

# Potential of cover crops for weed management in organic cropping

NJF SEMINAR 495  
4th NJF Organic Conference  
June 19 – 21, 2017 in Mikkeli, Finland  
Track 1A: Cover crops and weed management

The logo for CORE organic features the text "CORE organic" in a white, sans-serif font. Above the word "CORE" are three stylized white birds in flight, arranged in a slight arc. The entire logo is set against a dark green rectangular background.

CORE organic

PRODIVA project 2015–2018



# Implications



From unwanted weeds  Companion plants  
in cereal cropping

# Implications

- Integrated weed management (IWM) strategies call for diverse control/cropping methods
- High priority for sustainable measures
  - ❑ Effective control of harmful weed species
  - ❑ Maintenance of biodiversity in crop stands
  - ❑ Taking care of soil (chemical & physical)



Smart use of **COVER CROPS** in crop rotation





# Cover Crop Management

- ▶ Species / Cultivars / Mixtures
- ▶ Seed rates
- ▶ Sowing time
- ▶ Cover / Catch
- ▶ Short term / Long term
- ▶ Target weed species
- ▶ Services (N, soil structure, feed)



# Background and Objectives

- Cereal-dominated crop rotations



- Selection pressure in weed population



- IWM focus on aggressive weed species



Replace harmful weed species  
with gentle **COVER CROPS**

**During.....After.....Between  
the crop growing period**



# Objectives

## PRODIVA project HYPOTHESES

### WP 1 : Improved weed management with....

- ❖ Selected competitive **cover crop species**
- ❖ Improved **cover crop establishment**

*More project info: **Crop diversification and weeds (PRODIVA)**  
<http://coreorganicplus.org/research-projects/prodiva/>*

# News from Finland



by Jukka Salonen

# Cover crops in field experiments in Finland 2015-2016

## ▶ Spring-sown:

- ▶ TRFPR Red clover (*Trifolium pratense* L.)
- ▶ TRFRE White clover (*Trifolium repens* L.)
- ▶ TRFHY Alsike clover (*Trifolium hybridum*)
- ▶ TRFRM Persian clover (*Trifolium resupinatum* var. *majus*)
- ▶ TRFSU Subterranean clover (*Trifolium subterraneum* L.)
- ▶ TRFIN Crimson clover (*Trifolium incarnatum*)
- ▶ MEDLU Black medic (*Medicago lupulina* L.)
- ▶ MEUAL White sweet clover (*Melilotus alba* Med.)
- ▶ LOLMU Italian ryegrass (*Lolium multiflorum* Lam.)
- ▶ LOLPE English/Perennial ryegrass (*Lolium perenne* L.)
- ▶ PLHPR Timothy (*Phleum pratense* L.)
- ▶ FESPR Meadow fescue (*Festuca pratensis* Huds.)
- ▶ FESAR Tall fescue (*Festuca arundinacea* Schreb.)
- ▶ SECCE Winter rye (*Secale cereale* L.)

## ▶ After Harvest:

- ▶ VICSA Common vetch (*Vicia sativa* L.)
- ▶ RAPSA Oilseed radish (*Raphanus sativus* L.)
- ▶ LOLMW Westerwold ryegrass (*Lolium multiflorum* Lam. var westerwoldicum)



# Field trial in Jokioinen Finland 2015

## ▶ Previous crops:

- 2013: Oats with undersown clover/grass mixture
- 2014: Clover/Grass mixture (ploughed autumn 2014)

