

tillage

Conservation tillage

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This is a general term used to describe tillage systems that have the potential to conserve soil and water by reducing their loss relative to some forms of conventional tillage. The benefits for farmer and environment are considerable.

Globally, there has been a trend towards more sustainable cropping techniques dominated by non-inversion tillage systems. One such technique is conservation tillage (CT). A widely accepted definition of CT is a cultivation or cultivation and planting combination which retains a minimum of 30% of the previous crops residue on the soil surface.

This should not be confused with conservation agriculture (CA) which is based on:

- Continuous minimal soil disturbance.
- Permanent soil cover (plants or residues).
- Diverse crop rotations.

While there are challenges in adopting CT/CA systems there are also multiple benefits; financial, environmental and social.

The benefits that CT/CA can provide for agricultural systems include soil conservation, economic advantages associated with reductions in crop establishment time and energy use; reduction in soil erosion and non-point pollution, and enhanced storage or retention of soil organic matter and improvement of soil quality at the soil surface.



Improved soil structure is one of the most valuable benefits of conservation tillage.



Farmer profile

Shay and Michael Grace are a father-and-son tillage business farming 120 hectares in Clane, Co Kildare. Up until 2012 the Graces operated a traditional plough and one-pass based establishment system.

The Graces decided to look for an alternative to the traditional plough-based establishment system and, after much deliberation and research, they bought a Claydon drill (seed only).

"We believe the new drill will help us move to a rotation which will give us better crop returns and improve the timeliness of our operations," says Michael.

Why switch?

The move away from the plough was

also driven by a fragmented land base around a busy town coupled with labour issues during the Celtic Tiger years.

"We moved from the plough as wanted to try something different," says Michael.

"The primary aim was to have healthier soil and therefore better crops with increased profitability. The system has helped us to:

Spread workload with increased yields after the initial settling down period.

Reduce establishment costs.

Achieve healthier soils with less run off.

Soil type: The Graces' soil types are mostly medium which it is easy enough to work once conditions are reasonable.

"It took us three to four years to level up the fields after years of the plough," says Michael.

"Each year, crops are drilled at a



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slight angle to the previous year's as the legs on the Claydon drill help improve drainage of surface water."

Soil fertility and structure: To enhance soil structure, all wheaten and oaten straw on the farm is chopped. All the fields are soil-sampled every three years to try balance off-takes.

"The latest sets of samples taken were one hectare grid samples rather than the standard five hectare," says Shay.

"The grid soil-sampling has given us a better picture of the farm's fertility as more samples are taken. In the longer term, it will open the door for variable-rate fertiliser spreading."

The samples showed up small "acid patches" in fields. Soil fertility has been improving slowly over the last five to six years with most fields Index 2 and 3 for phosphorus (P) and potassium (K).

"On the high pH soils and high P fields, there has been some lock up of nutrients in particular P and Manganese," says Michael.

Last year, the Graces were able to use

TAMS support to purchase a combined seed and fertiliser drill to help improve establishment of spring beans and oats.

Use of organic manures: The Graces have been using Dynamo poultry pellets for three to four years, covering 50% of their land each year. No noticeable effect on crops has been noted as the 625kg/ha is not a huge amount.

"The aim is to put on as much fertiliser as a crop will remove and add a little extra organic material to help soil health and fertility," says Shay.

"Returning chopped straw in the system helps feed soil organisms and slowly improves soil structure and organic matter levels. This year, only the barley straw was baled. Everything else was chopped (wheaten straw, oaten straw and rape and bean haulms)."

Grace five-year rotation: A well-structured and thought-out crop rotation is the key to CT/CA systems as both cultural and chemical control methods can be used to stay on top of grass weeds. The rotation starts with winter barley as

the early harvest allows winter oilseed rape (WOSR) to be set in late August. It also helps to spread the workload. WOSR and spring oats are used as break crops in the system, allowing two first wheats to be grown over a five-year rotation. The Graces' simple five-year rotation is as follows;

