Table 7. Crop yields (Mg/ha, DM) from the Grain rotation that compares reduced herbicide (RH) and "standard" herbicide (SH) treatments.

Crop	Year	RH (6 yr)	SH (6 yr)	SE	Constrast RH vs. SH
		Mg ha^{-1}			p value
Corn Grain	2010	10.94	10.61	0.29	0.450
	2011	8.95	8.39	0.25	0.127
	2012	8.31	8.62	0.32	0.299
Soybean Grain	2010	4.33	4.22	0.26	0.791
	2011	2.78	3.34	0.25	0.132
	2012	2.40	3.53	0.32	**0.004**
Forages Yr. 1	2010	6.95	8.60	0.57	**0.001**
	2011	4.42	3.46	0.39	**0.020**
	2012	7.40	5.98	0.47	**0.043**
Forages Yr. 2	2010	8.30	8.90	0.57	0.145
	2011	14.06	14.16	0.39	0.755
	2012	10.69	12.87	0.47	**0.005**
Forages Yr. 3	2010	4.58	6.16	0.40	**0.001**
	2011	9.44	10.35	0.39	**0.026**
	2012	8.55	10.86	0.47	**0.003**
Canola	2010	1.42	1.01	0.30	0.380
	2011	2.06	1.99	0.25	0.843
	2012[ǂ]	1.56	0.88	0.32	**0.045**

[ǂ]2012 Grain Rotation canola corrected for yield loss

WEED MANAGEMENT COMPARISON		Tests of Fixed Effects		
Source of Variation	df	p value		
Year		2010	2011	2012
Crop	5	**<0.001**	**<0.001**	**<0.001**
Weed Mgt	1	**0.008**	0.983	**0.002**
MainMgt*Crop	5	**0.005**	**0.025**	**<0.001**

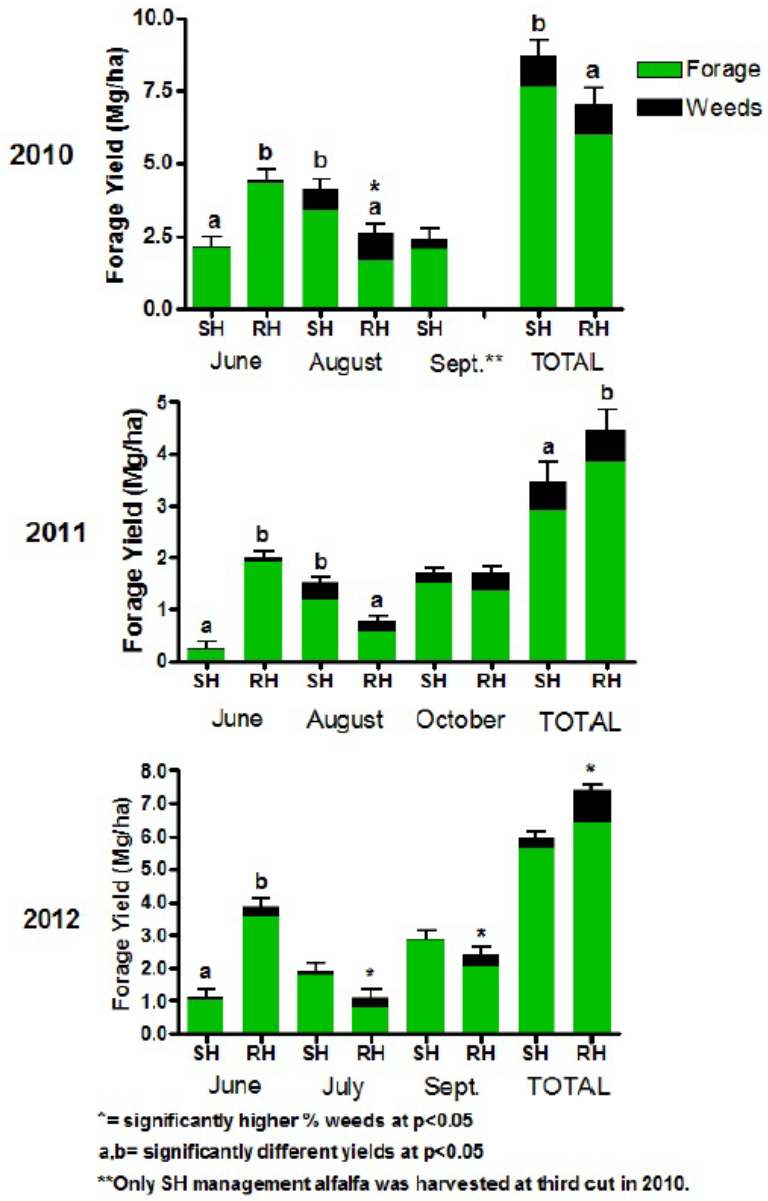

Fig. 8. Three years of establishment stand yields and % weeds by cutting for pure alfalfa in the standard herbicide (SH) rotation and for alfalfa, orchard grass, pea, and triticale in the reduced herbicide (RH) rotation.