## ▶ Field experiment in 2015

### ◦ Spring Barley with 6 cover crop mixtures

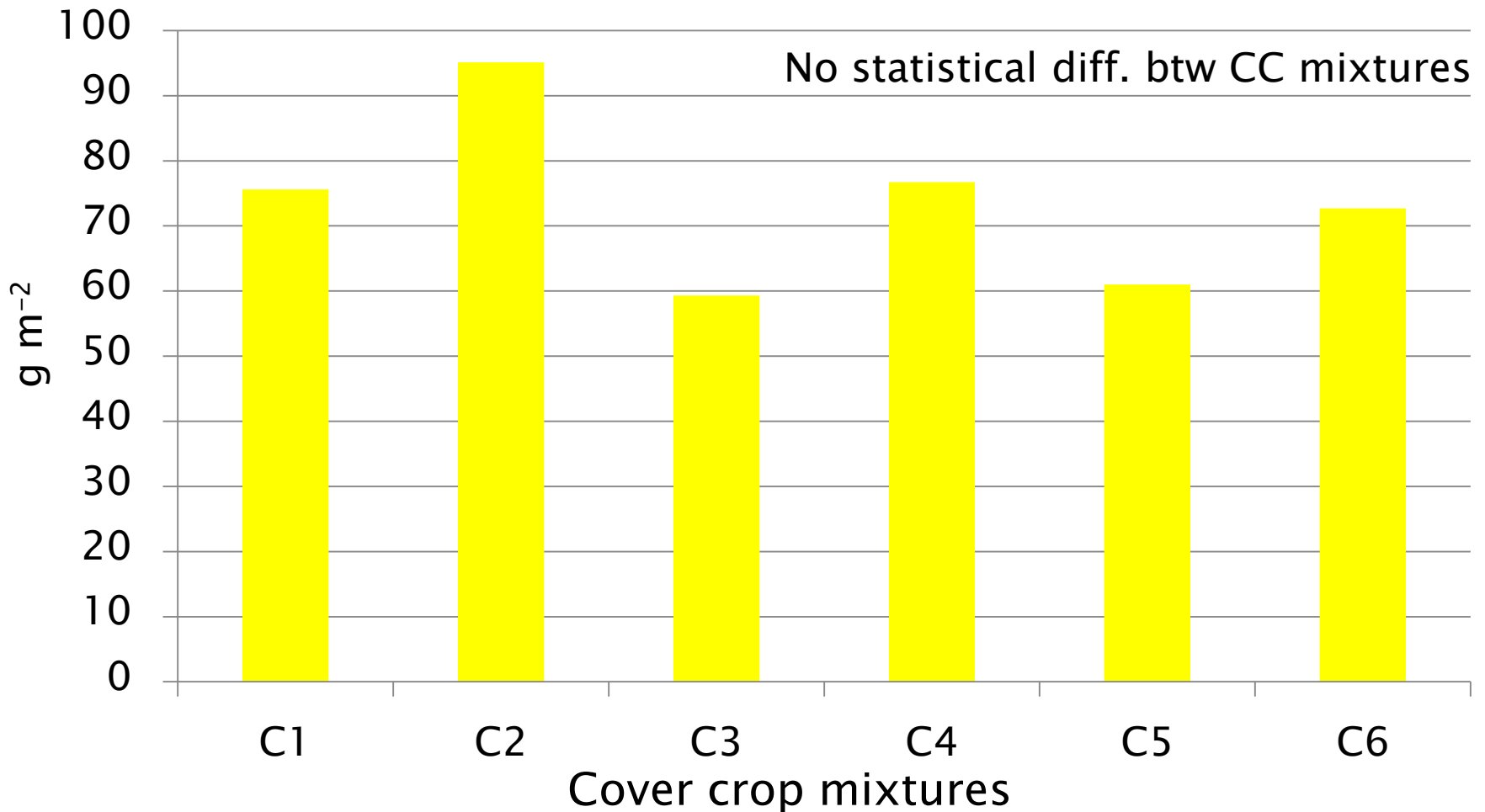
- Cover crops sown in spring barley in May at the same time with the main crop
- Oilseed turnip rape (BRSSS) as model WEED
- in addition to the natural weed infestation

# CC mixtures in Jokioinen 2015

- ▶ **C1:** No cover crops (CCs) in spring barley
- ▶ **C2:** TRFPR (8 kg ha<sup>-1</sup>) + TRFRE (4 kg ha<sup>-1</sup>)
- ▶ **C3:** MEDLU(6) + TRFRE(2) + TRFRM(3) + TRFIN(4)
- ▶ **C4:** TRFPR(12) + TRFRE(6)
- ▶ **C5:** SECCE(100)
- ▶ **C6:** MEDLU(20) + LOLMU(8)

