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Management of perennial weeds – results and experiences from the Danish HighCrop project

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Higher productivity in Danish arable crop production (HighCrop)

Main objective:

-to increase and stabilize crop yields

- robust crop rotations
- robust crops
- better nutrient management
- better weed management

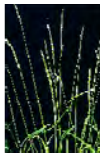
Management of perennial weeds

Main objective:

-to develop a weed management tool

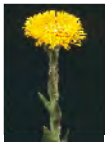
1. Analyze the dynamics of perennial weeds behavior in organic cropping system
2. Synthesize the results with results from other experiments and information provided by the extension services
3. Formulate concepts of weed control tactics and strategies for the management of perennial weeds
4. Strengthen strategic advising through the development of a picture card tool and a web-based planning tool

Major perennial weeds in Danish organic farming



Common couch grass (*Elytrigia repens*)

Creeping thistle (*Cirsium arvense*)



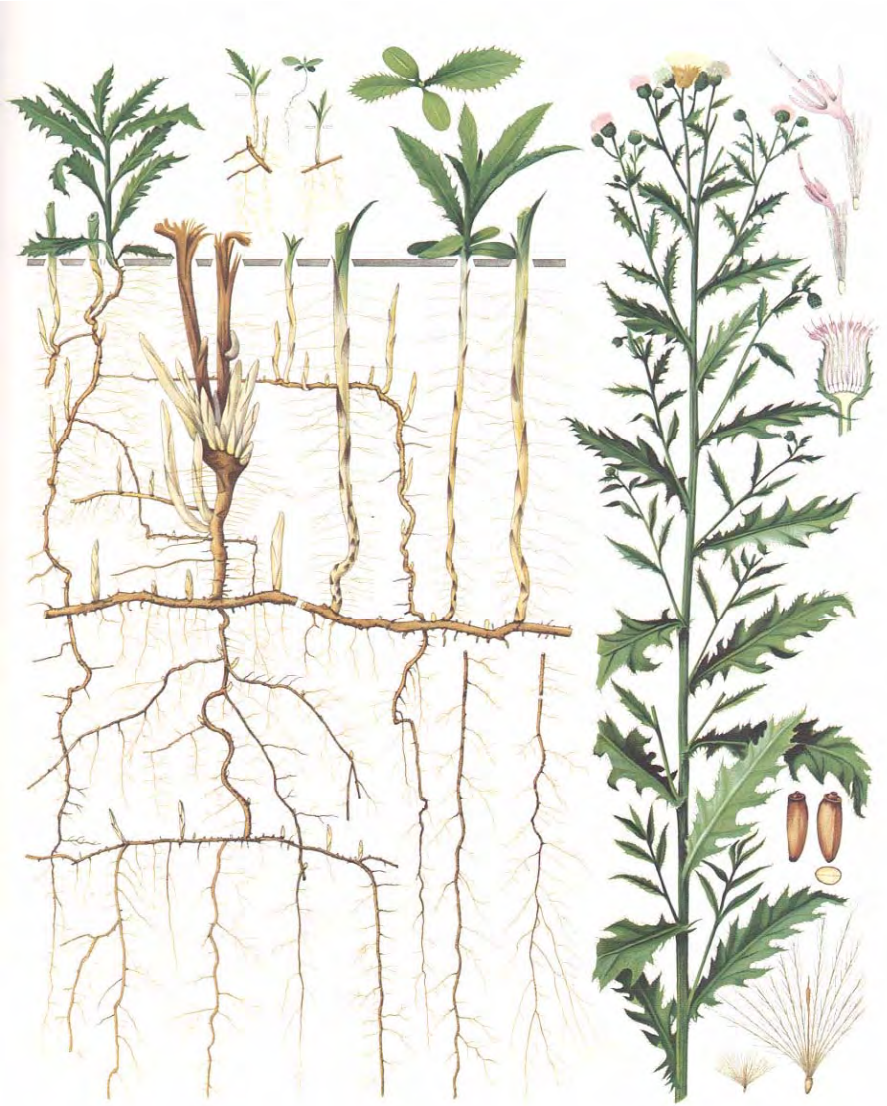
Coltsfoot (*Tussilago farfara*)

Sow-thistle (*Sonchus arvensis*)

Docks (*Rumex* spp.)

