

Mechanical
weeding of

Yvon Douville

SOYBEANS



Saint-Laurent
Vision 2000

TECHNAFLORA


**Stratégie
phytosanitaire**

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FALSE SEEDING

Effect a false seeding to reduce pressure from weeds.

False seeding (stale seedbed) consists of working the soil 7 to 10 days before the date planned for seeding, in order to promote the emergence of weeds.

The emerged weeds are then destroyed by the soil being worked during seeding.



Photo: Yvon Douville

False-seeding. Emerged weeds 10 days after working the soil for the false seeding (A) are then destroyed when the seedbed is prepared for seeding soybeans (B).

SEEDING

Effect a high quality seeding

- Seed in 76 cm (30 inch) rows;
- Seed a wide canopy crop
- Seed in a uniform manner, using a precision seed drill



Photo: Hélène Brassard

A corn seed drill is preferable to a grain seed drill for seeding soybean. The seeding is more uniform and the 76 cm (30 inch) rows greatly facilitate weed control by making the use of the low-residue cultivator possible.

PRE-EMERGENCE STAGE

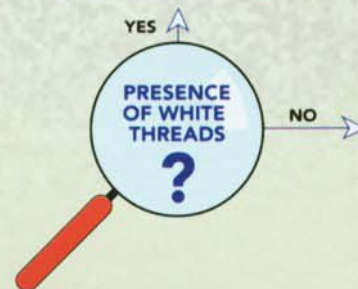
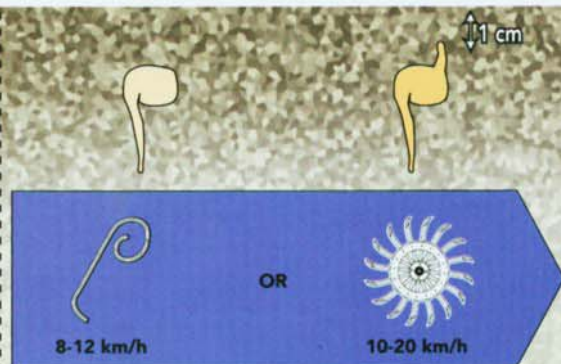


Photo: Anne-Marie Coulombe

The white threads are germinating weeds in the first few centimetres of moist soil. This stage is the most vulnerable to mechanical weeding.

LEGEND



Photos: Yvon Douville

Pre-emergence of soybean pass. The flex-tine harrow is preferable to the rotary hoe for the pre-emergence pass, because of its more energetic action on the soil.

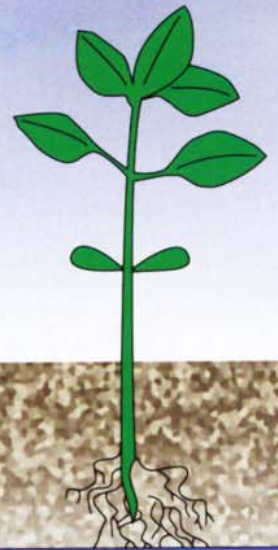
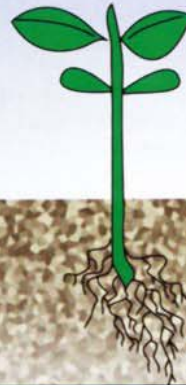
1ST TRIFOLIATE LEAF STAGE