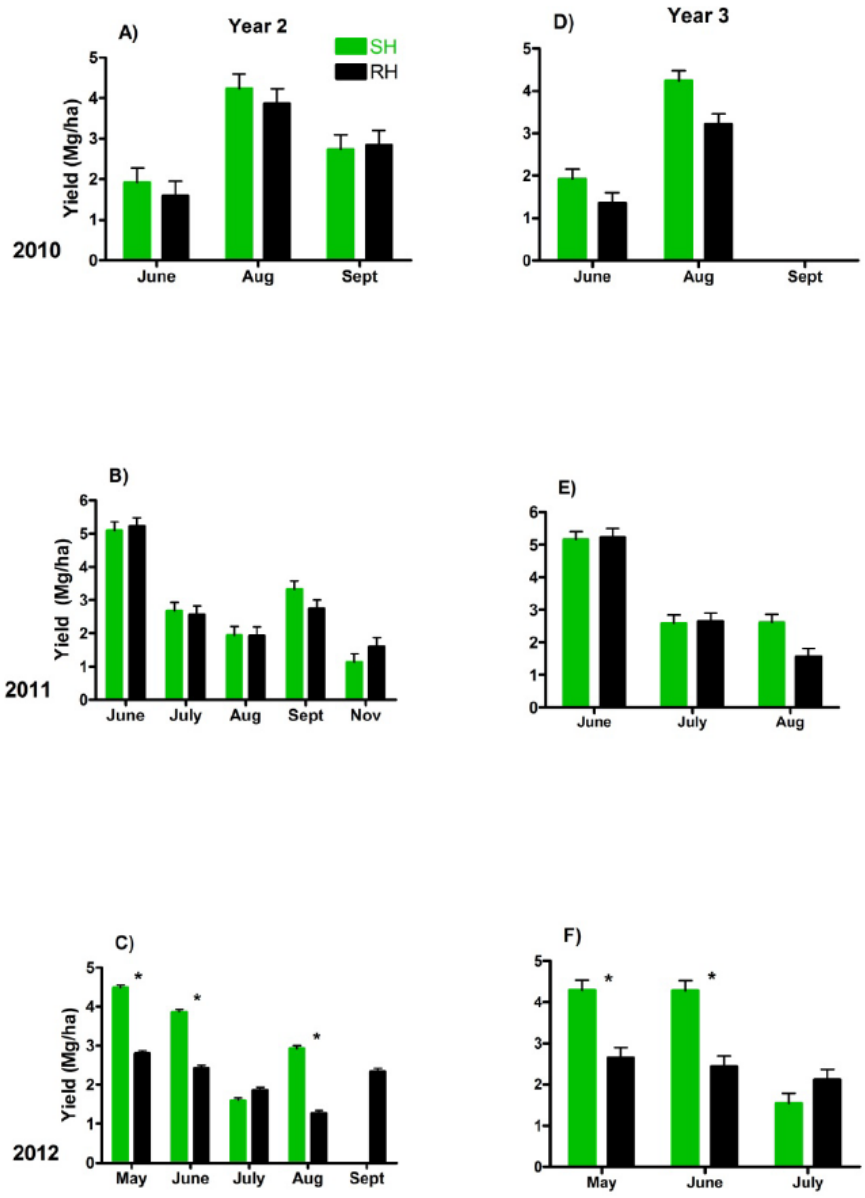

Fig. 9. Forage yield (Mg/ha) by harvest date for year 2 and year 3 crop entry points in the GRAIN rotation in 2012. Management comparison is reduced herbicide (RH) vs. "standard" herbicide. RH treatment is alfalfa and orchard grass; the SH treatment is alfalfa alone. Cuttings were taken at the same time each month in 2010-2011 but not in 2012, where alfalfa and grass were cut ~ 2 weeks earlier than pure alfalfa to improve forage quality.

