FAFO Report: July 2010 Part I: Final

Improving net profit under Intensive Grazing Management

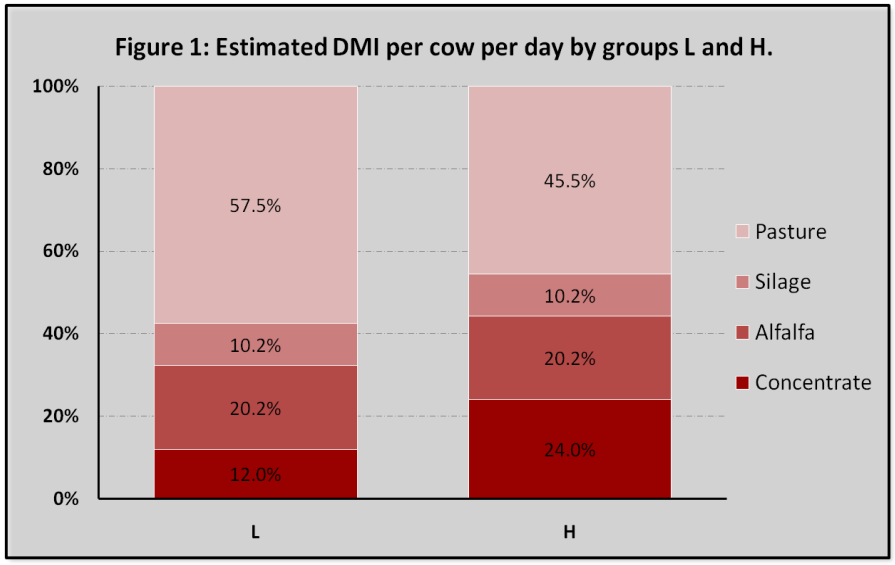
C.A. Daley, S. Horton, D.E. Holmes

California State University, Chico - Organic Dairy Farm
Sponsor: Organic Valley Farmers Advocating For Organics (FAFO) Fund

Objective: To study the impact of reducing grain inputs in an intensive grazing system on milk production, milk quality and income over feed costs.

The old adage "less is more" can be applied to grain supplementation under managed intensive grazing systems where pasture quality and quantity are in good supply. In a recent study completed on the Organic Dairy Farm at California State University Chico, cows supplemented with grain at 12% of their dry matter intake (DMI) had a significantly higher economic return (as reflected in income over feed costs), as compared to cows supplemented at 24% of their DMI under an intensive grazing system. All cows were grazed on cool season pasture forages including a mixture of annual and perennial ryegrass, prairie brome grasses, brassicas and white clover.

Data was collected over the course of the four month trial on seventy-five crossbred Jersey-Holstein cows that averaged sixty days in milk at the onset of the study. All cows were peaked at 14 lbs of grain, and then allotted to one of two treatment groups based on age and milk production. Treatments included *Group L*: Low supplementation group fed 6 lbs of grain/head/day (n=36 cows), and *Group H*: High supplementation group fed 12 lbs of grain (n=37 cows). The average cost and composition of the ad libitum and supplementary feeds are illustrated in Figure 1. All cows had ad libitum access to pasture and water and were rotated into a fresh feed every 12 hours. Both treatment groups were fed equal amounts of alfalfa hay (8.9 lb DM) and winter forage mix silage (4.5 lb DM) in a feed bunk once daily in the evening.



The concentrate used for supplementation was equal parts rolled corn and rolled barley and fed twice daily at the time of milking so that intake could be closely monitored. Daily DMI estimate was based off 4% of the herd average cow weight (1100 pounds) amounting to an average estimated DMI of 44 pounds per cow per day. The amounts of DMI from the alfalfa, winter mix silage, and concentrate were subtracted from the total estimated DMI to reach the estimated pasture consumption for group L of 25.32 pounds DM (58% of total DMI) and of 20.04 pounds DM (46% of total DMI) for group H.

Individual milk yield (Dairy Comp 305) was measured at each milking and recorded as a daily value. Individual milk quality (AgriTech Analysis) measurements consisting of somatic cell count, protein, butterfat, and solids non-fat, were measured monthly.