TRFxx = Clovers  
MEDLU = Black medic  
SECCE = Winter rye  
LOLMU = Italian ryegrass

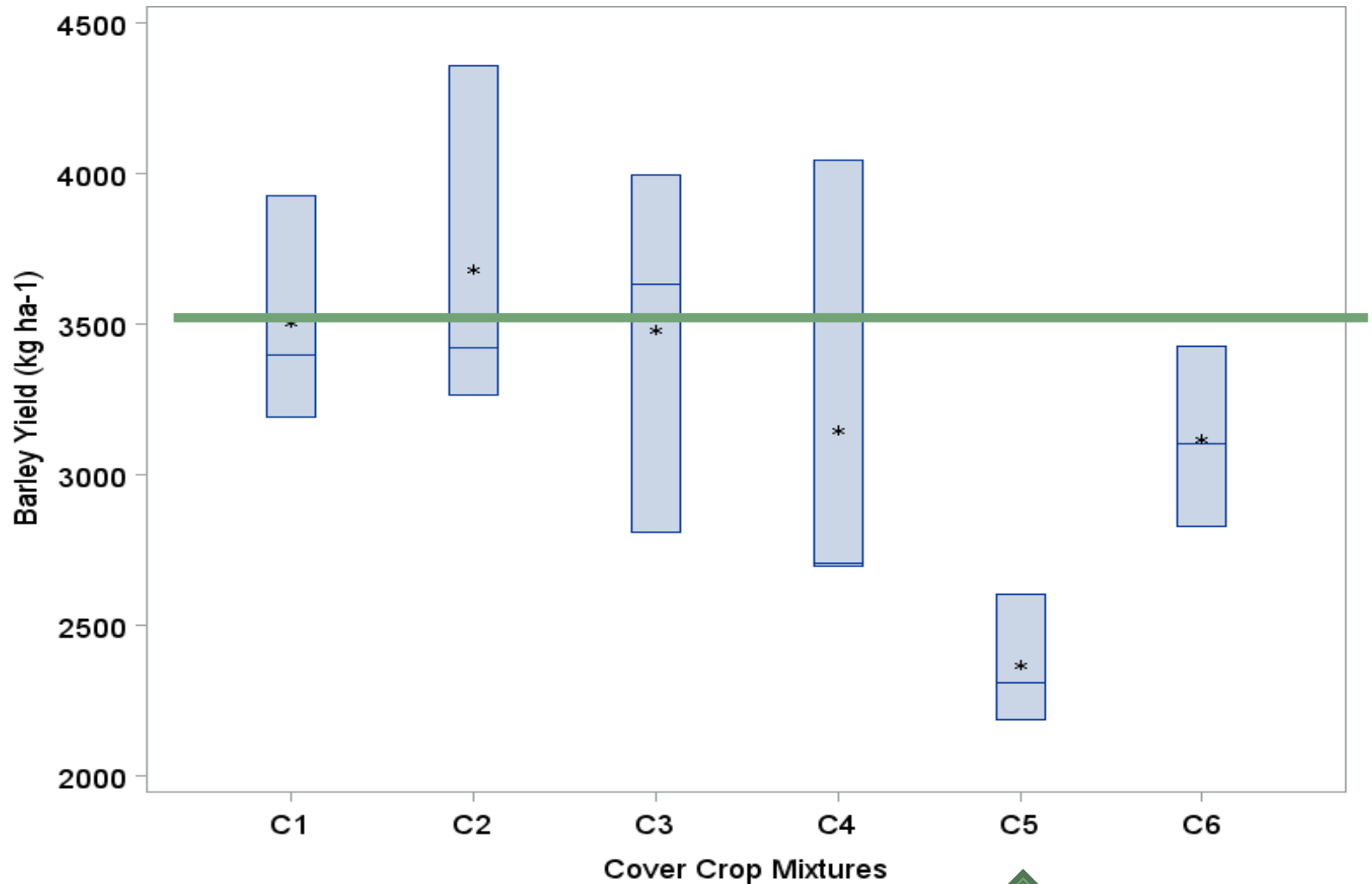
# Biomass of BRSSS in August 2015



Concl: Difficult to prevent early emerging weeds with CCs



# Yield response in spring barley



↑ C5 = rye as CC

# Findings and Speculation (FI)

- ▶ Cover Crops (CCs) are too slow against spring-emerging and tall-growing annual weeds in spring cereals
- ▶ CCs suppress weed growth in late summer and after harvest (Effect on weed seed production??)
- ▶ Red Clover, Alsike Clover and White Clover are most promising in Northern conditions. Sowing at the same time with spring cereals in clay soils but delayed in light soils
- ▶ Delayed sowing of more vigorous CCs, like Italian ryegrass
- ▶ Tolerable yield loss with suitable CCs sown at proper time
- ▶ Cover Crop cropping is well subsidized in Finland (100 €/ha)

# News from Latvia



by Livija Zarina

