



Harvesting / Transport No. 28

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- *Treat short rotation coppice as an agricultural crop with soil preparation, weed control and fertilisation*
- *Plant short rotation Coppice in straight double rows 75 cm apart and 1.5 metre between sets of double rows*
- *Plant large fields close to good roads*

## Establishment of short rotation coppice seen from a harvesting point of view

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### Background

Several actors in the bioenergy sector are offering contracts to farmers to grow short rotation coppice willow, where the contract can be over several years. Cost effective and rational harvesting means close attention to field layout. The advice on planning field layout provided here originates from experience gained in large-scale harvesting trials that were carried out in a European Union funded project across Denmark, Italy, Sweden, and UK. The information provided deals with crop establishment from a harvesting point of view only. For advice on suitable soil types, willow varieties and establishment the reader is referred to Teagasc publications and the farm advisory service.

### Establishment

Soil should be well prepared and free of weeds and grass. The better the pretreatment the lower the intensity of weed control during the time the willow has to establish itself.

The willow should be planted in a double row system, spaced 75 cm apart with 150 cm to the next double row. Spacing in the rows is 30 to 40 cm. This is an ideal system, where the double row can pass under and in between the wheels of the machines, while there is sufficient room for wide tyres to travel in the space between the double rows (see Figure 1).

The double rows should be planted in straight lines otherwise harvesting will be slowed down, adding to cost. Especially if the area is planted by hand, much care should be taken with the straightness and the distances between the rows (Figure 2). Driving over the stools may damage the tires of the machinery and will destroy the stools, opening the stand for disease.

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Figure 1: Recommended planting configuration of short rotation coppice willow to facilitate harvesting.

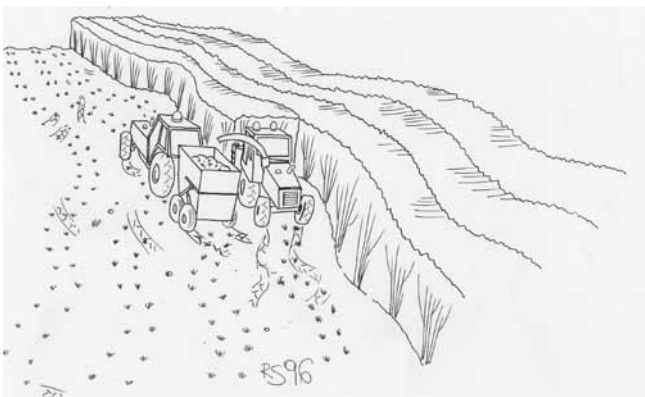


Figure 2: Concentrate planting as much as possible in full fields and along an all weather road.



Figure 3: Row length has a large influence on harvester productivity.

The size and shape of the fields has a large influence on harvesting costs. Machines lose a lot of time on every occasion they have to make a turn; short rows should be avoided as much as possible (Figure 3).

In an ideal field lay out, the rows are long and straight, but at regular intervals cross racks are established, where tractors transporting chips can turn out of the row and travel to the roadside for unloading. The distance between cross racks should be 150 m, as it will usually provide a full load of willow chip (Figure 4). Turning out of the row without cross racks is a bad idea. Stools will be damaged and may either die or form the nucleus for fungal infections which may infect larger areas, opening up the crop for weed invasion as well as leading to lost production.

It is also a good idea to concentrate willow fields in a particular area. Figure 5 shows willow areas in green, located in field corners and along boundaries – not a good idea as it will lead to very high harvesting costs. Furthermore edge effects are exaggerated, and these edges are the most difficult to harvest because they lean outwards and are often infested with weeds.

It is preferable to establish willow areas in large blocks across two or more farms in order to get scale and increase harvesting productivity. Remember also that willow is harvested either once every second or third year. Therefore one should consider planting one half or one third of the total area of willow one is planning to establish at the beginning, so that staggered harvesting is possible and a regular fuel supply and thus annual income is obtained.

