

## Best Practice Information Sheet

# Cultivation techniques to protect soils **Sheet 23.0a**

## Minimum tillage

### Why change?

Minimum tillage offers many benefits over traditional plough-based systems of crop establishment. These 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 runoff
- increased beneficial invertebrates and earthworms
- decreased mineralisation of nitrogen and reduced leaching risk.



*Wheat – minimum tillage*

## Steps to success

1. **Review the current situation.** Use the **Cross Compliance Soil Protection Review (SPR)** and guidance on soil management to consider whether economic and other benefits can be gained from a change to your system of crop establishment. Also, look at factors such as climate, soil type, residue management, farm size, cultivation system, cropping, management capability and personal business objectives.
2. **Identify potential opportunities** for reduced cultivation using minimum tillage - most appropriate when soil structure is good - on your farm.
3. **Calculate the cost-benefit of these opportunities** by comparing the cost of factors such as time, machinery, energy and agrochemical losses for both systems. Remember that minimum tillage also offers savings associated with improved soil workability and structure, as well as reduced soil erosion, runoff and pollution risk. Be aware that research has shown that reduced cultivation does not necessarily mean reduced yields.
4. **Develop an action plan** using the **SPR** to adopt a system of reduced cultivation using minimum tillage :
  - know the soils on your farm and consider whether reduced cultivation is an option. Consider partial adoption of minimum tillage as a first step. It is a requirement of cross compliance that every farm in receipt of Single Payment Scheme (SPS) payments must complete and maintain a soil protection review (SPR).
  - plough only when necessary, such as when the soil is deeply compacted or to meet the needs of specific crops, e.g. potatoes
  - 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. Work very shallow initially, and then a little deeper with each operation to minimise clods and provide a good mix of soil and straw
  - if incorporating straw, ensure it is chopped well and evenly spread
  - press and/or roll to consolidate, ensure good straw and soil contact, germination of weeds and volunteers, retain moisture, and minimise slug numbers
  - drill the crop into the seedbed using a robust drill for 'trash'
  - 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 and ensure timeliness of operations
  - consider using slurry injection tankers or compost muck so compost is friable, evenly distributed by flail muck spreaders, and tillage cultivators are not blocked.
5. **Check** your fields regularly for pests to minimise the cost of control.

# Cultivation techniques to protect soils **Sheet 23.0b**

## Minimum tillage - Practical examples

In this actual example, a farmer used minimum tillage for wheat on 10ha of his steepest fields, which resulted in the following changes:

- Run-off has been substantially reduced.
- Soil erosion has been greatly reduced.
- Crop damage from gullies and rilling was reduced.
- Fewer soil and nutrient losses have occurred.
- There have been no operations needed to reinstate eroded soils and clean dirty ditches.
- Labour costs have been reduced.
- Machinery running costs have been reduced.
- Less herbicides and fungicides are used.

### The quantifiable cost savings achieved were:

- A saving of 2% of the crop over the whole 10 hectares (Average yield = 7.5 tonnes /ha; sale price £90/tonne; gross margin £394/ha [John Nix, 2009] giving a total saving of £135.
- Preventing rills and gullies - labour saving of 2 hours to repair damage at £80 per hour (John Nix, 2009) giving a total saving of £160.
- Preventing highway cleaning - labour saving of 5 hours at £60 per hour giving a total saving of £300.
- Preventing ditch cleaning - labour saving 2 hours at £24 per hour giving a total saving of £48.

- Conventional cultivation @ £102 per hectare average, less minimum tillage @ £55 per hectare average, giving a saving of £47 /ha = £470 total.

**Total financial saving per year on 10 ha = £1,113, with immediate payback.**

### When is minimum tillage an option?

Improved soil management benefits all cropping situations. Minimum tillage promotes soil stability, fertility and porosity, and controls weeds in some situations. In many circumstances minimum tillage is preferable to ploughing.

Minimum tillage is best carried out on any stable soil that maintains its structure throughout the growing season. Clays, silty clay loams and clay loams are particularly suitable.

**Avoid** adopting minimum tillage on sands, compacted soil, fields with serious weed problems, and with crops that require specific tilth conditions such as potatoes.



*Minimum tillage can help avoid soil loss on sloping fields*

### Comparison of reduced cultivation versus ploughing

Source: Defra

System	Depth cm	Cost £/ha	Time min./ha	Cereal yield %
Plough	15-35	100-135	150-220	100
Reduced cultivation	5-10	70-90	60-100	100.8*

\* Average yield relative to ploughing for a medium loam soil

## Remember

- Minimum tillage or reduced cultivations can save money and protect the environment
- Select which fields are suitable for minimum tillage, avoiding sandy soils, crops requiring a fine seedbed or fields with serious weed problems
- Weed management needs to be planned specifically for minimum tillage

For further information: Defra ([www.defra.gov.uk](http://www.defra.gov.uk)), Environment Agency ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)), ECSFDI (<http://www.defra.gov.uk/foodfarm/landmanage/water/csf/delivery-initiative.htm>), Natural England ([www.naturalengland.org.uk](http://www.naturalengland.org.uk)), Cross Compliance Helpline 0845 345 1302 ([www.crosscompliance.org.uk](http://www.crosscompliance.org.uk)) and ART ([www.associationofrivertrusts.org.uk](http://www.associationofrivertrusts.org.uk))



This information sheet is part of a series providing farmers with advice on land management practices to protect water bodies, produced by Association of Rivers Trusts with support from the England Catchment Sensitive Farming Delivery Initiative. The advice will also enable farmers to use farm resources more efficiently and help meet Nitrate Vulnerable Zone and Soil Protection Review requirements under Cross Compliance and environmental regulation.



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