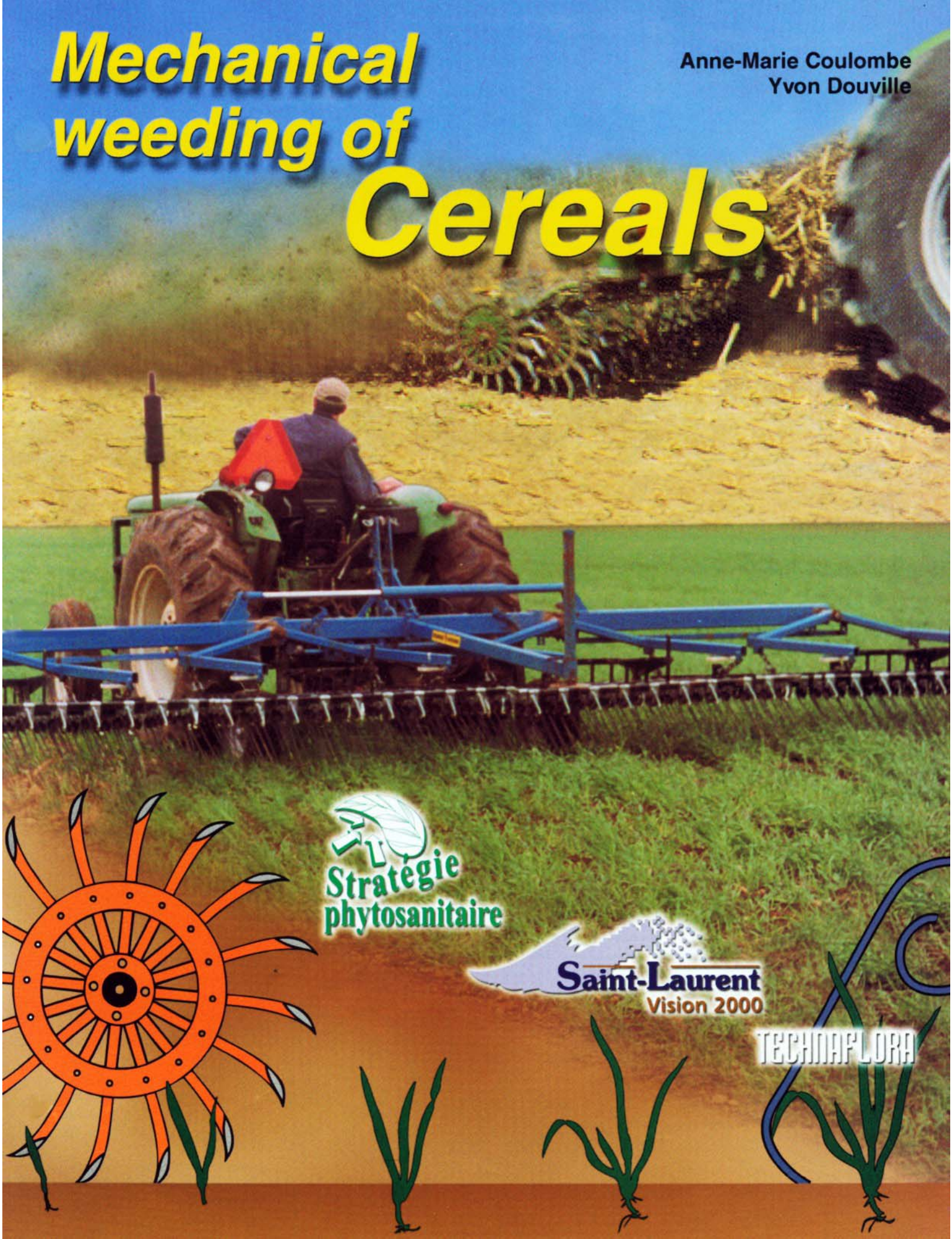
Mechanical weeding of Cereals

Anne-Marie Coulombe
Yvon Douville



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TECHNAFLORA
Saint-Laurent Vision 2000

SUCCESS BEGINS...

... with good seeding...

