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DAIRY NEWS

MULTI-CROP FORAGE PRODUCTION IN DAIRY FARMS

Increasing the efficiency to produce forages at farm level has at least three important effects: 1. Integrate crop and animal production to utilize manure as a plant nutrient source to reduce expenditure on both fertilizer and manure disposal. 2. Help to close the nutrient balances in farms with high animal stocking rates and/or relatively limited acreage, and 3. Decrease amount of purchase feeds and as a consequence the farm inputs of nitrogen (N), phosphorus (P) and other nutrients. The aim of this newsletter is to discuss a recent paper[1] related on how intensive forage systems can produce acceptable to high quality forage, protect the environment and be economically attractive.

The author's analyzed results of trails conducted in the southern United States were dairy manure was used as the nutrient source for 2 or more years. The two systems investigated were: a mixture of Abruzzi rye grass and crimson clover over-seeded in the autumn into a Tifton 44 bermuda-grass sod (for spring haylage), minimum tillage silage corn seeded after rye/clover harvest, and bermuda-grass hay harvest in summer (CBR); and a conventional minimum tillage (no living cover crop) rye and clover established in the autumn (for haylage), a first crop of temperate corn in spring and a second crop of tropical corn in summer, both for silages (CCR). These systems were investigated at field scale under a pivot irrigation system and in replicated small plots, and included comparisons between manure and commercial fertilizers that was applied at rates based on soil testing following each crop. Manure N and P applications and recoveries in the forages are shown in Table 1.

For the two triple-crop systems reviewed in detail in this work, N and P recoveries were greater for a corn silage-bermuda grass hay-rye haylage system while yield and forage quality were greater for corn silage-corn silage-rye haylage system when manures were applied at rates to supplied N. However, average annual value-minus-cost for manure CBR was $1569/ha, while for CCR it was only $1018. This difference was primarily due to the increased cost of establishing an additional annual crop (tropical corn); along with increased pest control for the summer corn compared to bermuda grass. To this respect, the authors indicate that economic theory suggests dairy production decisions should focus on the joint value of milk and the manure that are produced. If the net return to the last unit of manure produced adds to the whole farm income, a greater volume of milk

[1] Newton et al, (2003) J. of Dairy Sc. 86:2243-2252

and manure is likely to be produced. Alternatively, if return from manure disposal are negative, specifically, if disposal costs exceed nutrient benefits, there is an incentive to reduce milk production and therefore the amount of manure produced. However the researchers indicate that the net result depends on the organization of the individual farms and the manure management decisions.

In Table 2, published information on the efficiency of different systems and crops is compared. Examination of several single, double and triple crop systems suggest that the per acre economical value of the forage produced as well as the N and P uptakes tend to follow dry matter yields. Grasses tend to out-perform broadleaf forages and irrigation forages produce higher value forages and recycle more nutrients than dry-land production. Systems which include bermudagrass tend to have some of the highest economic values and recoveries of N and P. Also it is concluded that the systems that produce the highest yields and/or forage quality not necessary have the greatest economic advantage. Applying manure based on N normally result in excess application of P and probably inadequate forage quality for herd's forage needs, additional measures (chemical analyses) to balance diets will be needed.

This information also shown that even under systems and management that make maintenance of the environment and efficient utilization of manure nutrient a priority, some escape of nutrients is inevitable. For example, when a triple crop system received deficient applications of N, the N that could not be accounted for was similar to that for adequate N application. Any manure utilization scheme or plan that does not recognize the need to deal with nutrients leaving the field or production areas is incomplete. Finally, the authors indicate that landscape features, such a vegetated filter strips and riparian forest can potentially be coupled with production systems to reduce environmental risk of escaped nutrients and provide other benefits at the same time.

Table 1. Manure N and P application and recovery for two systems of year-round forage production.