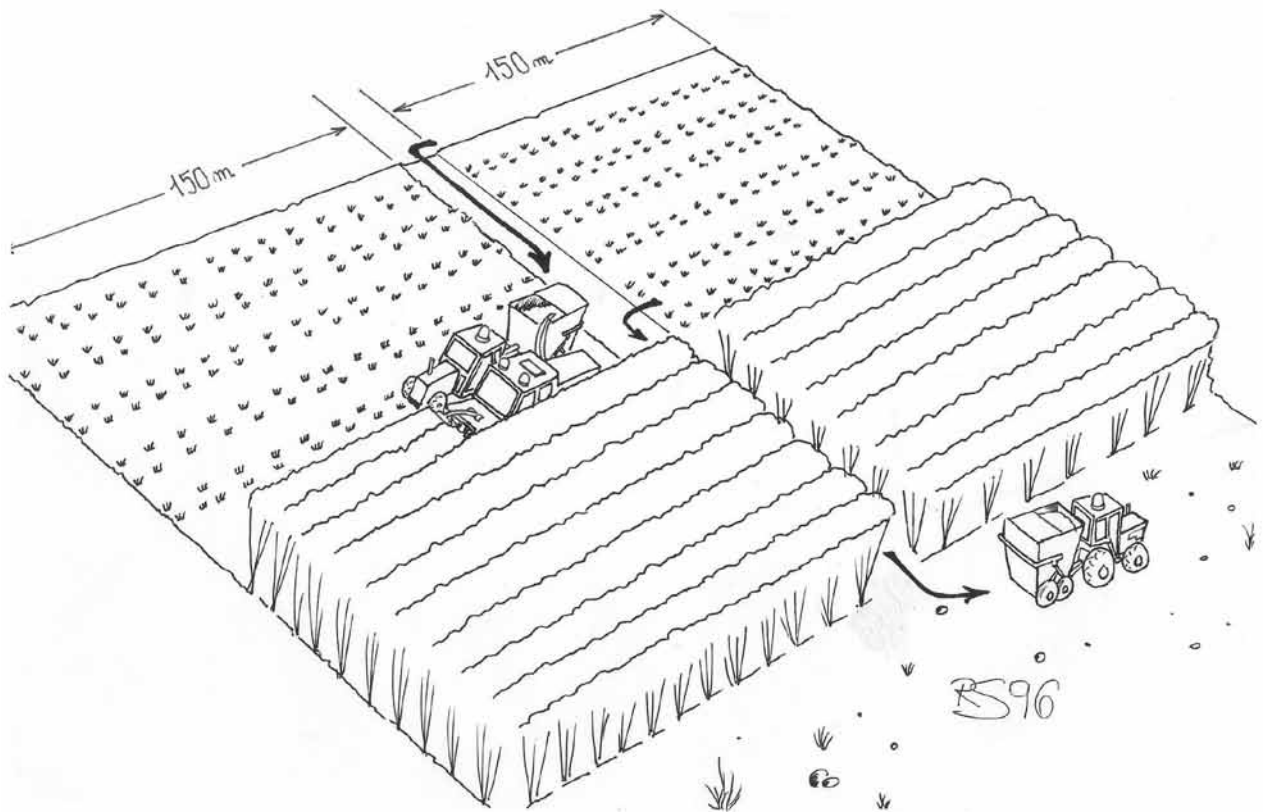


Figure 4: Regular field lay out with cross racks at 150 m intervals.