- Seed uniformly to a depth of at least 4 cm if planning a pre-emergence pass.
- Seed as early as possible in the spring.
- Do not leave ANY strips in the field unsown.
- Increase your seeding rate from 5 to 10%.

... using the proper equipment...

- Use the rotary hoe if crop residue is abundant or if the soil tends to become crusty after rain.

ROTARY HOE

FLEX-TINE HARROW

- Use the flex-tine harrow rather than the rotary hoe if there is little crop residue, whatever the type of soil.

... scouting the fields in order to make the right decisions...

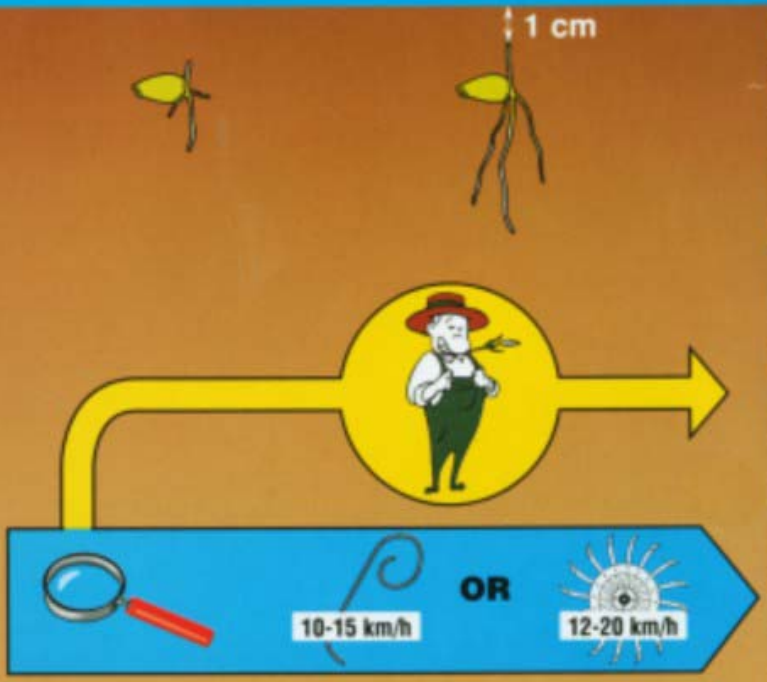
❶ Pre-emergence stage;

❷ 2 to 3-leaf stage;

❸ 4 to 5-leaf stage;

❹ Harvest stage...

... and by practising integrated weed control.



❶ PRE-EMERGENCE STAGE

Scouting

Scrape the soil 2 to 4 days after seeding:

- Check for the presence of white threads.
- Determine the stage of the cereal.