	Crop season								
	Spring		Summer		Autumn		Total		
Nutrient	Harvest (kg/ha)	Recovery (%)[1]	Harvest (kg/ha)	Recovery (%)[1]	Harvest (kg/ha)	Recovery (%)[1]	Applied (kg/ha)	Harvest (kg/ha)	Recovery (%)
Nitrogen									
CBR[2]	180.7	103	147.1	120	158.4	59	568	486.2	86
CCR[2]	180.5	115	104.5	61	99.1	43	560	384.1	69
Phosphorus									
CBR	45.2	61	19.0	52	22.0	26	196	86.2	44
CCR	46.0	72	18.1	36	13.1	16	197	77.3	39

[1] Percent of that applied during the cropping period

[2] CBR = corn-bermuda-rye/clover; CCR = corn-corn-rye/clover

Table 2. Comparisons of forages fertilized with dairy manure for yield, value, and N and P uptake.

Crop or system	Irrigated	DM yield (tonne/ha)	Crop ratio	Forage value ($/ha)	Nutrient harvest Nitrogen N (kg/ha)	Phosphorus P (kg/ha)
Single Crops						
Coastal bermudagrass	No	10.3	100	1220	285	69
Coastal bermudagrass	Yes	16.7	100	2022	300	38
Kenaf	No	3.7	100	472	52	6
Kenaf	Yes	13.8	100	2081	325	29
Forage sorghum	Yes	12.8	100	1417	120	16
Sorgo-sudan	Yes	16.6	100	1859	191	26
Pearl millet	Yes	12.8	100	1382	145	31
Grain sorghum	Yes	9.3	100	1141	124	19
Napier hybrid	Yes	11.7	100	1319	159	26
Corn	Yes	18.6	100	1959	274	46
Buffalograss	Yes	14.6	100	1457	248	
Sunflower	Yes	5.0	100	655	82	9
Lablab	Yes	7.9	100	1164	215	22
Cowpea	Yes	2.4	100	387	100	9
Double Crops						
T-85 bermudagrass/rye	Yes	26.5	85/15	3353	465	80
Perennial peanut/rye	Yes	18.1	75/25	2443	358	42
Coastal bermudagrass/wheat	No	11.3	80/20	1354	275	78
Coastal bermudagrass/wheat	Yes	16.5	76/24	2058	310	
Coastal bermudagrass/ryegrass	No	13.9	62/38	1691	200	
Coastal bermudagrass/ryegrass	Yes	23.6	77/23	3045	340	
Sorghum-sudan/wheat	Yes/no	18.2	83/17	2077		52
Triple Crops						
Corn/sorghum/rye	Yes	26.3	50/35/15	2985	320	60
Corn/bermudagrass/rye	Yes	24.6	51/33/16	2963	425	74
Corn/Perennial peanut/rye	Yes	18.4	61/15/24	2167	239	43
Corn/T.corn/rye	Yes	30.7	57/34/9	3361	380	77

Prolonged Oxytocin Treatment

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Naturally, oxytocin is produced by the pituitary gland. When released from the pituitary gland it causes contraction of the smooth muscles of the uterus and mammary gland. Various stimulations cause oxytocin to the released. The primary stimulation is from the massage of the surface nerve endings in the teats at the beginning of milking preparation. Modern cows may also be stimulated by the sound of the milking machine or the actions of the water in the wash pen. In the absence of sufficient hand massage, the action of the liners serves as a stimulus. In tropical settings, the presence of the calf may be the stimulus. After successful stimulation, oxytocin is released from the pituitary gland into the systemic blood stream. From the brain, the oxytocin is carried by the blood to the mammary gland where it causes the smooth muscles of the alveoli to contract. After these alveoli contract, the alveolar milk is forced down into the gland cistern and teat cistern. This release results in swelling of the teats and milk ejection. Once the milk is letdown into the gland and teat cisterns, the milking machine can remove the milk easily.

Under normal conditions of natural oxytocin release, 10-30% of the total milk will remain in the gland at the end of milking. This residual milk may amount to up to 2 cups of milk for the four quarters. The complete amount of residual milk can be taken from the gland following injection of oxytocin (10 i.u. injected IV).

Injectable oxytocin usually comes in a solution with 20 i.u. per ml or cc. The usual dosage is 10-20 i.u. to be given IV, IM or Subq. The action of injectable oxytocin is very rapid causing contraction of the mammary gland alveoli within 30 seconds. Oxytocin is often used in first calf heifers that are having difficulty letting down their milk during the initial adaptation to the milking parlor. It may also be used in older cows that have teat injuries resulting in letdown problems. In some cases, the injections of oxytocin are given over long periods of time as the cows seem to become “addicted” or in attempts to increase milk production.