Feed costs were calculated to determine the cost differential between groups L and H. Analysis of variance (ANOVA: statistical analysis) was applied to the quantity and quality components to establish income per day per cow. Milk yields were collected daily throughout the treatment period, data for quality and components were collected from the monthly DHIA reports and analyzed by cow and by treatment. Each cow was then assessed for Income Over Feed Cost (IOFC) which was measured in dollars per cow per day, as well as establishing Feed Cost/ CWT of milk produced. ANOVA analysis was used to determine treatment effects with respect to IOFC and FC/CWT between groups L and H and will represent our evaluation of overall profitability. Both figures reflect the difference between the price of milk and the cost to produce it (Bailey, 2007). The feed cost differential between groups L and H was calculated at $0.84 per head per day or approximately $25.20 per cow per month (Table 9). These figures are down 24% from one year ago due to the decline in feed prices. The main portion of this feed savings is based on the lower supplementation rate in group L. The diet for group L was 12% lower in concentrate and 12% higher in forage (from the pasture) than group H creating a cost savings because of the lower cost of pasture versus grain. Previous studies by Hanson et al. (1997) would agree, programs that utilize grazing have lowered overall feed costs.

Overall, there was no statistical difference between the mean pounds of milk yield for group L (48.34 ± 1.84) and group H (50.12 ± 1.82) (Table 5), there was on average 1.78 lbs more total milk produced per day in the H group receiving 12 lb of grain/day as compared to cows receiving 6 lb of grain/day. Interestingly, the additional 6 lbs of grain produced only 1.78 lb of milk. If our milk is worth $0.24/lb and our grain costs $0.21/lb, we are spending $1.26 and getting $0.42 in return.

McEvoy et al., (2007), with the Dairy Production Research Centre, Moorpark, Ireland, conducted a similar study where he found at higher forage intakes (17 kg DMI = 38.25 lbs) there was no difference in milk production between cows receiving 3 kg (6.75 lb) grain and those who consumed 6 kg (13.5 lb) of grain, using Holstein cows. We did not detect differences in components including protein, fat and solids non-fat, or in somatic cell counts.

Using 2009 grain prices ($425/T delivered), we saw significantly lowered feed costs/cwt of milk produced, indicating that the low grain feeding regime decreases feed costs significantly without a significant drop in milk production or milk components (under unlimited grazing of high quality forages).

Income over feed costs (IOFC), was not different between groups H and L ($6.90 vs $7.42, respectively for the High and Low grain treatments). While there is a $0.52 cent advantage for the low grain group, there was not adequate numbers to establish a statistical difference, nonetheless, for a 100 cow herd, there would be a $52/day advantage to the low grain group.

In addition, there was no reported difference in reproductive performance, with an average of 83.6 ± 5.05 days open for the H group and 79.6 ± 4.98 days open for the L group (Table 10). No significant difference in body condition score was noted between groups.

Table 2: Mean (S.E) percentage fat between groups L and H.

	L	H	P-value
April	4.18(0.12)	4.04(0.012)	0.400
May	3.75(0.10)	3.81(0.10)	0.629
June	3.56(0.10)	3.90(0.09)	0.743
July	3.83(0.11)	3.98(0.11)	0.372
Period Average	3.71(0.08)	3.80(0.08)	0.472

Table 3: Mean (S.E.) percentage solids non-fat between groups L and H.

	L	H	P-value
April	9.07(0.05)	9.20(0.05)	0.063
May	8.97(0.05)	9.00(0.04)	0.547
June	8.93(0.05)	8.95(0.05)	0.711
July	8.95(0.05)	8.99(0.05)	0.580
Period Average	8.95(0.04)	8.98(0.04)	0.586

Table 4: Mean (S.E.) somatic cell counts between groups L and H.

	L	H	P-value
April	100.40(39.73)	147.20(39.73)	0.408
May	112.95(17.96)	118.51(17.96)	0.827
June	150.78(30.58)	129.89(31.79)	0.637
July	135.87(20.81)	114.29(20.81)	0.466
Period Average	127.03(21.67)	133.86(21.40)	0.823

Table 5: Mean (S.E.) values for milk quantity and quality between groups L and H.