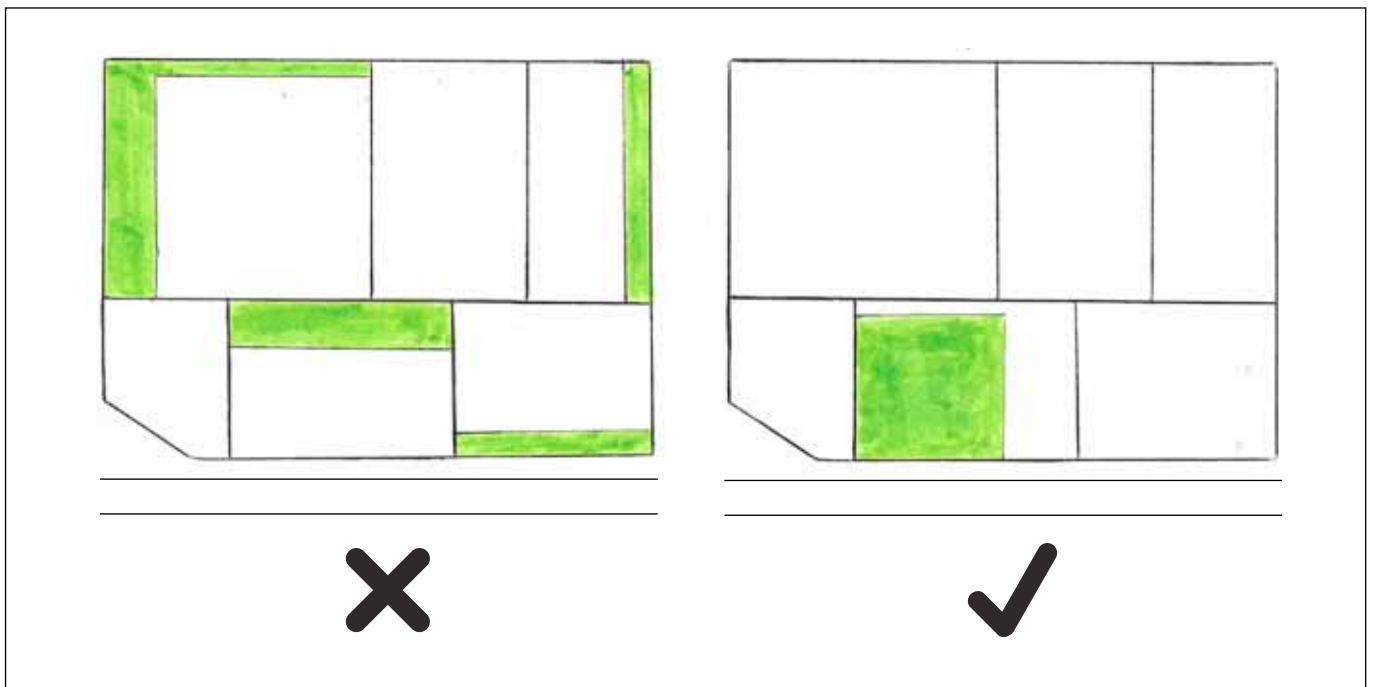


Figure 5: Establishing willow areas (shown in green) in scattered plots is not a good idea.

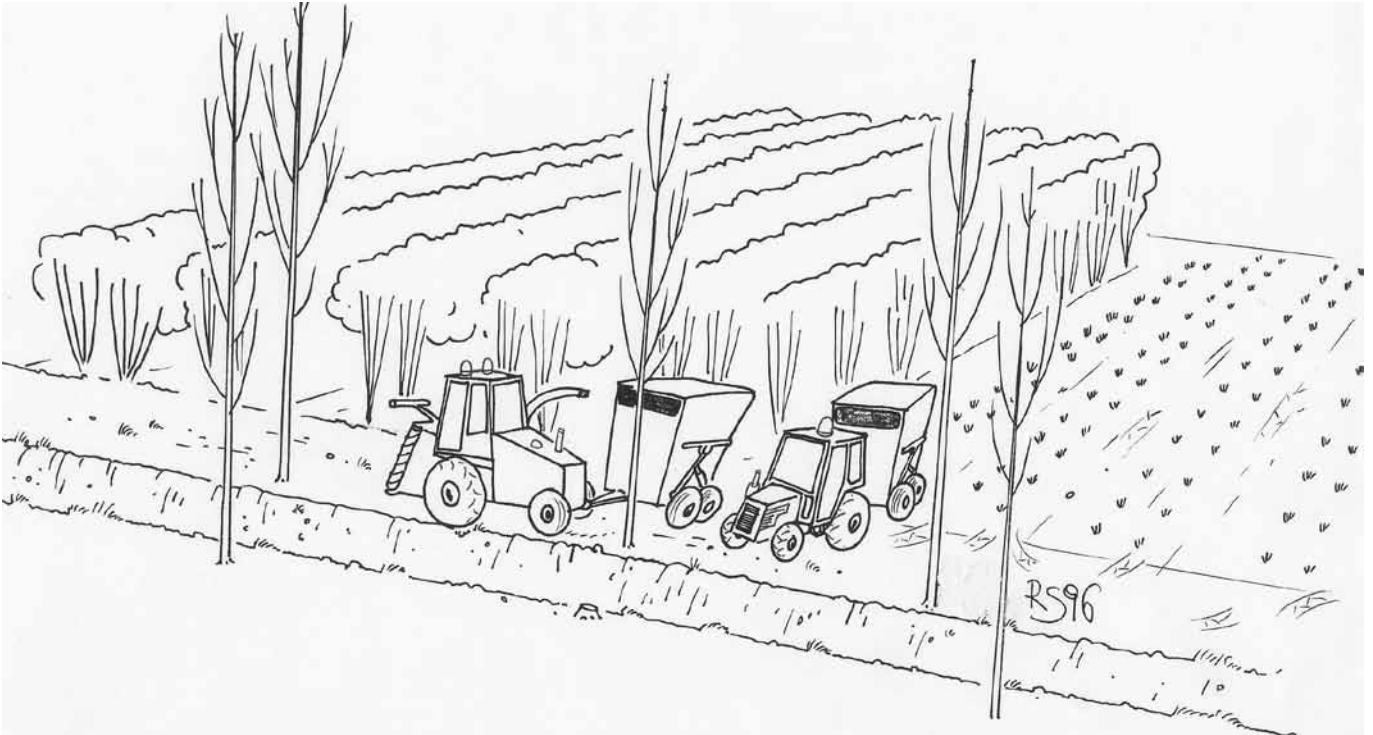


Figure 6: Wide headlands are needed to turn out off and into the crop.

