# SILAGE MAIZE PRODUCTION IN SLOVENIA: FARM-LEVEL IMPACTS OF PESTICIDE REDUCTION STRATEGIES

**Country: Slovenia**

**Crop: Silage maize**

**Focus: Weed control**

**Agronomic intervention: Substitution**

Some of the SPRINT case study sites were selected for a deep analysis into farm-level economic impacts of agronomic interventions for reducing synthetic pesticide reliance. This factsheet provides country-specific results for Slovenia, based on expert interviews and analysis of current herbicide costs.

***22 farms analysed***
*1 = organic*
*21 = IPM practices*

**Key weeds of silage maize**

Ambrosia
Wild sorghum
Spear thistle
Redroot pigweed
Green foxtail
Field bindweed
Johnson grass
Cockspur grass
Bitter dock

## Current agronomic practices

**Current pesticide use**

- Adengo and Lumax, both broad spectrum herbicides, were the main pesticides used in IPM-managed farms
- A single treatment was used by all farms, usually consisting of one product
- Mechanical weeding was sometimes used to supplement
- **No fungicides or insecticide applications were reported.**


Tillage/ploughing
Slurry applied
Harrowing to prepare seed bed
Maize sown a few days later
Some farms apply mineral fertiliser


Herbicide applications (IPM farms)
Organic farms: mechanical weeding


Maize harvested

Other crops included in rotations with silage maize: wheat, barley, triticale, oat, potato, rape, sorghum

## Ranking current weed control strategies

20 farms were ranked based on:
1) environmental/human health impacts and damage costs of their weed control strategy
2) Crop rotation (more grass-clover and less maize = better score)
3) Costs incurred due to pesticide use

The most common crop rotation was 1:3, whilst the organic farm uses 1:5.

**Top scoring crop rotation**:
Grass/clover - grass/clover - maize - barley - grass/clover
**Worst scoring crop rotation:**
Grass/clover - barley - maize - wheat - maize

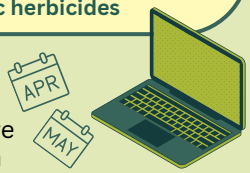
Most analysed farms were ranked as conventional farms with low toxicity. These farms mostly use the herbicide Adengo. The farms ranked as having higher toxicity were using Lumax, which contains significantly more toxic active ingredients than Adengo.

The farms using lower toxicity herbicides had significantly lower herbicide costs than those using highly toxic pesticides.

**Only around 1% of silage maize farms in Slovenia are currently organic due to difficulties controlling weeds without synthetic herbicides**

## Advice surrounding weed control

- Access to advice on weed control varied in terms of frequency and channels
- Channels include: direct contact, digital platforms, media, farm visits
- Frequency: Advice becomes key in April-May due to seasonal variation in weed pressure
- The most common concerns relate to perennials including ambrosia and wild sorghum




## Expert view on reducing herbicide reliance

During expert interviews, a number of strategies were suggested for minimising weed pressure without relying on synthetic pesticides:

1. **Blind seeding** = allow weeds to germinate before destroying through harrowing, fertiliser amendment and a single dose of herbicide (though all farms studied here already only apply herbicides once)
2. **Diversification of crop rotations** = incorporating silage maize in rotations every 2-3 years and growing a wide variety of crops. Including grass in rotations was seen as strongly beneficial for controlling weeds
3. **Winter cover crops** = weed suppression
4. **Precision farming techniques**
5. **Sowing in May instead of April** = accelerates crop germination, leading to faster soil coverage

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## Proposed intervention 1: Substitution of synthetic herbicides