	Group			
Item	All	High	Low	P-value
Milk (lbs)	49.64 ± 1.83	50.94 ± 1.82[a]	48.34 ± 1.84[a]	0.33
Protein (%)	3.24 ± 0.06	3.23 ± 0.06[a]	3.25 ± 0.06[a]	0.84
Fat (%)	3.76 ± 0.08	3.80 ± 0.08[a]	3.71 ± 0.08[a]	0.472
Solids Non-Fat (%)	8.97 ± 0.04	8.98 ± 0.04[a]	8.95 ± 0.04[b]	0.586
Somatic Cell Count (100,000 cells/mL)	130.4 ± 21.67	133.86 ± 21.4[a]	127.03 ± 21.4[a]	0.823

Table 6: Costs and estimated composition of ad libitum and supplementary feed.

	As fed cost/ton	As fed cost/lb	DM*	DM cost/lb
Concentrate	$425.00	$0.21	88%	$0.24
Alfalfa	$225.00	$0.11	89%	$0.13
Winter Silage	$50.00	$0.03	30%	$0.08
Pasture	$40.00	$0.02	25%	$0.08

*Estimated DM% based on data from the Samuel Roberts Noble Foundation.

Table 7: Estimated daily intake per cow per day by groups L and H.

	Grain		Alfalfa		Silage		Pasture		Total	
	L	H	L	H	L	H	L	H	L	H
As-fed intake (lbs)	6	12	10	10	15	15	101.3	80.2	132.3	117.2
DM Intake (lbs)*	5.28	10.56	8.9	8.9	4.5	4.5	25.32	20.04	44	44
% of DMI	12%	24%	20%	20%	10%	10%	58%	46%	100%	100%

Table 8: Feed cost per cow per day by groups L and H.

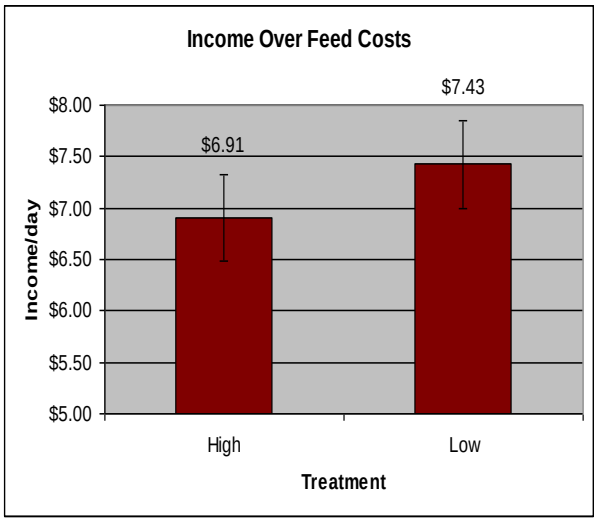
	Grain		Alfalfa		Silage		Pasture	
	L	H	L	H	L	H	L	H
DM Intake (lbs)*	5.28	10.56	8.9	8.9	4.5	4.5	25.32	20.04
Feed prices (lb DM)	$0.24	$0.24	$0.13	$0.13	$0.08	$0.08	$0.08	$0.08
Costs (cow/day)	$1.27	$2.53	$1.16	$1.16	$0.36	$0.36	$2.03	$1.60

Table 9: Price, average daily production and components, and income for cows in groups L and H.

	Pounds milk		% Butterfat		% Protein		% Other solids		Total	
	L	H	L	H	L	H	L	H	L	H
Price per cwt.	$22.00		$2.10		$1.80		$1.62			
Daily values	48.34	50.94	3.71	3.8	3.25	3.23	5.7	5.75		
Income/cow/month	$319	$336	$113	$122	$85	$89	$134	$142	$651	$689

Table 10: Average Days Open for cows in groups L and H.

