loams are particularly suitable in drier regions .

Avoid adopting direct drilling on sands, compacted soils, fields with serious weed problems, and crops that require specific tilth conditions such as potatoes. Always avoid wet soils.

Be aware that timeliness is the key to successful direct drilling.

Direct drilling is often cost beneficial

Remember

- Optimising crop establishment by reducing cultivations can save you money and protect the environment.
- Take advice before changing practices.
- Timeliness is key. Avoid operations in wet conditions to reduce the risk of soil damage, erosion and run-off.

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European Regional Development Fund
CPES
Pinpoint Rivers Trusts and Farmers working together for water
The Rivers Trust
Westcountry Rivers Trust

This information sheet is part of a series produced by Westcountry Rivers Trust providing farmers with advice on land management practices to protect water bodies. The advice enables farmers to use farm resources more efficiently, helping to meet Nitrate Vulnerable Zone, Cross Compliance, Farming Rules for Water and other regulations while protecting our environment and natural resources.