Potential of Warm-Season Annual Pastures in Rotation with Corn Silage for Organic Dairies

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Objectives

Compare yield and quality of annual warm-season pastures • Determine affects on yield of corn silage following annual warm-season pastures in rotation • Compare yield of annual warm-season pasture rotated to corn silage with two years of established cool-season perennial pasture • Perform partial-budget analysis to determine effect of switching from cool-season perennial pasture to warm-season annual pasture rotated to corn silage on farm profitability

Background

Complementing cool-season pastures with warm-season pastures can provide a more uniform pasture availability throughout the grazing season. Increased and constant pasture availability is especially important for organic producers because of the newly defined grazing requirement for organic dairy. Using warm-season annual grasses in rotation with corn silage allows dairy farmers to increase their available pasture without exchanging a field for perennial pasture.

Methods

The experiment took place at the Russell E. Larson Agricultural Research farm near Rock Springs, PA. It consisted of three trials which were initiated in 2012 at one site and in 2013 at two sites. The study has 8 treatments of monoculture and mixed stand cool-season perennial and warm-season annual pastures. The cool-season perennial pasture treatment was a red clover (*Trifolium pretense* L. cv. Renegade) and orchardgrass (*Dactylis glomerata* L. cv. Niva) mix. Warm-season pastures include sorghum-sudangrass (*Sorghum* x *drummondii* cv. AS6402UT) and teff (*Eragrotis tef* cv. Velvet) in monoculture or two and three species mixes with red clover. Warm-season annual pastures and the red clover monoculture were rotated to corn silage.

Grazing of the pastures was simulated using a Carter Mfg. Co. forage harvester and was initiated based on weed pressure and plant maturity. Subsequent grazing events took place at approximately thirty day intervals. Species composition, forage quality, and DM yield data were collected at every simulated grazing event. Forage quality and DM yield were also collected at corn silage harvest.

The partial budget analysis determines the change in net returns when comparing an all cool-season perennial pasture system and an all warm-season annual pasture rotated to corn silage system. The budget is calculated over four years.

Results

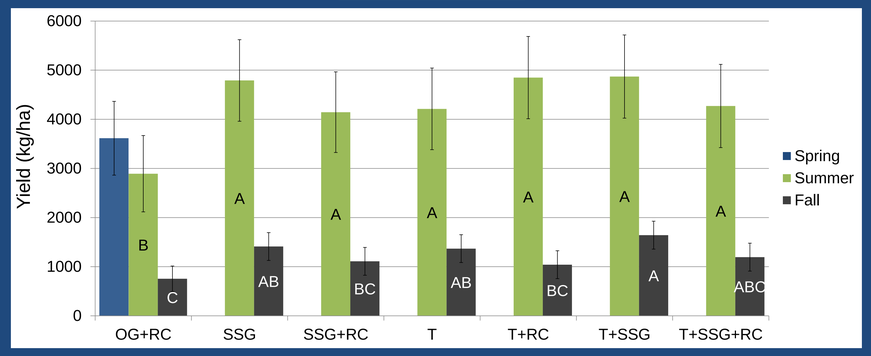

Figure 1. Mean yields of pasture summed within season.

Treatment	CP	ADF	NDF	IVTD	NDFD
	----------% DM----------				--% NDF --
OG+RC	20.62 a	32.48 ab	50.66 a	77.28 a	53.52 d
SSG	20.94 a	31.56 b	52.50 a	84.14 a	68.95 a
SSG+RC	21.41 a	31.39 b	49.98 a	83.03 a	64.81 abc
T	20.62 a	33.83 a	55.12 a	80.14 a	63.67 bc
T+RC	20.94 a	33.53 a	52.94 a	80.18 a	61.88 c
T+SSG	20.27 a	32.75 ab	53.83 a	82.28 a	66.60 ab
T+SSG+RC	19.92 a	32.94 ab	53.22 a	80.10 a	62.52 bc

Table 1. Forage quality of pastures. CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, IVTD = in vitro total digestibility, NDFD = neutral detergent fiber digestibility

OG	= Orchardgrass
RC	= Red clover
SSG	= Sorghum-sudangrass
T	= Teff
WSA	= Warm-season annual pasture
CSP	= Cool-season perennial pasture
CS	= Corn silage

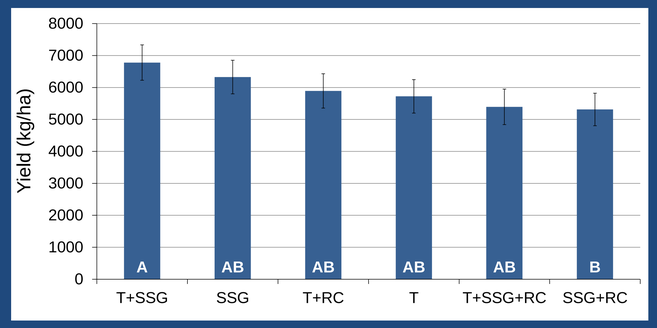

Figure 2. Mean season-end yields of warm-season pastures.