*Viola arvensis*  
*Chenopodium album*  
*Galeopsis spp.*  
*Veronica arvensis*  
*Lamium purpureum*  
*Fumaria officinalis*  
*Centaurea cyanus*  
*Apera spica-venti*  
*Elytrigia repens*  
*Equisetum arvense*  
*Cirsium arvensis*  
*Sonchus arvensis*  
*Polygonum convolvulus*  
*Artemisia vulgaris*



# SITE

## Priekuli, LTE field

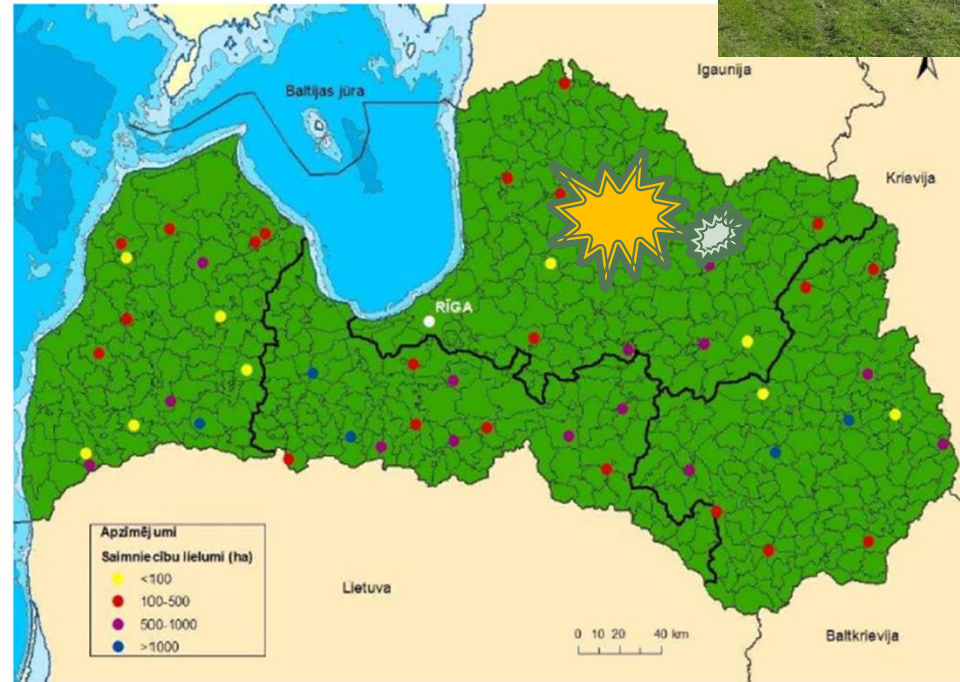
ca.123 m above sea level,  
(57° 18'49"N, 5° 20"E)



# SOIL

1. LTE:sod-podzolic loamy sand
2. OF field: sod gleyic soil

	2008	2014	2014	2015
pH <sub>KCl</sub>	5.7	5.6	6.1	6.0
SOM, g kg <sup>-1</sup>	25	21	54	54
P <sub>2</sub> O <sub>5</sub> , mg kg <sup>-1</sup>	128	126	95	101
K <sub>2</sub> O, mg kg <sup>-1</sup>	135	109	72	84



### *Crop rotation LTE*

1. Barley-clover/grass-barley-rye-barley-potato;
2. Barley-clover/grass-clover/grass-rye-barley-potato

### *Crop rotation OF*

Spring barley with clover as undersown- grasses- winter rye- potatoes.