Couch grass

Creeping thistle



The three principles

- Competition – suppressive crops
- Disruption – crop rotation composition
- Control - mechanical and thermal tactics

Basic measures

- Record and map your weeds
- Ensure even fields
- Inject slurry and other volatile fertilizers
- Diversify crop sequences with frequent inclusion of competitive crops
- Minimum 20% N-fixating green manure crops, preferably suitable for mowing

Strategies and tactics identified, mixed stands

Low presence of perennial weeds < 1 flowering shoot m^{-2}

1. 1-2 post-harvest stubble cultivation whenever possible
2. Catch crop
3. Mould board ploughing

Strategies and tactics identified, mixed stands

High presence of perennial weeds > 1 flowering shoot m^{-2}

- Mini-summer fallow
  1. Ploughing /cultivation from 1st July
  2. Repeated cultivations until early August
  3. Catch crop from beginning August
  4. Ended by ploughing late autumn or spring
- Disc or p.t.o driven weeding devices
  1. One pass post harvest (tine + disc/p.t.o.)
  2. Another pass 3 weeks later (disc/p.t.o.)
  3. Ploughing late autumn or spring

Implements for intensive cultivation

- 80-90% control after first year
- 95-100% control after two years in a row

Specific tactics / strategies

Against creeping thistle

1. Ploughing /cultivation post-harvest
2. Catch crop from beginning August
3. Ploughing late autumn or early spring

Against couch-grass

1. Uprooting and removal of severe patches
2. Depletion of the food reserves

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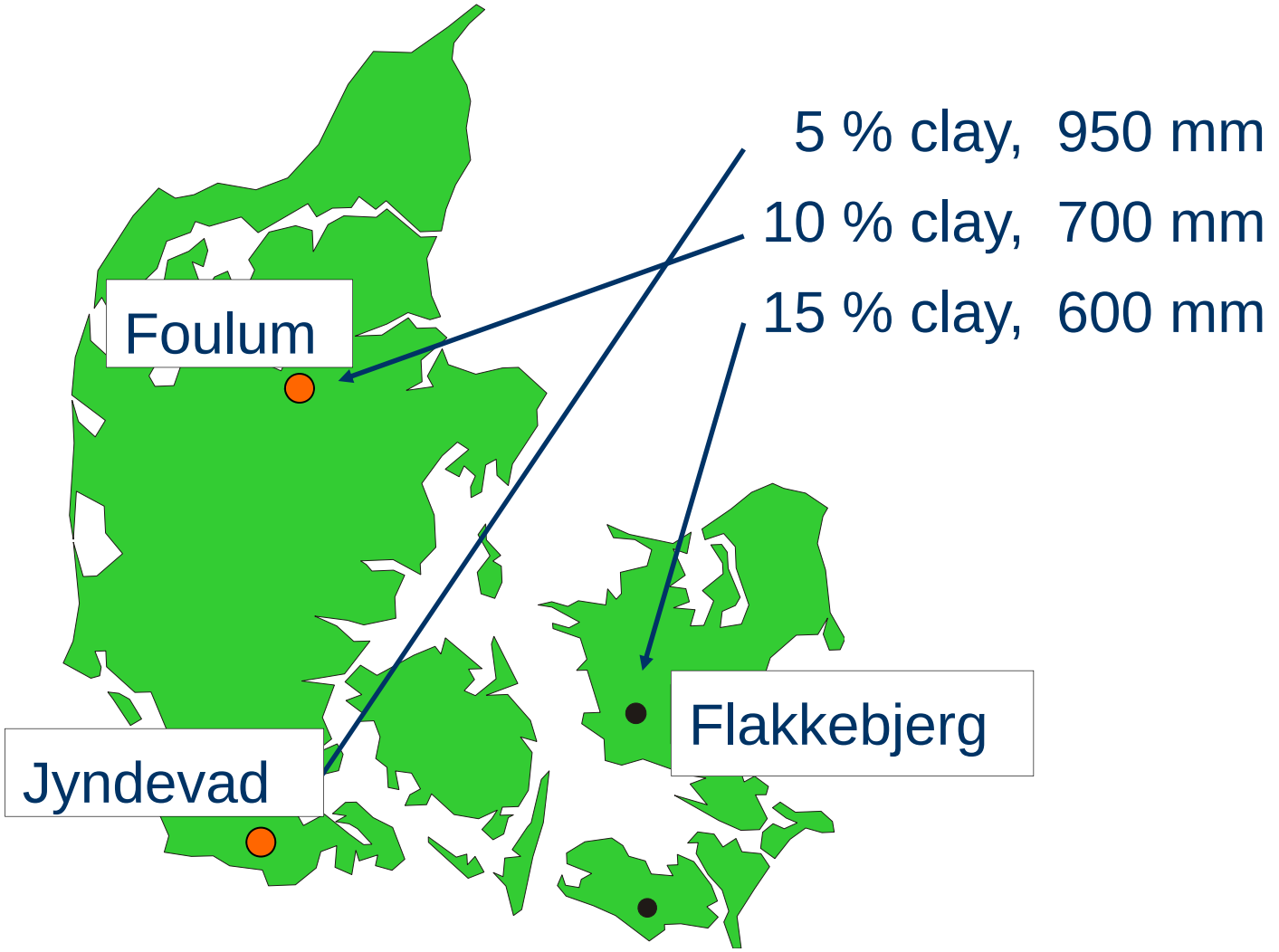
Organic cropping systems at three locations in DK, 1997-2009

