

Strip tillage: a method to limit the time needed for soil tillage in diversified crop systems: An example in sugar beet

Problem

Diversified cropping systems can be time consuming for the farmer, finding techniques that can save farmers time is therefore a key goal. For the Syppre experiment in the Champagne region, France, crop diversification involves the use of diverse cover crops, to protect the soil, improve soil fertility, and store carbon. The planting of crops and cover crops must be always done under favourable conditions, and some crops such as sugar beet need deep soil loosening. This means more time spent for soil tillage and drilling, with possible conflicts between primary interventions and risks of emergence failure.

Solution

Strip tilling loosens soil layers in 25cm wide rows that are to be drilled, and keeps the 45cm wide inter-rows untouched. It simplifies soil tillage, reduces work time and energy consumption, and protects the soil by keeping a living cover crop or residues on the surface (picture 1). It is applied in the Syppre innovative system on light chalky soils, for both sugar beet and rapeseed.

Benefits

Conventional soil tillage before sugar beet costs about 120€/ha, while strip tillage amounted to 70€/ha, with fuel consumption reduced by 50% to 70%. Crops and intercrops can succeed one another without delay. As there is no shallow preparatory tillage, and because soil is only loosened in the row that is tilled, strip tilling reduces the risk of dry soil at sugar beet drilling. It also makes it possible to sow sugar beet into a previously sown cover crop, a method which is currently being tested.

Applicability box

Theme

Cropping system, field

Agronomic conditions

Implemented on the Syppre experimental platform in chalky soils in Champagne, France. Local climate is semi continental, with around 730 mm rain/year and mean T° of 10°C, with cold periods and frequent frost which facilitates cover crop destruction. The solution was also tested in silty clay soils.

Application time

In light and well-draining soils, deep strip tillage should be done a few days before or at sugar beet drilling. Soil must be sufficiently dry. For heavier soils, deep blade should be passed in autumn (see figures in second page)

Required time

Strip till work output is of 2 to 2.5 ha/hour. For the whole soil preparation, from previous crop to harvest, time is divided by 2 or 3.

Period of impact

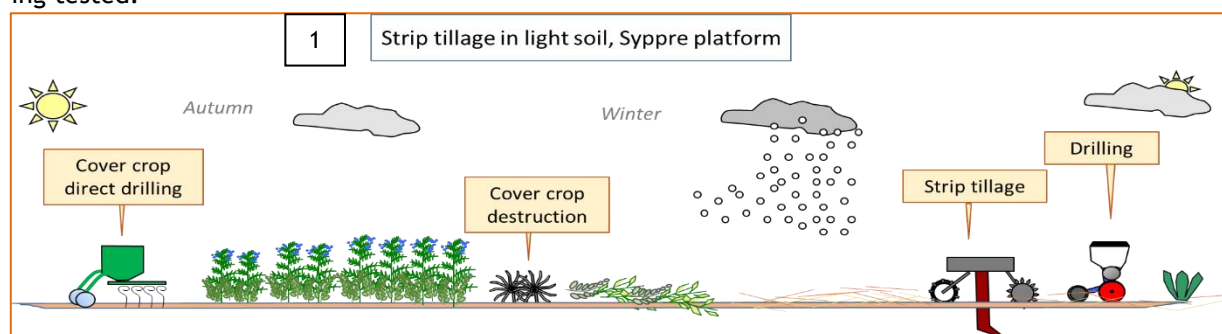
Impact is expected for each row crop. Soil protection is expected for row drilled spring crops such as sugar beet, time saving is expected for both sugar beet and rape seed.

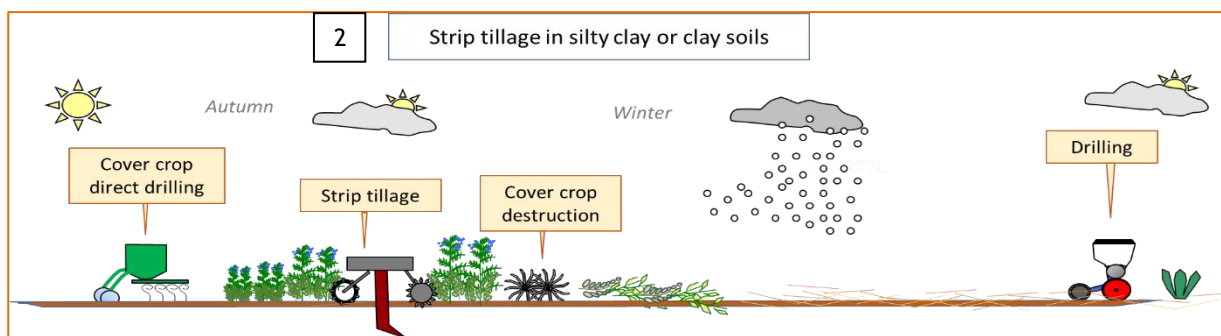
Equipment

Strip till equipment is needed. Drilling can be done with a conventional drilling machine, but an equipment with opening discs and heavy elements will be preferable. Precise GPS RTK is essential if strip till and drilling are not performed in the same operation.

Best in

Systems with several crops adapted to row drilling, conservation tillage systems, in well-draining light soils and also in heavy clay soil.





Figures 1 and 2- Strip tilling successive interventions, in light soils (figure 1)/in heavy soils (figure 2).

Practical recommendation

- Strip tilling works best on a firm soil surface. Avoid fields with recent shallow tillage that created loose superficial soil.
- On the Syppre experimental platform in Champagne, after the previous crop harvest (a winter cereal or spring barley) the cover crop (mustard solo or grass-clover) is sown as early as possible after a superficial stubble tillage, or is undersown in the cereal crop. The cover crop is destroyed with a harrow or a roller in frost conditions.
- In light soils such as the Champagne chalky soils, a strip till equipped with a deep loosening blade can be followed by the drilling machine, or they can be combined in one pass (figure 1, picture 2).
- In heavier soils, deep strip tillage needs to be done in autumn in the living cover crop, and an additional superficial pass is then used just before drilling in order to strengthen the top soil layer and prevent seedbed desiccation (figure 2).
- We observed that crop growth can temporarily slow down during May/June. The most likely reason is that the soil created by the strip till blade is too loose. A solution to this is to use crosskill-cylinders in front of the drills.
- As mechanical weeding is difficult to apply in a superficial mulch, a row chemical herbicide spreader will be preferable, with interrows being cleaned with a conventional hoeing machine.



Picture 1: Cover crop residues protecting soil surface in spring (Syppre platform) (Photos: Pascal Amette, ITB)



Picture 2: Summer rapeseed drilling with strip till (Syppre platform) (Photos: Pascal Amette, ITB)

Further information

- Check the following video for further information on Syppre experimental platform in Champagne (in French): <https://www.youtube.com/watch?v=tii3kqOcLP0>
- Technical information is available on following these links: <https://www.itbfr.org/tous-les-articles/article/news/implanter-ses-betteraves-en-strip-till-1/>

About this practice abstract and DiverIMPACTS

Publisher:

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Authors: Remy Duval (duval@itbfr.org)

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DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

Project website: www.diverimpacts.net

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