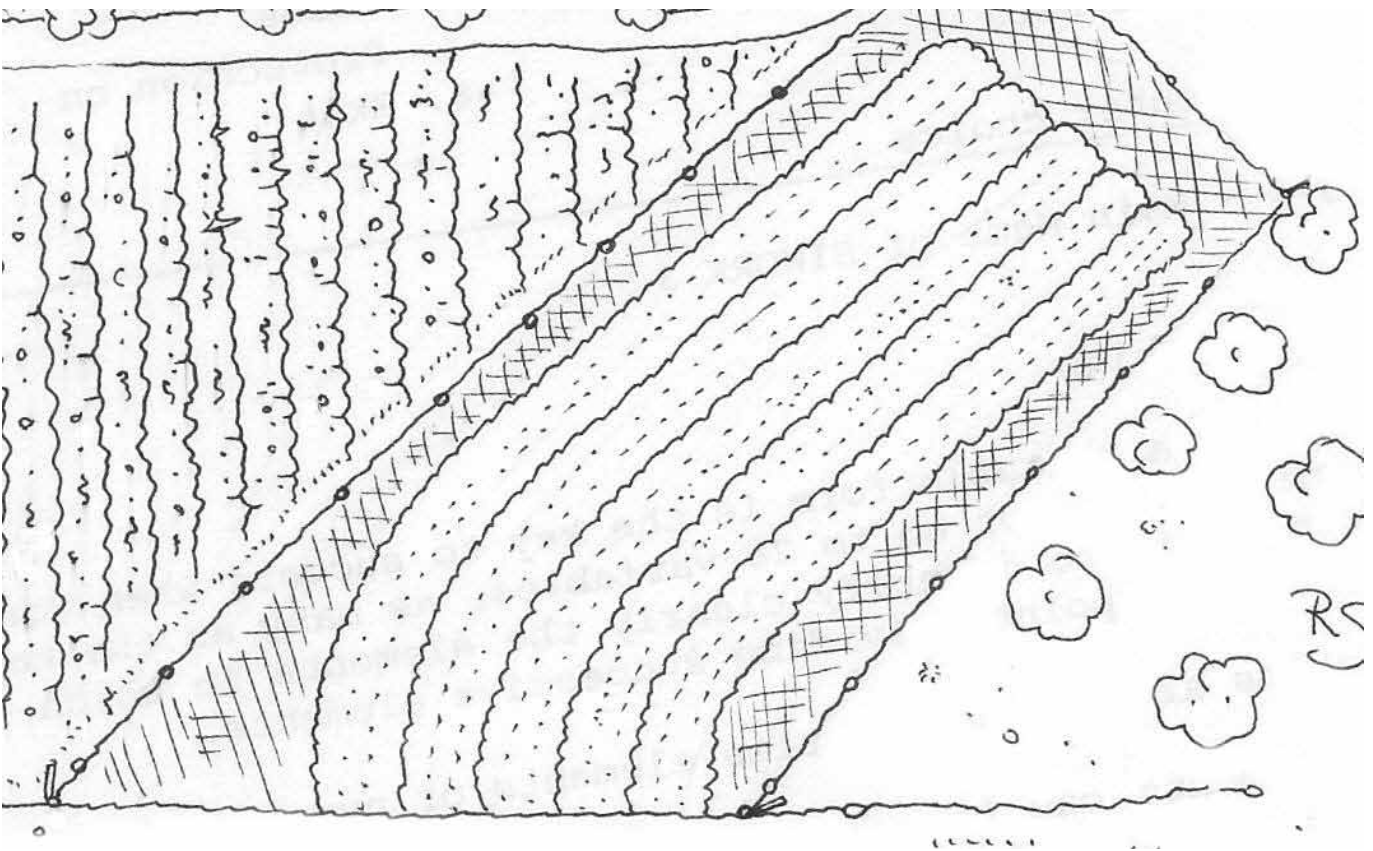


Figure 7: Rows should end at right angles at the headlands.