## How work was carried out?

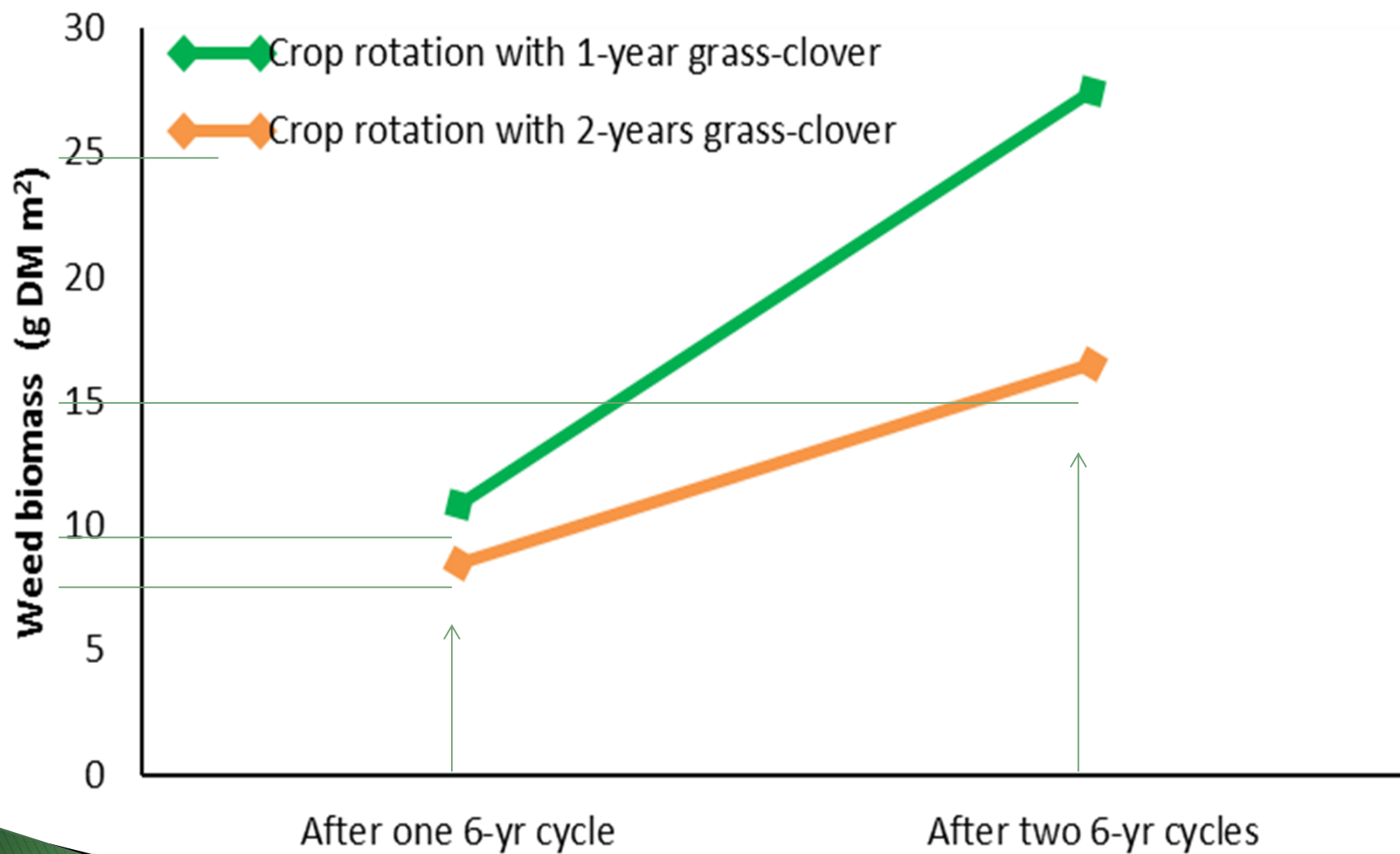
### Two experiments

1. Grass/clover mixture (*Trifolium pratense* L. and *Phleum pratense* L.) as under-sowing in spring barley (*Hordeum vulgare* L.) was grown for one and two seasons in six field crop rotation in long-term experimental field.
2. Red clover 'Raunis', white clover 'Daile', and ryegrass as undersown in spring barley 'Ruja' was grown for two seasons on peaty sod gleyic soil at organically managed field.

Numbers of weed plants in spring (BBCH 20–29) were recorded using 0.1 m<sup>2</sup> frame in 10 places; plant biomass of under-sown crops and weeds were sampled within 1.0 × 1.0 m squares after the first cut in the following year after harvesting of main crop (barley).