In a recent report[1] studying chronic oxytocin injections, stopping the injections caused an abrupt drop in milk output. Three groups of seven cows were used in the study. The cows were milking 50-70 lbs/day with 2X milking. Cows in the study were intensively stimulated prior to milking. The oxytocin group got 50 i.u. prior to each milking for 21 days. Another group received NaCl in a volume equal to the oxytocin. And a final control group received no injections. On days 7, 14, and 21 the oxytocin group did not get oxytocin prior to the afternoon milking while the other groups remained the same. After that milking, all the cows in all three groups got 10 i.u. IV to remove their residual milk. The volume of milk at that milking decreased significantly (15-20% on average) in the oxytocin group with a range of 5-50% reduction. The other groups remained the same. The residual milk remained the same for all groups. No difference was noted in the groups when oxytocin was resumed on the following day.

The authors concluded that within one week after beginning daily pre-milking oxytocin treatment there was a reduction in normal milk removal when the oxytocin injections were omitted. They also felt that the amount of residual milk was not altered by repeated oxytocin injections. Regular injections of oxytocin will not reduce the amount of milking remaining the udder following proper stimulation of the udder during the preparation prior machine attachment. Prolonged use may eventually result in decreased production when the injections are halted and may cause the cows to resist entering the milking parlor. They suggest that regular administration of oxytocin should be carefully planned and only done when udder health was endangered by leaving large amounts of milk in the udder after milking.

[1]Bruckmair RM. Chronic oxytocin treatment causes reduced milk ejection in dairy cows. J Dairy Res. 70;123-126, 2003.

Chlorhexidine Not Recommended To Halt Lactation of Chronically Infected Quarters

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Chlorhexidine (Nolvasan) along with several other solutions have been recommended to halt milk flow in quarters of dairy cows that have been chronically infected and non-responsive to antibiotic therapy. The usual recommendation is to infuse the infected quarter with one gram of chlorhexidine after milking and repeat the infusion in 24 hours. After the infusions, the quarter is not milked for the remaining of the lactation.

A recent report[1] suggests that there is a danger of inhibitory residue in the milk and a potential, but minimal risk to human health. In their study, 6 cows were infused with chlorhexidine in a single infected quarter. The remaining 3 quarters were milked for another 42 days. Milk samples were periodically taken from all 4 quarters (treated and controls) for analysis of chlorhexidine concentrations for 8 days in three cows and 42 days in three other cows. Chlorhexidine could be detected in all treated quarters for up to 42 days following the infusions. It was also detected in milk from some of the untreated quarters.

The report indicates that the half life of chlorhexidine in milk from treated quarters is about 11.5 days. This means that in about 11 days after infusion, the concentration in the milk will have dropped to about half its original concentration. It is not precisely known at what level the residual might be detected as an inhibitory substance by testing at the milk cooperative. However, two potential situations might result in a detectable residue. First, the treated quarter could be mistakenly milked into the bulk tank milk. Or, enough residue might appear in the untreated quarters to become detectable. The research also point out that they milked the treated quarters in order to determine the chlorhexidine concentration. On the dairy, the quarter would not be milked. Therefore, the concentration might remain higher in the un-milked quarter and present a greater risk if it were milked accidentally.

In summary, on the basis of their study, these researchers recommend that chlorhexidine not be used to stop milking of infected quarters in dairy cows. At the very least, when chlorhexidine is used for this purpose, the cow and the quarter should be clearly marked to prevent milking. Veterinarians recommending this extra-label treatment are responsible for recommending residue avoidance information to the dairyman. Dairyman should seek the advice of their herd veterinarian prior to treatment.

[1]Middleton JR, Herbert VR, Fox LK et al. Elimination kinetics of chlorhexidine in milk following intramammary infusion to stop lactation in mastitic mammary gland quarters of cows. JAVMA 222(12); 1746-1749, 2003.