UNIFOLIATE STAGE

COTYLEDON STAGE

STAGE

SPIKE HOOK



**DON'T MAKE PASSES!
FRAGILE SOYBEANS !**

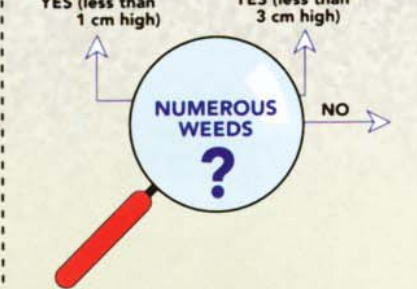
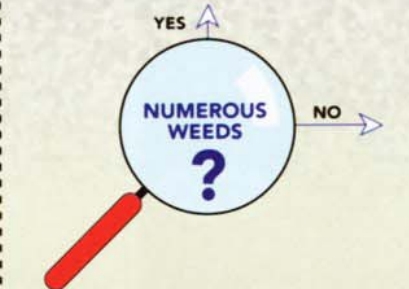
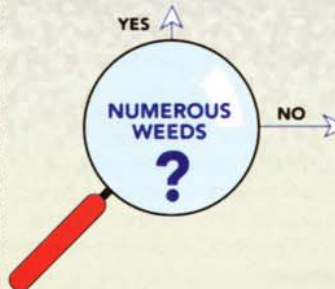
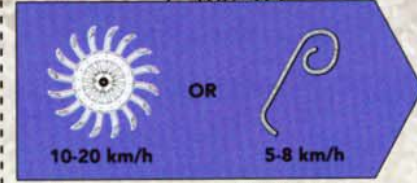


Photo: Yvan Douville

Soybeans at the spike stage. Do not pass any equipment if the soybean crop is in the spike or the hook stage. At these stages, the soybeans are very fragile and might be damaged by the flex-tine harrow or the rotary hoe.

General rule, do not pass any equipment at this stage because of the fragility of the soybeans. If a pass of the rotary hoe must be made at this stage, then make it a slow one (6 to 10 km/h).

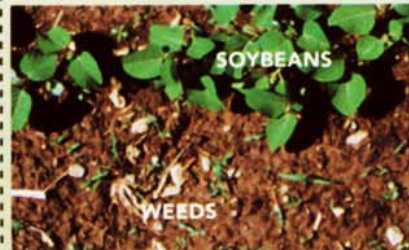


Photo: David Girardville

The final stage for passing the rotary hoe grasses have two leaves, and broad-leaved plants are at the cotyledon stage. This field of soybeans is at the unifoliate stage, therefore a pass with the rotary hoe should be done without delay.

Contrary to growing corn or grain, there is no threshold indicating when it is time to pass a mechanical weeding device or use chemical intervention with soybeans. Therefore the producer must rely on his/her own experience, go carefully, and get the advice of a specialist in soybean crops.



Photo: Hélène Brassard

Pass of the flex-tine harrow at the 1st trifoliate leaf stage of the soybean crop.

At this stage, the pass of the flex-tine harrow is often done gently, by reducing speed and tension on the tines. There is nevertheless little risk for the soybeans if less than 3 to 5% of the crop is buried or ripped out of the soil.