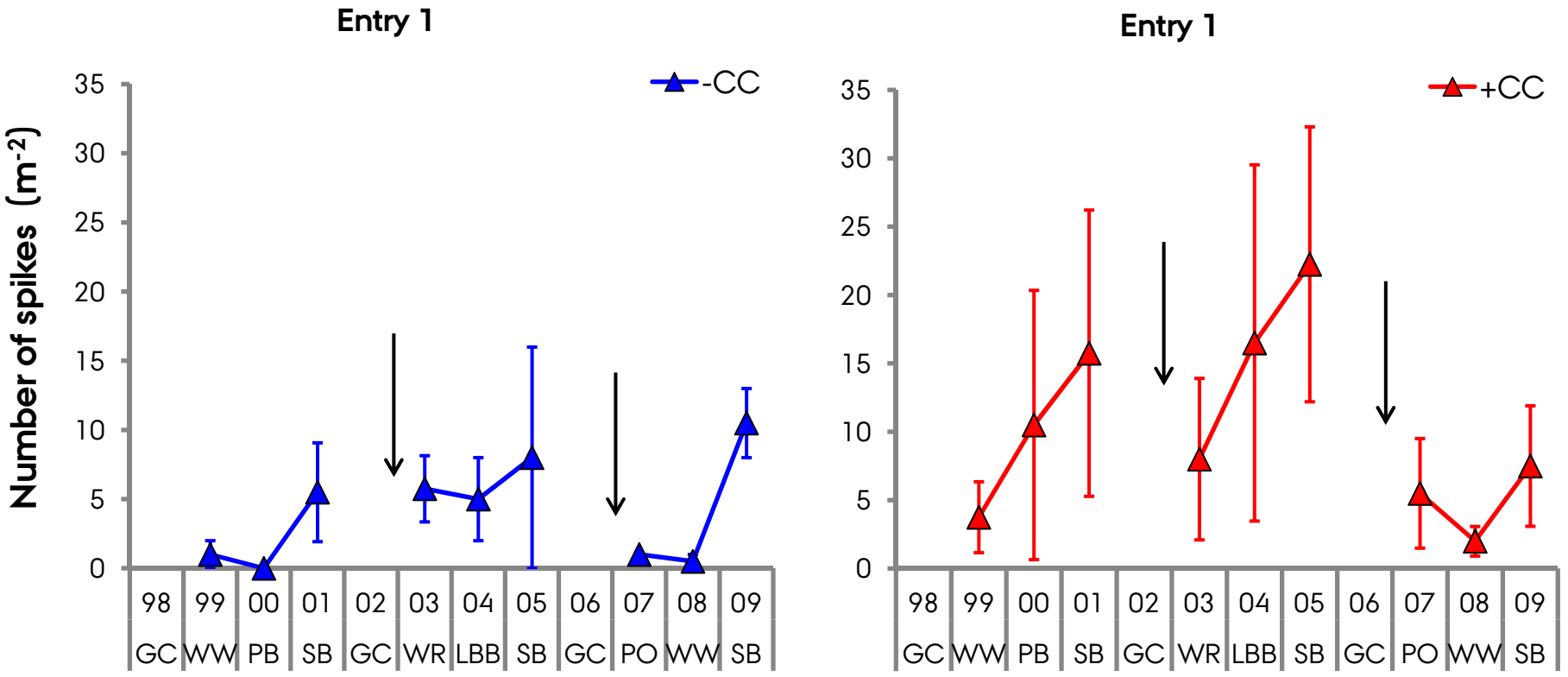


The cropping systems at Jyndevad, a coarse sand

Cycles	Crop rotation O1	Crop rotation O2
1997-2000	S. barley:ley Grass-clover S. wheat Lupin	S. barley:ley Grass-clover W. wheat Pea:barley
2001-2004	S. barley:ley Grass-clover S. oats Pea:barley	S. barley:ley Grass-clover W. rye Lupin:bean:barley
2005-2009	S. barley Pulse crop Potato W. wheat	S. barley:ley Grass-clover Potato W. wheat

± catch crops, ± manure (slurry)

Couch grass development in rotation O2 on coarse sand



Factors that promoted Couch-grass growth

No	Factors	Effects
1	Pulse:barley mixture	+736%
2	Spring wheat	+501%
3	Winter wheat / grass-clover as the preceding crop	+444%