	Treatment		
	L	H	P-Value
Avg. Days Open	83.6 (5.05)	79.55 (4.98)	0.566



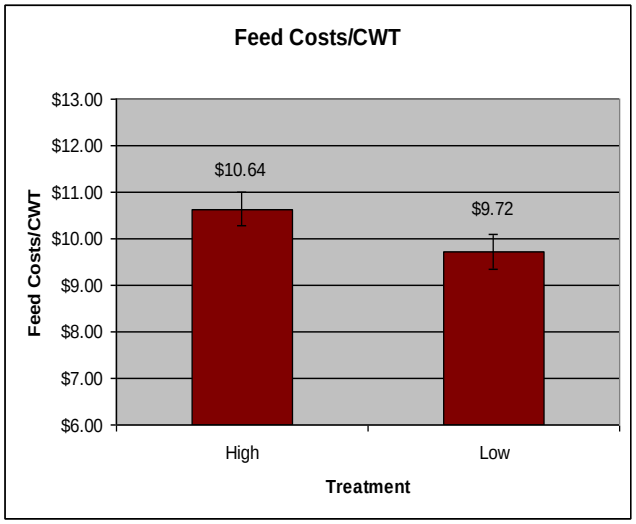
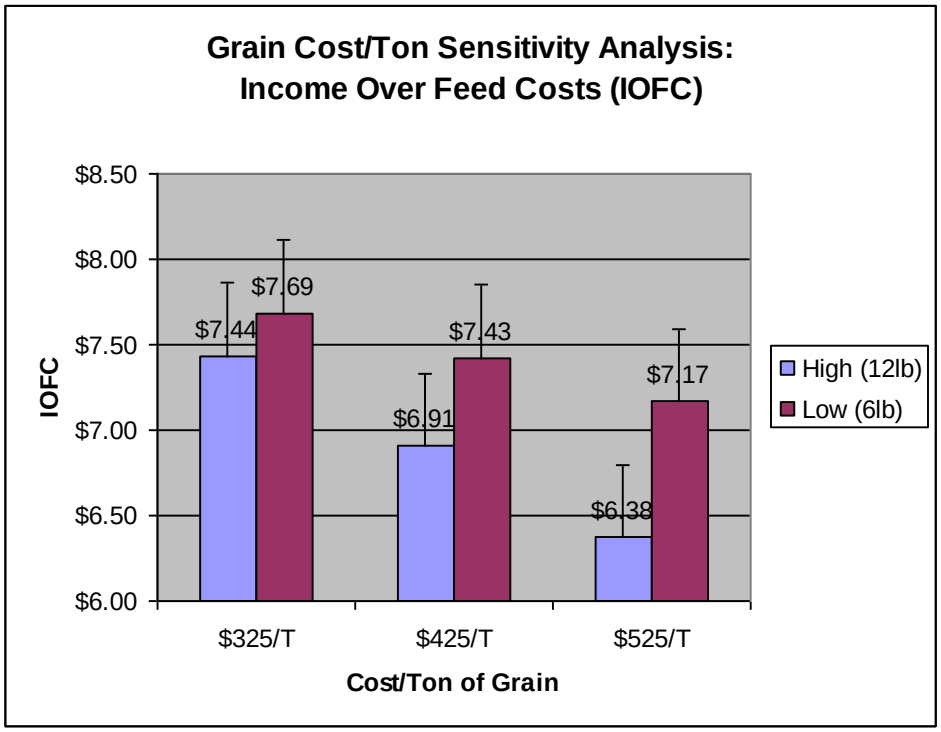


Table 11 : Grain Price Sensitivity Analysis for groups L and H.

	Grain $325/ton		Pasture		Total Feed Costs	
	L	H	L	H	L	H
DM Intake (lbs)*	5.28	10.56	25.32	20.04	44	44
Feed prices (lb DM)	$0.16	$0.16	$0.08	$0.08		
Costs (cow/day)	$0.86	$1.72	$2.03	$1.60	$4.41	$4.83

	Grain $425/ton		Pasture		Total Feed Costs	
	L	H	L	H	L	H
DM Intake (lbs)*	5.28	10.56	25.32	20.04	44	44
Feed prices (lb DM)	$0.21	$0.21	$0.08	$0.08		
Costs (cow/day)	$1.12	$2.24	$2.03	$1.60	$4.67	$5.36

	Grain $525/ton		Pasture		Total Feed Costs	
	L	H	L	H	L	H
DM Intake (lbs)*	5.28	10.56	25.32	20.04	44	44
Feed prices (lb DM)	$0.26	$0.26	$0.08	$0.08		
Costs (cow/day)	$1.39	$2.77	$2.03	$1.60	$4.93	$5.89



Conclusions –A key finding of this study was that decreasing the concentrate supplementation levels from 24 to 12 percent of DMI was shown to have little impact on milk yield or milk quality in an intensively managed, pastured based dairy with high forage quality, resulting in a higher net profit/cow.