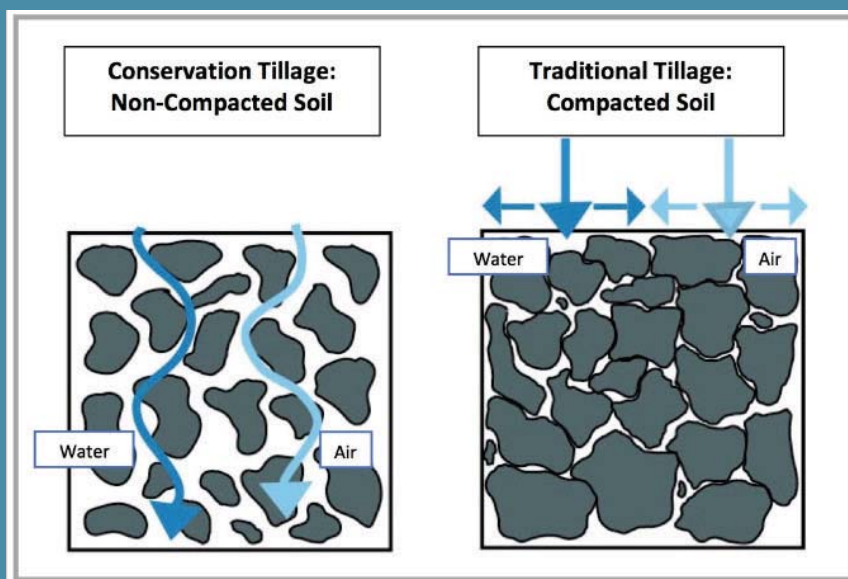
- 1 Winter barley.
- 2 Winter oilseed rape/spring beans.
- 3 Winter wheat.
- 4 Winter oats.
- 5 Winter wheat.

GLAS options: Minimum tillage, wild bird cover and environmental management of fallow were the options that the Graces implemented on their tillage farm. One major flaw with GLAS is the limited number of actions allowed per parcel/field plus the need to fence off parcels even though there are no livestock on the farm.



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Non-compacted soil is porous, allowing both water and air to penetrate the surface (Figure 1). This improves water absorption and reduces the likelihood of soil erosion and surface runoff. This keeps the soil and nutrients on the field where they can work for you, rather than in local waterways.



Issues with the system

• **Slug control.** It is only really a problem in WOSR and a crop following WOSR. You're better off applying slug pellets as soon as field is rolled.

• **Grass weeds.** Rotation is key. Having a non-cereal crop in the rotation is the best way best of controlling grass weeds. WOSR is better than beans because if the beans are thin, grass weeds can come late in the season. Spring cropping also helps as grass volunteers can be sprayed off in the autumn and the spring.

The Graces utilise a number of cultural control methods and in combination with their rotation they're vital in controlling grass weeds on the farm. These include;

- Stale seedbeds: it is important when establishing stale seedbeds to ensure you do not till deeper than is necessary in order to get weed seeds to germinate. Rolling is another important step in establishing effective stale seedbeds as it improves weed seed/soil contact and helps to preserve moisture.
- Cover crops with volunteers sprayed off; allows for volunteer cereals and grass weeds to germinate while providing soil cover and a source of organic manure.
- Grass margins; the use of competitive grass margins (perennial ryegrass or a timothy and cocksfoot mix) allows for the control of sterile brome at the bases of ditches/hedges and field margins, by preventing brome from setting and shedding seed thereby preventing this problematic grass weed encroaching into the field.
- Cleaning down machinery between fields; one of the biggest culprits of spreading grass weeds into fields

which have been previously unaffected is contaminated machinery. By implementing a machine hygiene policy the Graces reduce the risk posed by contaminated machines. Cleaning down combines and balers coming from neighbouring farms or infected fields will drastically reduce the possibility of contamination.

- Hand rogueing; preventing seed return is by far the most effective way of reducing and preventing grass weeds from getting a foothold in a field.

- No big square balers are allowed; there is always the possibility of weed seeds being introduced by balers and it has to be considered as a source of contamination. Shay and Michael are acutely aware of the possibility of compaction occurring on over-trafficked soils.

Conservation tillage learning curve: "Like anything in life that you are not used to; learning comes mainly from making mistakes and from not being afraid to ask questions," says Shay Grace.

"Sowing early was considered critical but in terms of good establishment you need to have patience if conditions are not suitable. The autumn of 2019 was definitely the exact opposite to autumn 2018!"

"When switching from a plough-based establishment system, the most important thing is not your new drill or cultivator, it is mindset," says Michael.

"Flexibility, patience and a heightened attention to detail are vitally important." Shay concludes: "Every day is a learning day with this system and an open mind is important if you want to succeed in life."