*Undersowing effect in two 6-field rotations, LTE*





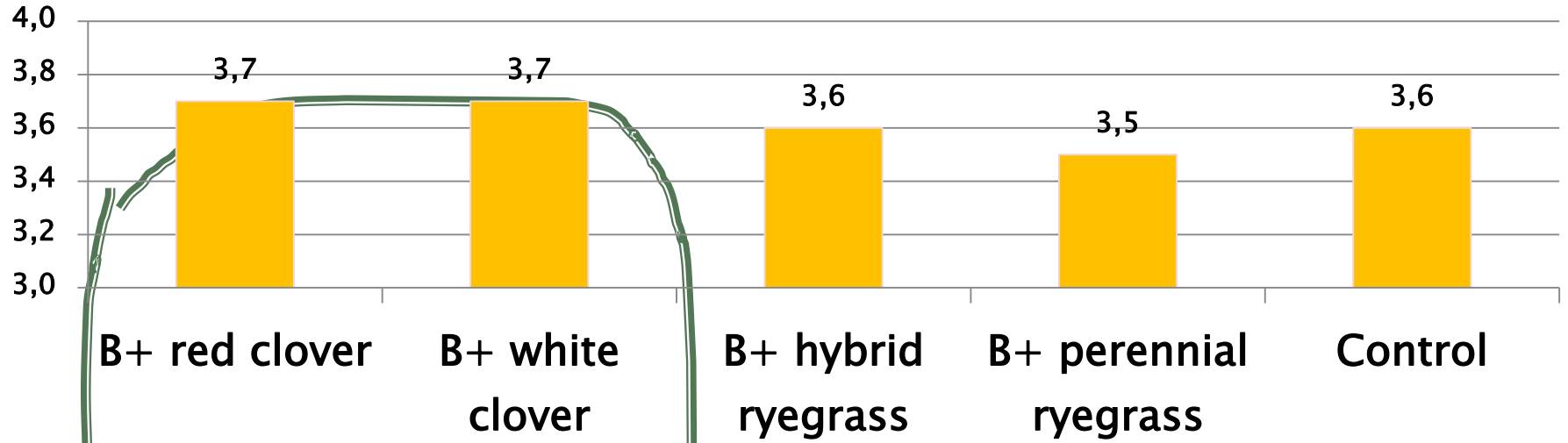
*The most common weed species in 6 field crop rotation in spring barley with grasses undersown*

Crop rotation	1 <sup>st</sup> rotation	2 <sup>nd</sup> rotation	3 <sup>rd</sup> rotation	4 <sup>th</sup> rotation
1. barley – grasses – barley – rye – barley – potato	CHEAL VICHI ELYRE RAPRA TRIIN	CHEAL TRIIN RAPRA CENCY VICHI	CHEAL TRIIN SPRAR RAPRA TAROF	CHEAL GALSS SPRAR CENCY TRIIN
2. barley – grasses – grasses – rye – barley – potato	CHEAL RAPRA TRIIN SPRAR VICHI	CHEAL VICHI SPRAR CENCY GALSS	CHEAL SPRAR THLAR STEME CENCY	CHEAL SPRAR CENCY CAPBP STEME