4	Lupin / grass-clover as the preceding crop	+397%
5	Oat / cerelas as the preceding crop	+203%
7	Lupin / cerelas as the preceding crop	+195%
8	Oat / grass-clover as the preceding crop	+158%
9	Spring barley / no cereals as the preceding crop	+154%
10	Spring barley / cereals as the preceding crops	+124%
11	Winter wheat / spring barley as the preceding crop	+103%
12	Winter rye	0%
13	Potatoes	0%

Factors that reduced the Couch-grass population

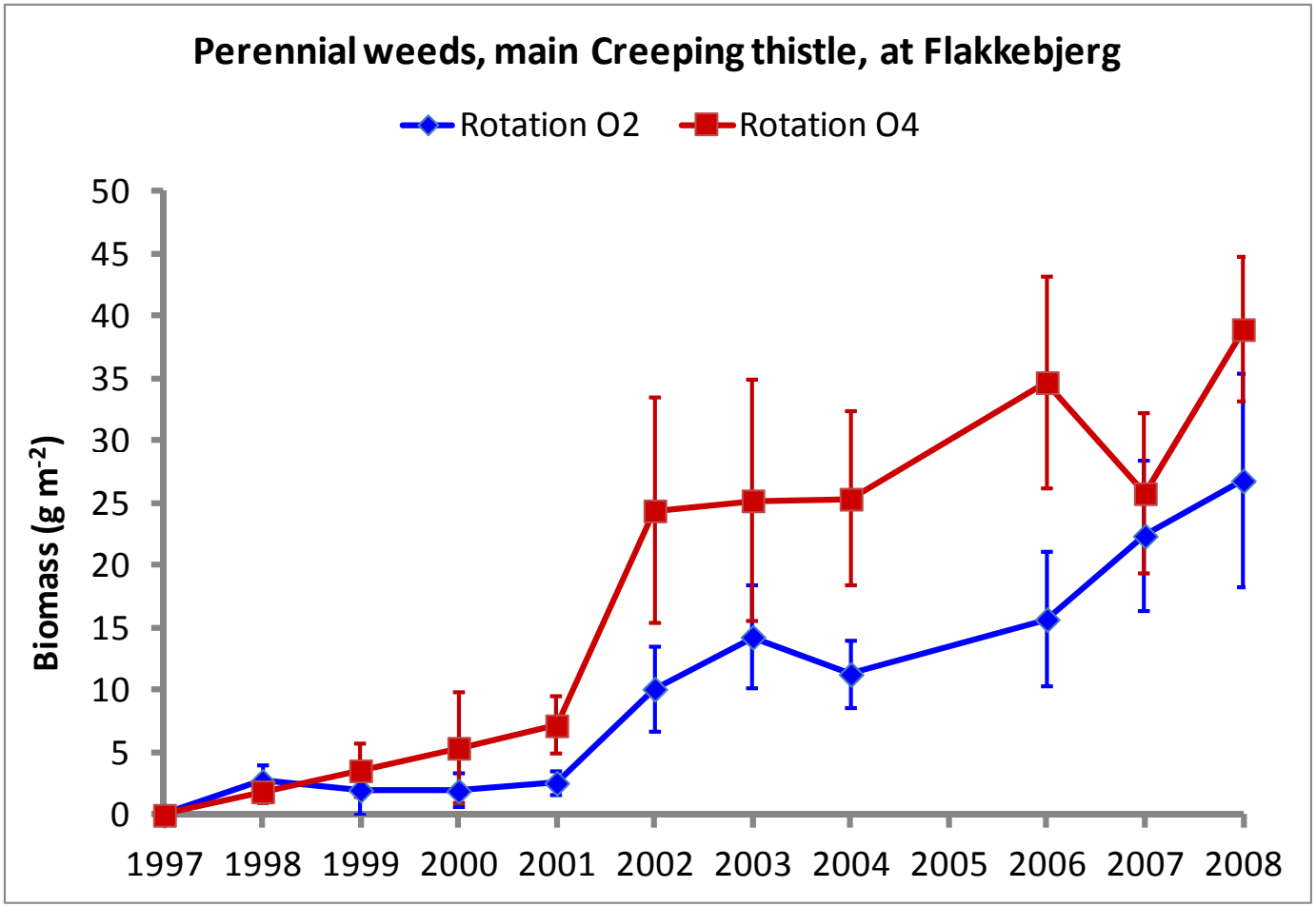
No	Factors	Effects
1	Mini summer fallow	-62%
2	Stubble cultivation followed by a catch crop	-26%
3	Tine cultivation in spring	-20%
4	Fertilisation	-18%
5	Stubble cultivation without a subsequent catch crop	-14%