*Table 8. Cover crop biomass, weed biomass, and crop yields in **corn grain**: GRAIN Rotation 2010-2012. "SH" refers to standard herbicide weed management strategy and "RH" refers to reduced herbicide weed management strategy.*

Year/Management	Row Spacing	Cover Crop Biomass£ Mg/ha	SE	Weed Biomass€ g/m2	SE	Yield€ Mg/ha	SE
2010							
SH	**76 cm**	**2.2^**	----	**1.0**	1.3	**10.6**	0.3
RH	**76 cm**	**2.3^**	----	**3.3**	1.3	**10.9**	0.3
2011							
SH	**76 cm**	**0.3**	0.1	**0.2 b**	3.5	**8.4**	0.3
RH	**76 cm**	**0.5**	0.1	**20.6 a**	3.5	**9.0**	0.3
2012							
SH	**76 cm**	**1.6 a**	0.1	**0.3**	6.7	**8.6**	0.3
RH	**76 cm**	**1.0 b**	0.1	**15.7**	6.7	**8.3**	0.3

a,b- Indicate values that were statistically significant by weed management.

€- Dry matter reported.

^- Statistical analysis not performed on cover crop biomass in 2010 as biomass was only collected from half of the plots.

*Table 9. Cover crop biomass, weed biomass, and crop yields in **soybean**: GRAIN Rotation 2010-2012. "SH" refers to standard herbicide weed management strategy and "RH" refers to reduced herbicide weed management strategy.*

Year/Management	Row Spacing	Cover Crop Biomass£ Mg/ha	SE	Crop Population plants/ha	SE	Weed Biomass€ g/m2	SE	Yield€ Mg/ha	SE
2010									
SH	**19 cm**	**2.0 ^**	----	**295,163**	16377	**0.0**	3.8	**4.2**	0.3
RH	**76 cm**	**1.5 ^**	----	**343,239**	16377	**8.0**	3.8	**4.3**	0.3
2011									
SH	**19 cm**	**3.5 b**	0.3	-----	-----	**0.4 b**	11.4	**3.3 a**	0.3
RH	**76 cm**	**4.4 a**	0.3	-----	-----	**89.0 a**	11.4	**2.8 b**	0.3
2012									
SH	**19 cm**	**4.9**	1.3	**289,209 a**	26459	**0.0**	0.5	**3.5 a**	0.3
	76 cm	**4.5**	0.9$	**151,947 b**	39219$	**0.1**	0.1$	**3.1 ab**	0.3
RH	**76 cm**	**7.9**	1.3	**111,278 b**	26459	**1.2**	0.5	**2.4 b**	0.3

a,b- Indicate values that were statistically significant by SH or RH management.

£-Rye terminated in RH soybeans earlier than in SH soybeans in every year, and is rolled down with a roller-crimper

€- Dry matter reported.

^- Statistical analysis not performed on cover crop biomass in 2010 as biomass was only collected from half of the plots.

$- SE reported determined by within Main Management comparison between SH-19 cm row and SH-76 cm row.

Table 10. Herbicide active ingredient rates by crop and main management- GRAIN Rotation.

Crop	Active Ingredient	SH kg active ingredient/ha	RH kg active ingredient/ha	% change in ai: SH to RH
Alfalfa (Yr.1)	glyphosate	0.84	0.84	
POST	2,4-DB	1.12	0.00	
	clethodim	0.14	0.00	
TOTAL		2.10	0.84	-0.6
Canola	glyphosate	1.26	0.00	
	2,4-D	0.84	0.00	
TOTAL		2.10	0.00	-1.0
Rye Cover	glyphosate	0.84	0.84	
	2,4-D	0.56	0.56	
TOTAL		1.40	1.40	0.0
Soybean	glyphosate	0.84	0.84	
	2,4-D	0.56	0.56	
PRE	flumioxazin	0.06	0.02	
	chlorimuron	0.02	0.01	
	s-metolachlor	0.00	0.63	
POST	glyphosate	0.84	0.00	
TOTAL		2.33	2.06	-0.33
Rye Cover	glyphosate	0.84	0.84	
	2,4-D	0.56	0.56	
TOTAL		1.40	1.40	0.0
Corn	glyphosate	0.84	0.84	
	2,4-D	0.56	0.56	
PRE	pendimethalin	1.59	0.53	
	s-metolachlor	1.87	0.63	
	mesotrione	0.00	0.03	
POST	dicamba	0.08	0.00	
	diflufenzopyr	0.03	0.00	
TOTAL		4.98	2.59	-0.48
Total Active Ingredient Use in 6-year rotation		**14.32**	**8.30**	**-0.42**