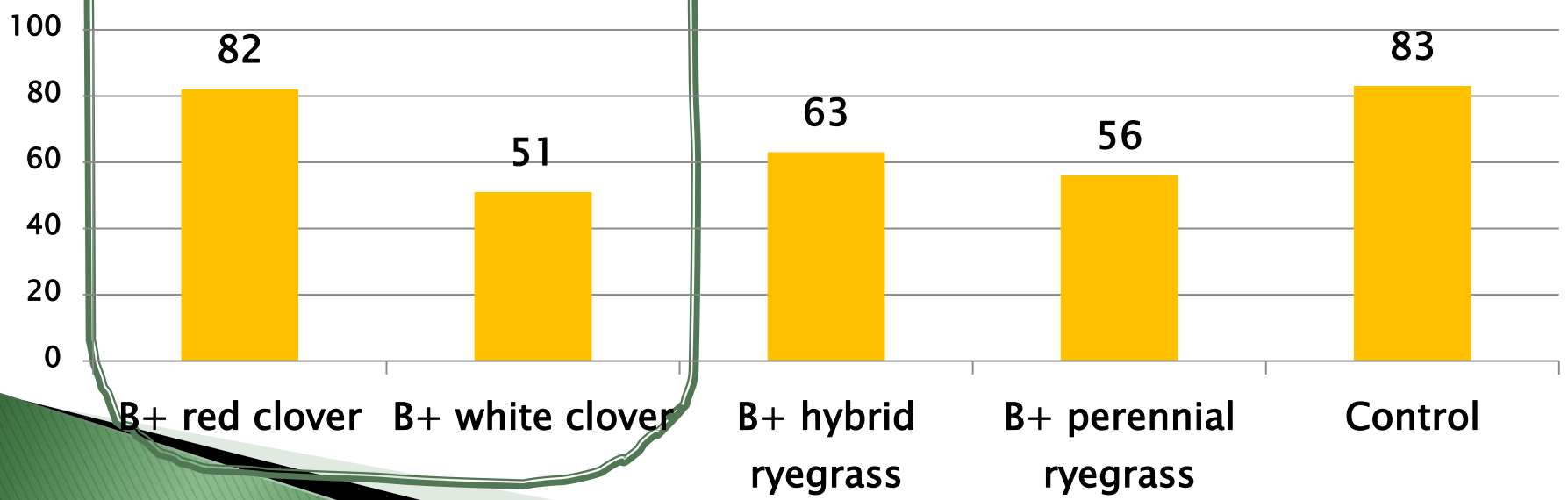
***Weed proportion in sward of perennial grasses  
depending crop rotation cycle, %  
(LSD<sub>95</sub>-2.01)***

Crop rotation	1 <sup>st</sup> rotation	2 <sup>nd</sup> rotation	3 <sup>rd</sup> rotation	4 <sup>th</sup> rotation
1. barley – grasses – barley – rye – barley – potato	4.3 a	4.9 a	6.5 b	7.1 c
2. barley – grasses – grasses – rye – barley – potato	4.2 a	4.9 a	6.1 ab	6.4 b

# Yield, 'Rūja', t ha<sup>-1</sup>



# Weed biomass, g m<sup>2</sup>







*Pictures of weeds by PRODIVA partners*



### From LTE:

under-sown in spring cereals can improve weed management, but effect decreasing through period: starting 3-rd rotation weed proportion going up, therefore **VERY IMPORTANT** is to respect agronomical factors.

## From OF field

Yield reductions caused by weeds can be reduced with successful choice of cover crops which are grown together with the main crop, but we need respect field conditions very carefully.

Red clover?

# Potential of cover crops for weed management in organic cropping

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