The cropping systems at Flakkebjerg, a sandy loam

Cycles	Crop rotation O2	Crop rotation O4
1997-2000	S. barley:ley Grass-clover W. wheat Pea:barley	Oat W. wheat W. wheat[1] Pea:barley
2001-2004	S. barley:ley Grass-clover W. wheat Lupin:barley[2]	W. wheat[4] Oat S. barley Lupin[3]
2005-2008	S. barley:ley Grass-clover Potato W. wheat	S. barley Faba bean Potato W. wheat

± catch crops, ± manure (slurry)

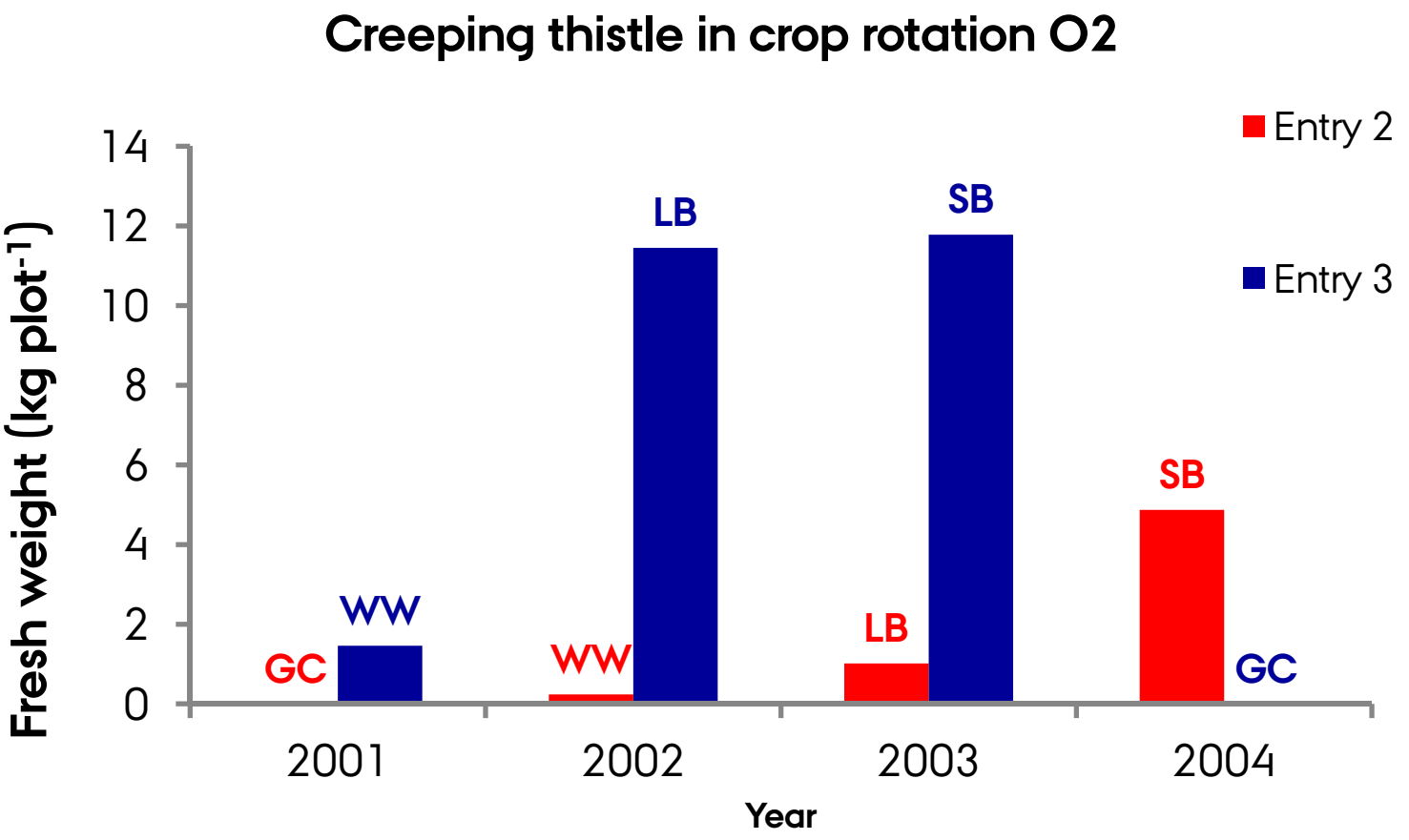
Proliferation of perennial weeds at Flakkebjerg