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

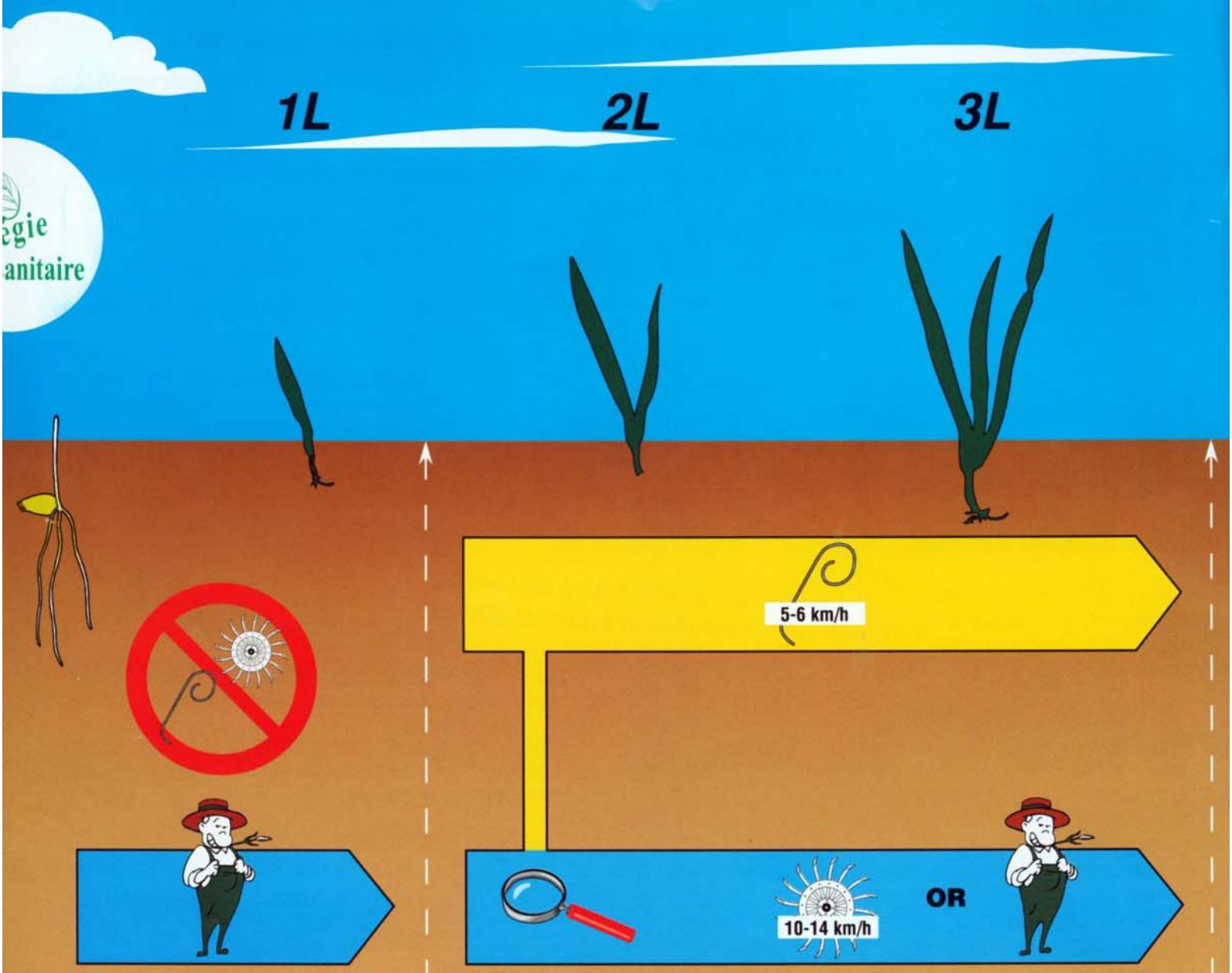
Decision

➪ **Make a pass with the flex-tine harrow immediately, if...**
1. there are white threads
2. and the cereal has sprouted and is MORE than 1 cm from the surface of the soil.

➪ **Make a pass with the rotary hoe immediately, if...**
1. there are white threads
2. the cereal has sprouted and is MORE than 1 cm from the surface of the soil
3. and a flex-tine harrow is not available.

➪ **Don't do anything if...**
1. there are no white threads
2. the cereal has sprouted and is LESS than 1 cm from the surface of the soil.

Note : *The flex-tine harrow is the most effective device in pre-emergence if there is little crop residue.*



DON'T MAKE PASSES !

FRAGILE CEREAL!

2 2 TO 3-LEAF STAGE

Scouting

- Count the number of leaves on the cereal.
- Evaluate the state of the cereal:
  a) in good state: no visible signs of nutritional deficiency or hydric stress;
  b) in bad state: clear signs of nutritional deficiency or hydric stress.
- Check to see if there is a light crust on the soil's surface.
- Determine the average stage of the weeds.