2ND AND 3RD TRIFOLIATE LEAF STAGES

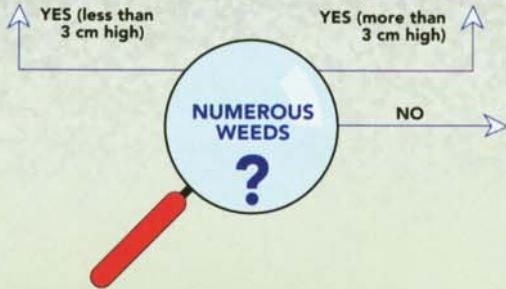
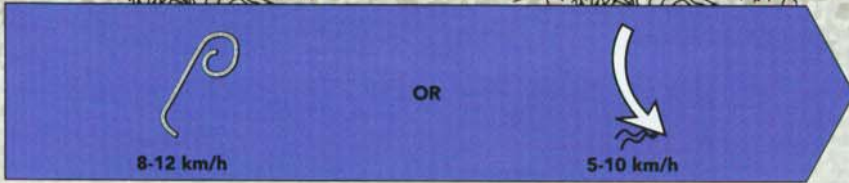
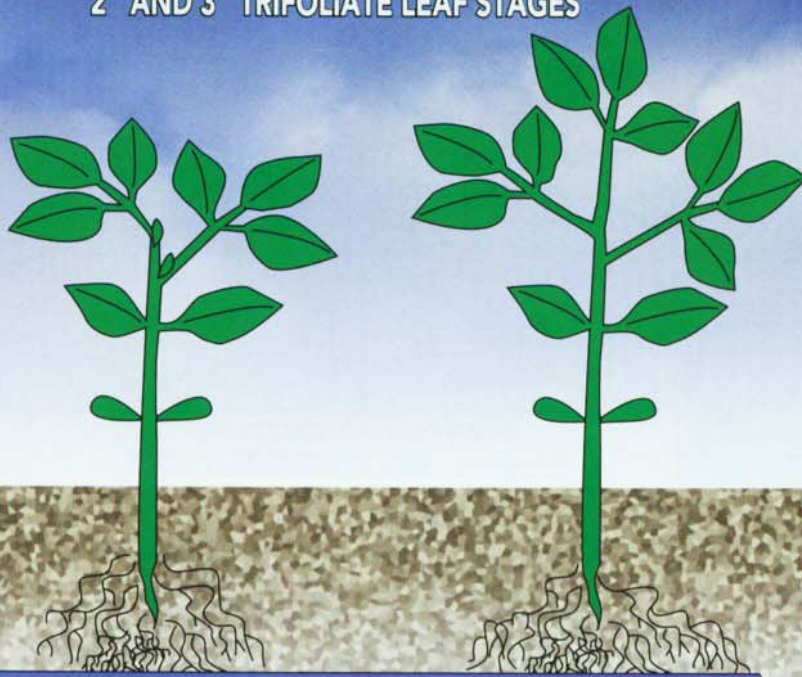
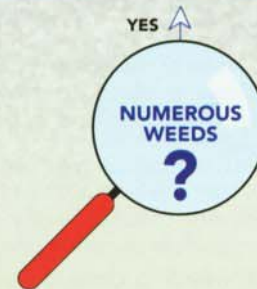
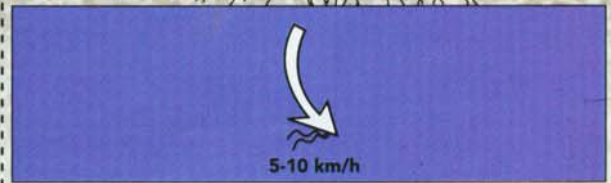
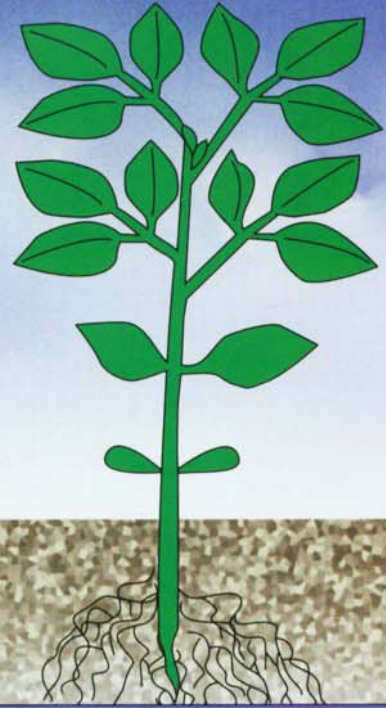


Photo: John Deere

Pass with the moderate-residue cultivator around the 2nd trifoliate leaf stage of the soybean crop.

Soybeans are not a very competitive crop. Efficient cultivation greatly reduces the ratio by which weeds exceed soybean plants by the end of the summer.

ADVANCED STAGE (UP TO 45-60 CM)



Ensure that the spaces between rows are weed-free when the soybeans close up the rows, or when they reach a height of 45 to 60 cm (18 to 24 inches). End weeding.

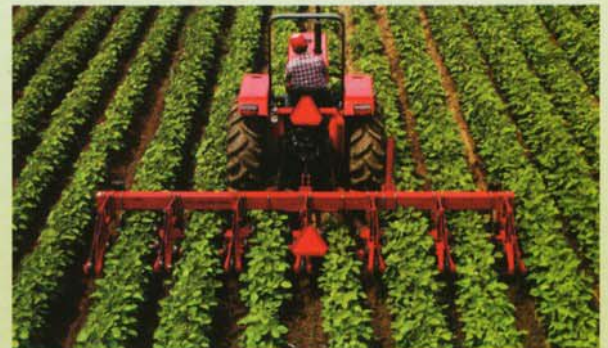


Photo: Case International

Passing the low-residue cultivator in soybeans that are 45 cm high (18 inches).

Why weed soybeans mechanically?

To reduce production costs, the risk of contaminating water courses and to decrease dependence on herbicides.

What are the pre-requisites for success?