Main factors affecting the growth of creeping thistle

- ✓ Crop rotation
- ✓ Entry point, i.e. the specific crop sequence
- – Catch crop
- – Manure
- – Stubble cultivation

The importance of entry point / crop sequence



Crop effects on creeping thistle

Crop	Effects
Lupin	8.9
Lupin:barley	2.6
Winter wheat	2.0
Spring barley	1.0

Strategic planning – picture card tool

Web-based planning tool

Crop rotation (spreadsheet).

Crops, fertilisation, weed species, weed pressure, control actions etc.

20130308_TNT_Crop_Model(34)_JEO [Read-Only]

Scenarie: A

År	Sædskifte? (vælg)	Planterester (Vælg)	Ukrudtsstrategi: Forud for etablering (Vælg)	Ukrudtsstrategi: Efter etablering (Vælg)	Ukrudtsstrategi: Efter høst (Vælg)	TYPE (vælg)	Bruges til reg. af sum af ukrudtdækning.	Sum dækning (100%=ingen reg.)	Faktiske udbytte (tons TS pr. ha) e. række afstd. reg	Faktiske udbytte (tons TS pr. ha) e. Ukrudt reg.
					Input				Nøgle	
1	Majs	Ingen halm	Pløjning + falsk såbed	Radrensning	Stubharvning_A1	Korsblomstret		100	7.8	7.8
2	Vinterrug	Halm snittet	Pløjning	Blindstrigling + alm. ukrudtsharvning	Stubharvning_A2	Vinterrug		100	3.2	3.2
3	Havre	Halm fjernet	Stubharvning + pløjning	Blindstrigling + alm. ukrudtsharvning	Pløjning_A3	Korsblomstret		100	4.8	4.8
4	Vårsæd (korn undt. Havre)	Halm fjernet	Stubharvning + pløjning	Ingen	Stubharvning_A4	Korsblomstret		100	5.4	5.4
5	Vintersæd (korn undt. rug)	Ingen halm	Stubharvning + pløjning	Ingen	Stubharvning_A5	Vinterrug		100	2.9	2.9
6	Vælg afgrøde	Ingen halm	Pløjning	Ingen	Stubharvning_A6	Korsblomstret		#N/A	0.0	0.0

Basis oplysninger | Input og resultater (År 1- 6) | Dataindberetning | Løbende noter TNT