Our study shows that forages can be a suitable substitute for grain inputs under intensive grazing management where pastures provide ample high quality forages.

Of special note were some of the behavioral changes we identified. We observed cows on the low grain treatment grazed more than the high grain cows, suggesting that when cows are subsidized too well, there is less incentive to get out there and harvest feed on their own. From a sustainability perspective, as well as from an economical point of view, the low grain/ high pasture DMI ration showed favorable results.

This study has shown that the income over feed costs and feed costs/cwt of milk produced can be significantly greater for the low supplementation group, making intensive grazing a highly profitable solution for organic dairy farmers with access to high quality pastures.

References

Bailey, K. 2007. "Dairy Risk-Management Education - Tracking Milk Prices and Feed Costs." Pennsylvania State University.

Dartt, B.A., J.W. Lloyd, B.R. Radke, J.R. Black, and J.B. Kaneene. 1999. "A Comparison of Profitability and Economic Efficiencies Between Management-Intensive Grazing and Conventionally Managed Dairies in Michigan." *Journal of Dairy Science* 82:2412-2420.

"Feed Library." *The Samuel Roberts Noble Foundation*. Available at: http://www.noble.org/Ag/FeedLib/Index.aspx. Accessed February 12, 2009.

Hansen, G.D., L.C. Cunningham, M.J. Morehart, and R.L. Parsons. 1998. "Profitability of Moderate Intensive Grazing of Dairy Cows in the Northeast." *Journal of Dairy Science* 81:821-829.

Hermansen, J.E., S. Osterson, N.C. Justesen, and O. Aaea. 1999. "Effect of levels of N fertilizer, grass, and supplementary feeds on nitrogen composition and renneting properties of milk from cows at pasture." *Journal of Dairy Research* 61:179-189.

Hutgens, M. 2009. "Huge Losses Greet June Dairy Month." College of Agriculture, Consumer, and Environmental Studies, University of Illinois.

Lopez-Villalobos, N., Garrick D.J., 2002. Economic Heterosis and Breed Complementarity for Dairy Cattle in New Zealand. 7th World Congress on Genetics Applied to Livestock Production, August 19-23rd, 2002. Montpellier, France.

McEvoy, M.E., E. Kennedy, J.P. Murphy, T.M. Boland, L. Delaby, and M. O'Donovan. 2008. "The Effect of Herbage Allowance and Concentrate Supplementation on Milk Production Performance and Dry Matter Intake of Spring Calving Dairy Cows in Early Lactation. *Journal of Dairy Science* 91:1258-1269.

Robiana, A.C., C. Grainger, P. Moate, J. Taylor, and J. Stewart. 1998. "Responses to grain feeding by grazing dairy cows." *Australian Journal of Experimental Agriculture* 38:541-549.

Rotz, C.A., G.H. Kamphuis, H.D. Karsten, and R.D. Weaver. 2007. "Organic Dairy Production Systems in Pennsylvania: A Case Study Evaluation." *Journal of Dairy Science* 90:3961-3979.

Sehested, J., T. Kristensen, and K. Søegaard. 2003. "Effect of concentrate supplementation level on production, health, and efficiency in an organic dairy herd." *Livestock Production Science* 80:153-165.

Soder, K.J. and C.A. Rotz. 2001. "Economic and Environmental Impact of Four Levels of Concentrate Supplementation in Grazing Dairy Herds." *Journal of Dairy Science* 84:2560-2572.

Tozer, P.R., F. Bargo, and L.D. Muller. 2004. "The Effect of Pasture Allowance and Supplementation on Feed Efficiency and Profitability in Dairy Systems." *Journal of Dairy Science* 87:2902-2911.

Zezima, K. 2009. "Organic Dairies Watch the Good Times Turn Bad," *The New York Times*, May.