Cotyledons stage

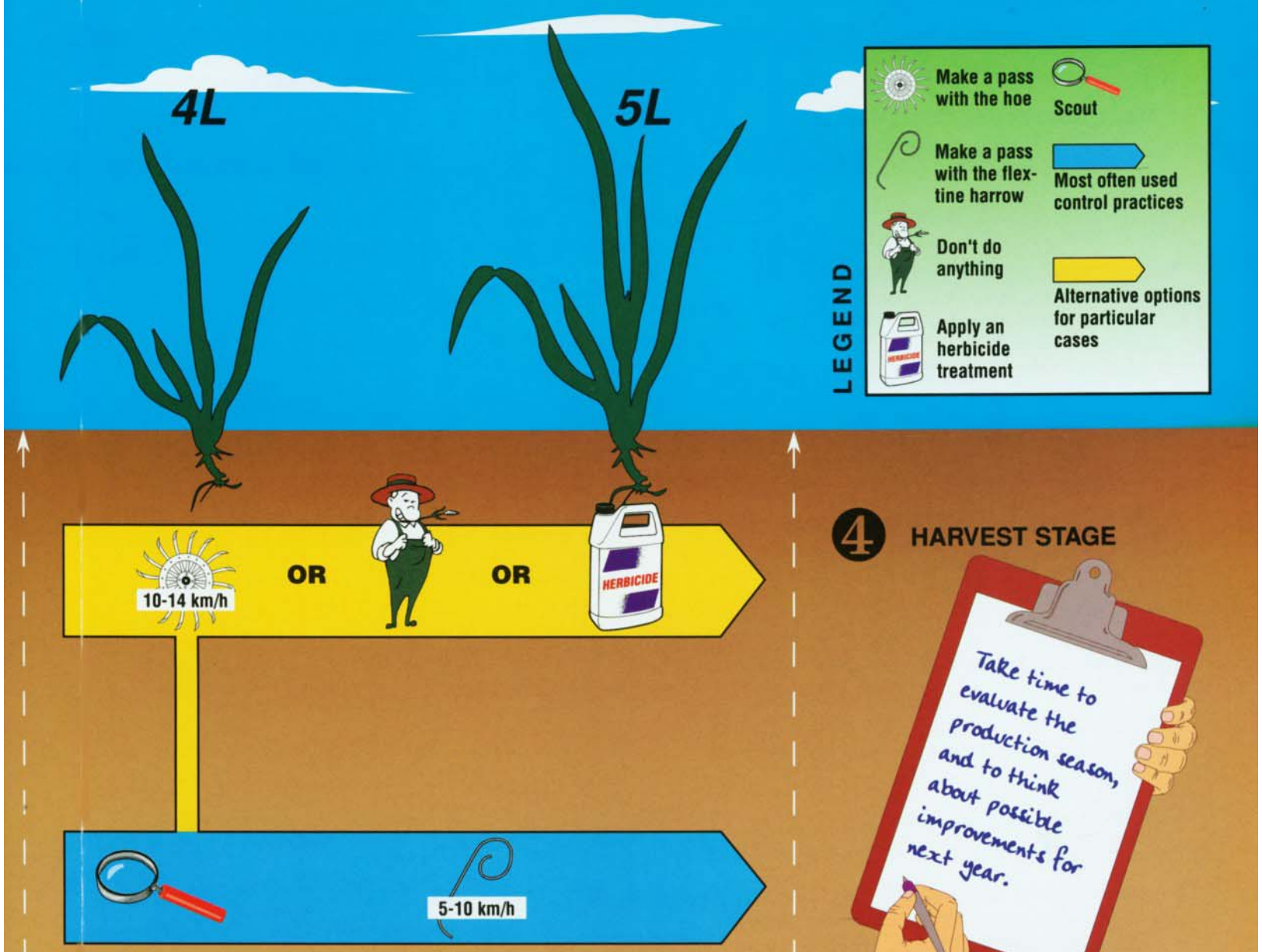
Decision

➪ **Make a pass with the flex-tine harrow immediately, if...**
1. the cereal is in good state;
2. the majority of weeds are in the cotyledon stage;
3. and a crust has formed on the soil surface.

➪ **Don't do anything if...**
1. the cereal is in bad state;
2. the majority of weeds already have their first leaves;
3. or the soil does not have a crust on its surface.

➪ **Make a pass with the flex-tine harrow immediately, if...**
1. the weeds are very numerous;
2. and you practise organic farming.

Attention: If you decide to do nothing and there are weeds, then you should make a pass with the flex-tine harrow at the 4 to 5 leaf stage for the cereal, or plan on effecting an herbicide treatment.