Mechanical weeding of soybeans does not reduce yield and is an efficient way to control weeds. In order to achieve good results, the following conditions must be respected:

- Use a maximum of preventive measures in the fight against weeds: balanced rotation, green manure, proper management of manure, etc.,
- Do a false seeding (stale seedbed). False seeding decreases pressure from weeds. It consists of working the soil about 7 to 10 days before seeding, in order to encourage the germination of weeds. The weeds are subsequently destroyed by a light working of the soil prior to seeding;
- Use a precision seed drill to get uniform seeding. Avoid using a grain seed drill;
- Give preference to wide canopy cultivars rather than tall growing ones;
- Seed in 76 cm (30 inch) rows. This allows weeding between the rows, a practice that greatly increases the control of weeds. No loss in yield results from this practise in 2600 CHU zones or higher;
- Make all passes of weeding equipment at the right stages. Follow a strict strategy of scouting and weeding passes as outlined in the central section of this brochure.

Is it worth it?

Yes. Mechanical weeding costs between \$59 and \$70/ha, whereas a chemical treatment costs between \$100 to \$120/ha. That is a savings of over \$2,000 on a 50 hectare surface. In addition, chemical-free soybeans sell for higher prices in some specialized markets.

What equipment is used?

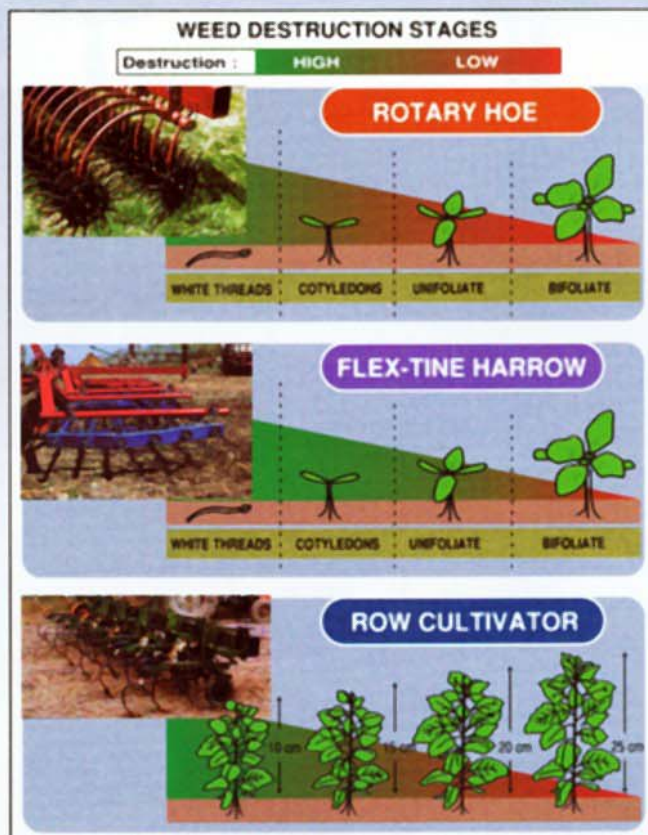
Two types of devices are necessary for mechanical weeding of soybeans:

- 1) **A flex-tine harrow or a rotary hoe.** These devices weed the entire surface of the soil in order to repress weed seedlings.
- 2) **A row cultivator.** This device weeds a zone of about 45 cm (18 inches) between the rows to repress weeds of up to 20 cm (8 inches) high.

How do these devices destroy weeds?

The flex-tine harrow and the rotary hoe go through the soil up to a depth of 2 to 5 cm (1 to 2 inches). The tines of the flex-tine harrow scratch through and agitate the soil, while the spoons on the wheels of the rotary hoe burst the soil crust. Therefore, weeds are either buried, uprooted or mutilated.

The flex-tine harrow and the rotary hoe destroy only the young seedlings of annual weeds (grasses and broad-leaved plants). For maximum weed destruction, 1 to 3 passes are generally made over a period of 7 to 21 days after seeding.



The tines of the row cultivator bury and cut up the weeds in the spaces between rows. The cultivator is mainly used starting at the 2nd trifoliate leaf stage until the crop reaches a height of about 45 to 60 cm (18 to 24 inches). One or two passes are generally made, from about 4 to 7 weeks after seeding.