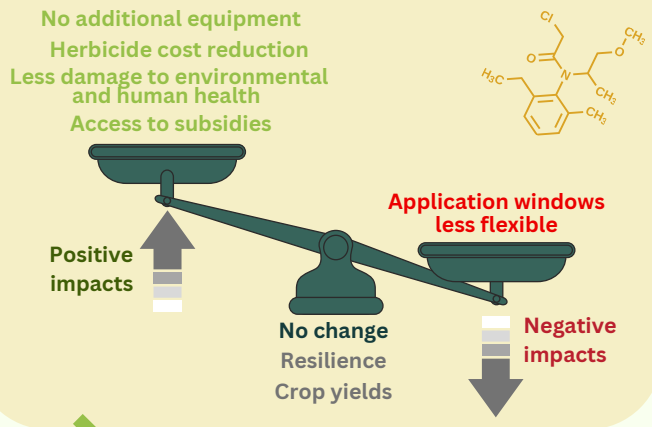
Want more detail?
Read p28-30 of SPRINT deliverable 6.3

**Lumax**: Highly toxic synthetic herbicide → **Adengo**: Less toxic synthetic herbicide

Lumax, a broad-spectrum synthetic herbicide, has been replaced a less toxic synthetic herbicide, Adengo, by many farmers across Slovenia. Whereas 80-90% of farmers used to use lumax, only 10-20% of silage maize producing farms do so now. This is largely due to the KOPOP programme, an initiative for improving water quality. This programme does not allow the use of one of the active ingredients in Lumax. In addition, switching products is straightforward aside from having a smaller application window.

Experts were asked to assess various indicators for this intervention, and evaluation was undertaken based on current herbicide prices.

### Pros and cons of substituting synthetic herbicides




### Barriers to adoption

Reasons for some farmers not replacing Lumax:

- A perception that Lumax is more effective and cheaper. Adengo is, however, slightly cheaper.
- Long-standing habits so are reluctant to experiment with new products.
- Avoidance of applying for farm subsidies due to associated bureaucracy, despite payments being available for switching to Adengo under the KOPOP programme.

Evaluation of current herbicide prices revealed that alongside the reduced costs to human and environmental health, **switching from Adengo to Lumax decreases weed control costs.**

## Proposed intervention 2: Mechanical weeding for replacing herbicide use

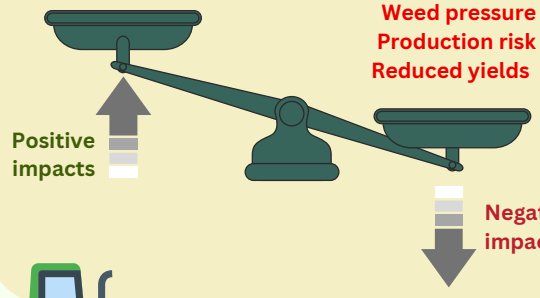
At present, not many Slovenian farmers growing silage maize rely entirely on mechanical weeding. Experts suggested that replacing synthetic herbicides with mechanical weeding is very difficult and that any transition would have to be gradual. Interviewed experts believed that using no herbicide would result in decreased yields.

### Barriers to adoption

- Perception that crop yields will significantly decrease
- Wet weather increases weed growth and makes it difficult to get onto the land to undertake weeding
- Mechanical weeding perceived as less effective against perennial weeds
- More labour and fuel costs due to increased tractor passes
- New machinery needed for effective weeding

### Pros and cons of replacing herbicides with mechanical weeding

Interviewed experts believed there would be an increase in weed control costs. However, evaluation analysis revealed that **weed control costs would decrease**.




Want more detail?
Read p30-33 of SPRINT deliverable 6.3

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## Proposed intervention 3: Wider crop rotations

According to experts, typical conventional farms growing silage maize in Slovenia follow a five-year rotation, including three years of maize, one year of grass-clover, and one year of cereals. Organic farms usually grow grass twice consecutively to reduce weed pressure.