Systems over 4 years		T	SSG	T+SSG	T+RC	SSG+RC	T+SSG+RC
		----------dollars*acre^{-1}----------					
Income	WSA Milk Yield	5,339.56	5,898.25	6,307.10	5,219.22	4,793.11	4,760.43
	CS Milk Yield	10,675.28	10,345.36	9,004.26	9,605.31	11,142.81	9,679.40
	CSP Milk Yield Seeding year	1,404.15	1,404.15	1,404.15	1,404.15	1,404.15	1,404.15
	CSP Milk Yield Established years	11,217.54	11,217.54	11,217.54	11,217.54	11,217.54	11,217.54
Costs	Additional Costs	688.58	761.06	755.81	711.16	769.07	764.76
	Reduced Costs	130.20	130.20	130.20	130.20	130.20	130.20
	Positive Effects	16,145.04	16,373.81	15,441.57	14,954.73	16,066.12	14,570.03
	Negative Effects	13,310.27	13,382.75	13,377.50	13,332.85	13,390.76	13,386.45
	Net Difference	2,834.77	2,991.06	2,064.06	1,621.88	2,675.35	1,183.57

Table 2. Partial budget analysis for change in net returns over four years moving from a cool-season perennial system to a warm-season annual pasture rotated to corn silage system.

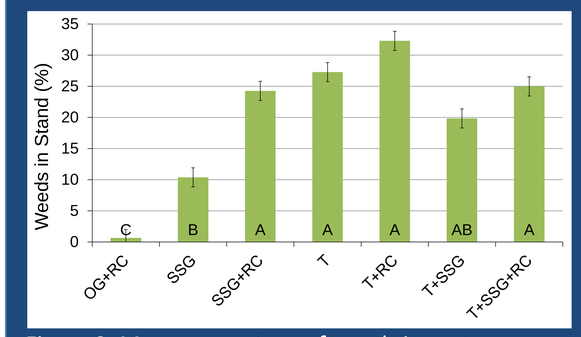

Figure 3. Mean percentage of weeds in pastures.

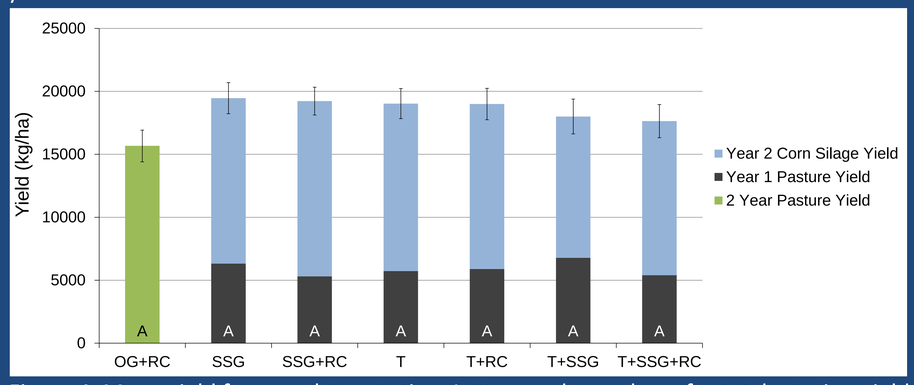

Figure 4. Mean yield for complete rotation. Letters and error bars for total rotation yield.

Conclusions

The warm-season annual pastures (WSA) generally had similar yields. All warm-season annual pastures yielded higher than the cool-season perennial pasture (CSP) during the summer and the warm-season annual pastures that did not contain red clover yielded higher than the CSP during the fall. The CSP suppressed weeds best overall but out of the WSA the sorghum-sudangrass had the least weeds. Quality was similar among the WSA and the CSP, although NDFD was better for the WSA. The WSA did not affect corn silage (CS) yield as corn silage yielded similarly between all treatments (results not shown). Yield did not differ between the CSP system and the WSA-CS system. The WSA-CS system is expected to produce higher net returns compared to the CSP system over four years. The results of this experiment indicate that using warm-season annual pastures in rotation with corn silage could be a profitable option for organic dairy producers looking to increase on farm feed and forage production.