3 4 TO 5-LEAF STAGE

Scouting

- Count the number of leaves on the cereal.
- Evaluate the state of the cereal:
  a) in good state: no visible signs of nutritional deficiency or hydric stress;
  b) in bad state: clear signs of nutritional deficiency or hydric stress.
- Determine the average stage of the weeds.
- Make a visual examination of the cover percentage of annual broad-leafed weeds in 15 spots in the field.

In this example, the cover percentage of the weeds circled is 2%. The dimensions of the frame are 50 cm X 20 cm.

- Add the percentages obtained from the 15 frames distributed over the whole field. The total represents the **field infestation score.**

For more information, consult the *Dépisteur céréales*.

4 HARVEST STAGE

Decision

- ⇨ **Make a pass with the flex-tine harrow immediately, if...**
  1. the cereal is in good state;
  2. the majority of weeds are not past the 2-leaf stage;
  3. and the field infestation score is between 6 and 40.
- ⇨ **Make a pass with the rotary hoe immediately, if...**
  1. the majority of weeds are in the cotyledon stage;
  2. the field infestation score is between 6 and 20.
- ⇨ **Apply an herbicide, if...**
  1. the cereal is in a bad state;
  2. the majority of weeds are past the 2-leaf stage;
  3. the field infestation score is greater than 40.
- ⇨ **Don't do anything if...**
  1. the field infestation score is less than 6.

Why weed cereals mechanically?

To reduce production costs, eliminate all danger of contamination of water courses, and to decrease dependence on herbicides.

Does it work?

Yes. Mechanical weeding gives very good results in most of the cereal fields in Quebec:

- Yield equivalent to that obtained using chemical treatments;
- A weeding cost similar to or lower than that of using herbicides;
- A level of weeds that does not reduce yield.

Is it worth it?

Yes. Mechanical weeding decreases the cost of weeding by about $5/ha, since each pass of the rotary hoe or the flex-tine harrow costs only $11/ha, all included.

Does mechanical weeding require more time in the field?

Yes, but very little compared to the advantages described; about 12 minutes more per hectare.

What equipment should be used?

Mainly the flex-tine harrow, but also the rotary hoe.

The flex-tine harrow's tines scratch and vibrate in the soil, whereas the spoons on the rotary hoe burst the crust on the soil surface. This way, weeds are buried, uprooted or mutilated.

The flex-tine harrow is the device most used with cereals. It can be adjusted precisely and works effectively in almost all types of soil. Since the flex-tine harrow jams when crop residue is abundant, it would be best to use a minimum till rotary hoe in such situations.

Which cereals can be weeded mechanically?

All spring and autumn cereals lend themselves well to weeding with the hoe and the flex-tine harrow: oats, barley, wheat, rye, peas, etc. Wheat is more delicate than other cereals. When working wheat, the passes must be made carefully: less aggressive settings, slower speed, etc.

Weeding is not recommended for seeding cereals because it would destroy forage species. Some flex-tine harrows are equipped with a pneumatic seed drill allowing the seeding of forage species at the time of the final weeding, near the 4 to 5 leaf stage of the cereals.

Do the flex-tine harrow and the rotary hoe damage cereals?

Not if the stages for safe passing as described in the central section of this brochure are respected. In addition, it is preferable to make the passes when the cereal is properly green and shows no sign of nutritional deficiency or hydric stress.

Two hours after passing the rotary hoe.

Same field, 14 days later.

How to tell if the cereal has been damaged after a pass.

A plant lying on the soil or lightly covered with soil will survive, but a plant which has been uprooted or buried will die. Aim for less than 5% plant loss at each pass.