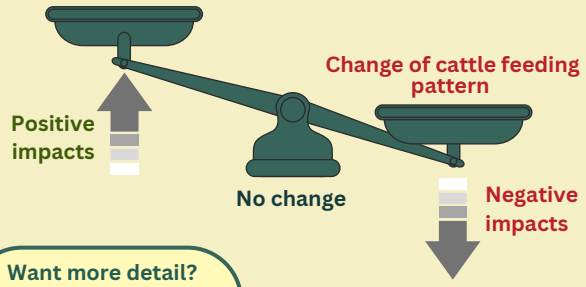
The intervention discussed here involved switching to crop rotations which include two years of grass.

### Barriers to adoption

- Growing maize less often is difficult where farms are under pressure to grow lots of silage maize as a result of low milk prices and high stocking rates
- It is difficult to extend crop rotations in smaller land parcels
- Some farmers are nervous of moving away from traditional practices
- Lower nutritional content of livestock feed

### Pros and cons of adopting wider crop rotations to reduce synthetic herbicide reliance

Herbicide cost reduction
Lower weed control costs including environmental/human health costs)
Increased yields
Overall resilience
Subsidies (if going organic)
No additional equipment needed

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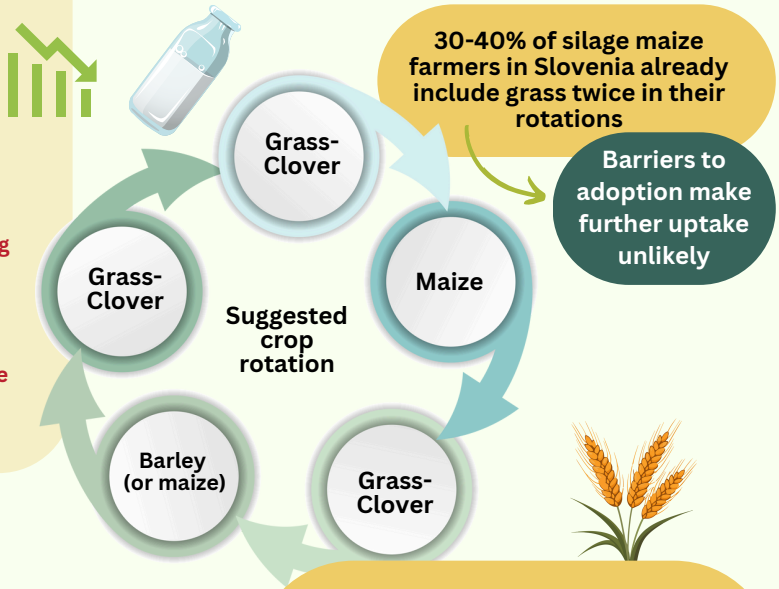


**30-40% of silage maize farmers in Slovenia already include grass twice in their rotations**

**Barriers to adoption make further uptake unlikely**

## Conclusions

The potential of three agronomic interventions for moving away from synthetic herbicide reliance when growing silage maize were assessed:

1. Substituting a synthetic herbicide for another, less toxic synthetic herbicide
2. Replacing synthetic herbicides with mechanical wedding
3. Using a wider crop rotation, with at least two years of grass and maize once every 4-5 years

These interventions were assessed through expert interviews and evaluation of current pesticide costs. It appears that both herbicide substitution and use of wider crop rotations have clear benefits whilst reducing pesticide reliance. Mechanical weeding also reduces total weed control costs but there are some barriers to full adoption with no herbicide use. A key barrier is insufficient demand for organic milk - this is needed to encourage more farmers to consider mechanical weeding. Changes to crop rotations offer a possible success story for moving away from pesticide use due to the clear benefits. However, many barriers need to be overcome as these are preventing further uptake.

**Criteria used to evaluate the impacts of agronomic interventions for transitioning away from pesticide use:**

1. **Production value** (yield - quantity/quality)
2. **Amount of pesticide needed** - number of treatments and amount
3. **Total labour requirement**
4. **Equipment needs**
5. Environmental and human **health risks**
6. **Resilience** against extreme weather
7. **Subsidy availability**
8. **Current uptake** by other farms

Full report: SPRINT Deliverable 6.3.
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