What to choose between the flex-tine harrow and the rotary hoe.

The rotary hoe is good for soil that forms a thin crust at the surface (about 1 cm deep). It works equally well in corn residue, if the minimum-till model is used.

The flex-tine harrow is appropriate for all types of soil except very hard soil, and can be adjusted precisely. It is not a good choice for abundant crop residue because it will tend to get plugged.

What type of row cultivator to choose.

There are 3 types:

- Low-residue (5 rigid tines per unit)
- Moderate-residue (3 shanks or tines per unit)
- High-residue (1 rigid shank per unit)

The row cultivator (5 tines) is mainly suitable for light to medium soils with little crop residue.

The high-residue cultivator (1 shank) works well in the previous conditions as well as being suitable for heavy soils, or those with high crop residue. This is the type of cultivator that does the best job destroying weeds. It is also the most expensive type of cultivator.

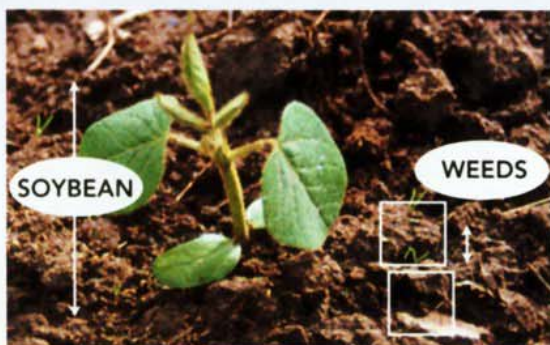
The moderate-residue cultivator falls between the low-residue and the high-residue cultivators. It is suitable for all types of soil and residue unless the residue is very abundant.

Does the weeding equipment damage the soybean crop?

Not if the stages for safe passing as described in this brochure are respected.

Soybeans will produce the same yield even if the plant population is reduced by 15%. Therefore a 3 to 5% loss after a pass is easily acceptable with no risk of losing yield. In addition, mechanical weeding often brings a 200-300kg/ha increase in yield through its positive effect on the soil (breaking on soil crust, increase in mineralization, etc.).

Why are weeds destroyed but not the soybeans?



The soybean plant in this photo is 10 times larger than the weeds, and therefore much more resistant. A pass with the rotary hoe or the flex-tine harrow at this stage will damage less than 5% of the soybean plants, but will destroy 80 to 90% of the weeds.

How to adjust and use weeding equipment.

It is very important that the equipment be adjusted and that a test be made on a small surface area, before weeding the whole field.

ROTARY HOE

1. Adjust the equipment so it is level (with the right hydraulic arm and the three-point hitch);
2. Place the rotary hoe to soil level and advance at at least 10 km/h. In some very friable soils (black earth and some loam), the hydraulic arm should be raised slightly to avoid over-penetration.

FLEX-TINE HARROW

1. Adjust the equipment so it is level (with the right hydraulic arm and the three-point hitch);
2. Adjust the tension of the tines to the central position for all sections;
3. Adjust the depth wheels so that the tines penetrate about 1 to 2 cm into the soil. If needed, re-adjust the three-point hitch so that the whole set of tines penetrate the soil;
4. Use the forward speed recommended in the central section of this brochure for the dominant stage of soybeans in the field;
5. Scout the quality of the weeding: the entire surface of the soil should be turned over, the weeds should be destroyed, and very little (less than 5% of the plant population) of the soybeans should be damaged. If necessary, adjust the tension of the tines, the speed of the pass, and the depth of the wheels and continue the test.

ROW CULTIVATOR

1. Adjust the equipment so it is level (with the right hydraulic arm and the three-point hitch);
2. Adjust the depth wheels so that the soil is worked to a depth of 2 to 5 cm (1 to 2 inches);
3. Use the forward speed recommended in the central section of this brochure, making sure the machine is properly aligned in the rows;
4. Scout the quality of the weeding: the surface of the soil between the rows should be turned over, the weeds should be destroyed, and the soybeans should hardly be damaged (neither buried, nor uprooted). If necessary adjust the wheel depth, the three-point hitch or the alignment, and continue testing.

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TEXT

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TRANSLATION

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