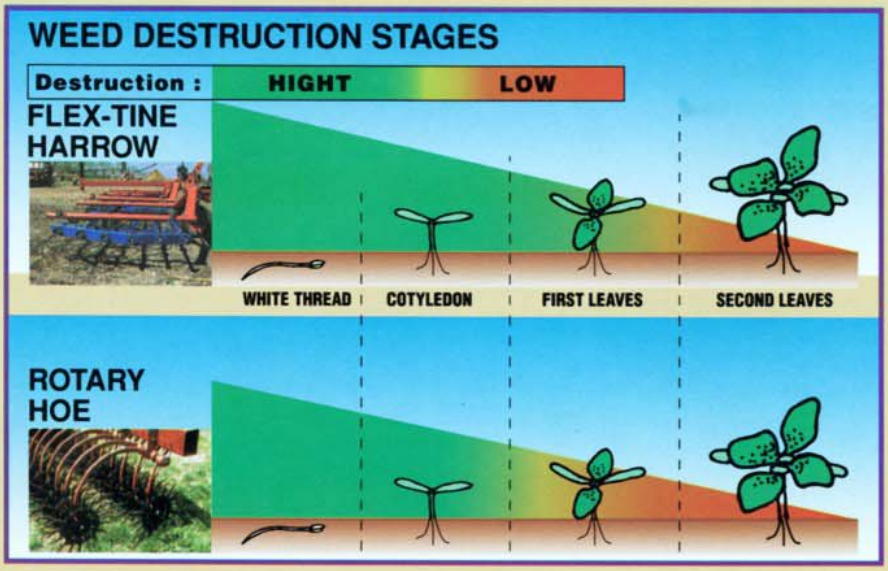
The cereals damaged if you the appropr

Which weeds are destroyed by mechanical weeding?

Weeding is effective against most annual weeds, but has no effect against well-established perennials, or against deep-rooted annuals (e.g.: wild oats).

The flex-tine harrow effectively destroys weeds until they each the 2-leaf stage.

For effectiveness with the rotary hoe, the passes must be made before weeds pass the cotyledon stage. The white thread stage (weeds germinating in the soil) is the most vulnerable to mechanical weeding.



How to adjust the equipment.

Rotary Hoe : There is no adjustment to make on a rotary hoe. Just put the device on the ground and advance at high speed (more than 10 km/h).

The first pass of the rotary hoe or the flex-tine harrow doesn't cost anything !

Flex-tine harrow: The adjustments for this device comprise 3 elements: the tension of the tines, the depth of the depth wheels and the forward speed. Adjust the flex-tine harrow as follows:

1. Make the flex-tine harrow level;
2. Adjust the depth wheels so that the tines penetrate the soil to a depth of about 2 cm;
3. Adjust the tines in two or three sections to different tensions, going from minimum to maximum;
4. Advance at about 10 km/h for about 10 metres;
5. Check the quality of the weeding: the entire surface of the soil must be worked, the weeds destroyed and the cereals barely damaged. Choose the tine tension which gave the best results. If necessary, continue adjusting, repeating steps 2 to 5.

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How many passes should be made?

In general, only one. Two passes may be necessary if the weed infestation is high or if soil and weather conditions were less favourable for the first pass.

Are there other advantages to weeding mechanically?

Yes. Weeding aerates the soil and promotes tillering. This regularly translates as a 100 to 300 kg/ha gain in yield. In addition, weeding conserves humidity in the soil by breaking surface capillarity. All these advantages mean that the first pass of the flex-tine harrow or rotary hoe doesn't cost a thing!

Are there fields where it is best not to weed?

Yes:

- Organic soil;
- Very rocky fields;
- Fields heavily infested with annual weeds.

In summary, what are the key elements in the weeding of cereals?

- Effect a quality seeding: early, uniform, with no unseeded strips, at least 4 cm deep, at a seeding density higher than 5 to 10%.
- Use the right equipment: choose the flex-tine harrow rather than the rotary hoe if there is little crop residue. Take the time to adjust the equipment over a short distance before weeding the whole field.
- Scout the fields regularly : at least 3 times from seeding to tillerage and once just before harvest.
- Include preventive measures in your weed control strategy: balanced rotation, green manure, proper management of manure, etc.
- Practice integrated weed control.

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TEXT AND PHOTOS

Anne-Marie Coulombe, M. Sc., agronome, PHYTO CONTRÔLE
Yvon Douville, M. Sc., TECHNAFLORA
TRANSLATION: The Quebec Farmers' Association

PUBLISHER

TECHNAFLORA
9485, des Merisiers
BÉCANCOUR, Canada
G9H 3K1
819-297-2121
yvon.douville@sympatico.ca

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