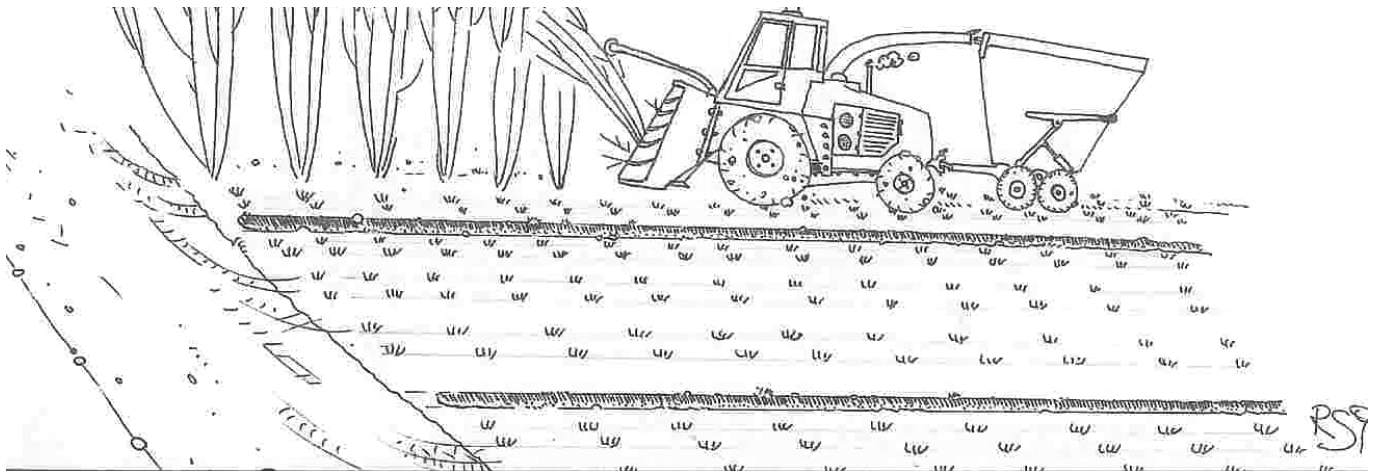


Figure 8: Ditches to run parallel to the rows. No ditches at the headland.

The headlands of the fields should be wide enough (8-10 m) to allow the harvesting machine and the tractor trailers to turn out of the crop with ease (Figure 6). Much time is wasted when it is difficult for a machine to manoeuvre.

In order to allow the machines to turn out in either direction, the rows should arrive at the headland at a right angle (Figure 7). If the rows come to the headland at a steep angle, the machines will be forced to turn out in the direction of the angle, which will mean more travel on the headlands or damage to the ends of the lines.

Since willow is harvested during the wettest season of the year, fields with a risk of water-logging should be drained with ditches at regular intervals of 14-15 metres (centre to centre). The ditches should be parallel to the rows and there should be sufficient space next to the ditches for the

wheels of the machinery. Ditches should not be crossed. At the headlands the ditches have to be piped to a main ditch in closed pipes. In this way the stand is drained and the headlands offer a smooth ride to the operators of the transport tractors. If willow is planted on fields that have been drained with pipes, the roots of the willow will enter the pipes and clog them, destroying the drainage system.

Willow needs a lot of water during the growing season, but when the leaves are off during winter and the shoots are to be harvested, dry periods should be chosen when the soil is able to accommodate heavy harvesting equipment. Harvesting equipment, both the harvester and the receiving tractor trailers should preferably be on rubber tracks to lower the ground pressure of the machines. Wet areas should be avoided if at all possible (Figure 9).



Figure 9: Avoid wet terrain for willow crops and harvest during dry periods.



Figure 10: Avoid planting willow crops along the slope as machines may become unstable during harvesting.

Steeply sloping ground can also cause problems. Here the rows should not follow the contour, but go up and down the slope. Harvesting machinery tends to be high and is unstable on cross slopes (Figure 10).

## Conclusions

- Willow short rotation coppice (or any other coppice tree species) should be treated as an agricultural crop with regular weed control, fertilization etc.
- Large regular fields should be planted
- Very wet or sloping areas should be avoided
- Row spacing of double rows of 75 cm between the two rows and 150 cm to the next double row
- Headlands should have a good grass cover and should be a minimum of 8-10 m wide
- Cooperative planting of larger areas of willow coppice will lower establishment and harvesting costs.

## Acknowledgement

Drawings are by Raffaele Spinelli (the Italy representative in the EU-funded project referred to in the Background), drafted in consultation with the author.