Optimizing Your Heifer Enterprise

Dr. Lee Kilmer and Dr. Larry Tranel
Extension Dairy Specialists, Iowa State University

Feed is by far the single largest expense on every dairy farm, with labor and cost of raising replacement heifers next. Unfortunately, few dairy producers actually know their heifer rearing costs or whether they could purchase herd replacements cheaper than they could raise them. However, the biggest advantages of producers raising their own replacement females is that the genetic merit is known and additional biosecurity concerns that come with purchased animals are lessened. Given the cost of rearing heifers, producers need to examine their goals for their replacement rearing program and take a critical look at all of the costs that can be incurred and pursue ways to reduce these costs.

Goals

Dairy producers often have different goals for their replacement rearing program. For some, the main goal may be to increase herd size, which often means raising as many heifers as possible. For others, they may simply want to maintain or, in some cases, reduce their current herd size. The last group of producers are those who want to focus more on increasing the genetic merit of their herd or market high genetic potential heifers. In any event, producers need to strive to raise their heifers as economically as possible. This can be accomplished by:

- not raising unneeded heifers – identify best ones and cull rest early
- reducing age at weaning and/or interval from birth to calving
- increasing (doubling) the growth rate from birth to weaning (different than above)
- Breeding earlier to reduce age at first calving ($ per day weaning to breeding)
- utilizing more economical feed sources, such as pasture, without reducing growth rate

Only Raise the Best Heifers

Historically, dairy producers have tended to raise every heifer calf born alive, but with improved management, and the availability of sexed semen, the potential could be a lot more heifers in a given herd than needed to replace culled cows. The number of replacement heifer calves that a producer can expect to be available each year is a function of several factors and can be calculated by the following formula:

Number available = HS X (12/CI) X SR X (1-CM) X (AFC/24) where

HS	= herd size	Example:	100 cows
CI	= calving interval in months		13.5 mos.
SR	= sex ratio of calves born alive		65% heifer with some sexed semen
CM	= calf mortality rate		7%
AFC	= age at first calving		23 mos.

Using the example figures, this herd would have 51.5 heifer calves available each year. Although the example herd above would have 51.5 replacement females available each year, they may not all be needed to maintain the same size herd. The number of heifers actually needed to maintain a static herd size can be calculated as well:

Number needed = HS X (AFC/24) X CR X (1 + NCR) where

HS	= herd size	Example:	100 cows
CI	= calving interval in months		13.5 mos.
CR	= culling rate of herd		35%
NCR	= non-completion rate (mortality & heifers culled)		10%

Using the example above, this herd would need 74 replacement heifers in total (37 each year). Given the numbers above, this example herd would have 51.5 heifer calves available each year but since 3% would die or be culled before calving, there would still be 50 available. However, since the herd would only need 37 each year, the additional 13 heifers represent extra expenses for feed, labor, facilities, etc. Consequently, the producer needs to look at the costs associated with raising the extra heifers and what potential return they might receive.

One option for herd owners is to identify the lower genetic potential calves by genomic testing or by looking at Parent Averages, then culling the bottom 10-25% before investing much in them. The table to the right shows the very significant milk and fat yield for the higher Genomic PTA grazing dairy cows. Thus, knowing the Genomic PTA should help determine which heifers are more profitable to raise and which should be sold.

	Good Grazing Cows	Poor Grazing Cows	P <
Milk yield	21805	16511	<0.001
Fat yield	782	642	<0.001
Genomic PTA			
Net Merit $	135	28.8	<0.001
Milk Yield, lb	259	-406	<0.001
Fat Yield, lb	15	-3	<0.001
Fat, %	0.01	0.04	0.25

Kester. Vanderwerff and Hoffman. 2013

The Cost of Raising Calves and Heifers

Total costs per day for calves between birth and weaning (at 61 d of age) typically exceed $5.00 per day, but once weaned, these costs drop dramatically to just over $2.00/day. The table to the right shows the estimated total cost for each weight class of heifers in 2013, then broken down between feed and other costs in the next two columns. The 2014 estimations use on 75% of the 2013 feed costs to show a drop in cost per heifer between $0.30-$0.60 per head per day. Thus, feed prices are a most significant variable in the cost of raising heifers over time.

The average size heifer at about 700 pounds is estimated to cost about $2.45/head/day with 2014 feed prices but can vary drastically from farm to farm depending on feed resources and management efficiency. But, an estimated slide rule figure is that each 100 pounds above or below 700 pounds average weight costs $0.12-$0.15/head/day, mostly accounting for feed but also realize non-feed costs can play an pivotal role as non-feed costs can range from around a $1 to $1.50 per head day.

The graph to the right depicts typical feed costs (bottom line) per day for heifers of different ages, and although the graph only goes to 22 mos., the increase feeds costs beyond 22 mos. are linear.

The top line depicts total costs of raising heifers from weaning forward. Notice the high proportion of costs that are wrapped up in feed costs.

Total Cost of Raising Calves and Heifers

The following chart illustrates various cost associated with raising heifers from birth to freshening in confinement based systems. Feed, bedding, veterinary expense saw the most significant increase while labor costs were also significant.

Total costs of raising heifers increased 72% during this six year time frame while the price paid for heifers on the market decreased below the cost of raising them.

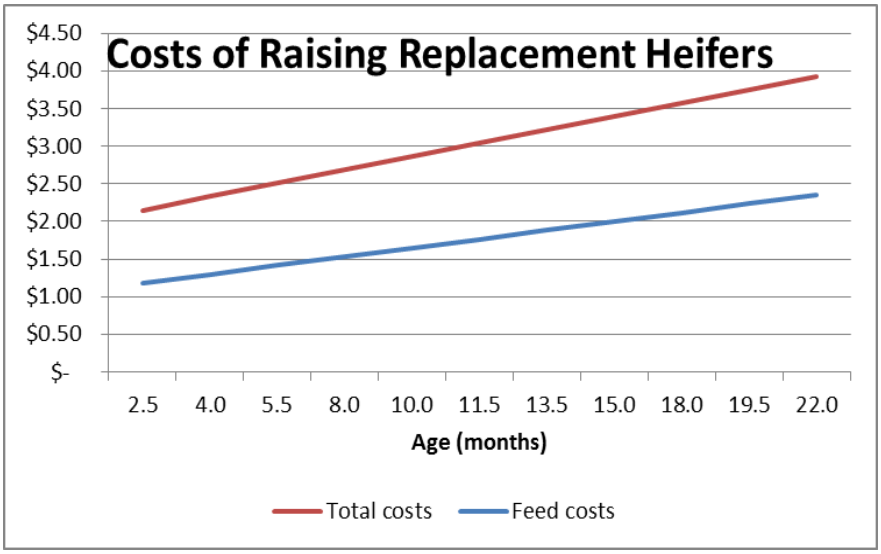
It is important to note that none of the farms contributing to this Wisconsin survey used rotational grazing to raise their heifers. Research has shown rotational grazing to be a significant contributor to reducing the total costs of raising heifers and to increasing other herd benefits when these heifers come into the milking string.

Estimated Heifer Raising Costs for 2103 and 2014

Weight Lbs.	2013 Cost	2013 Feed	2013 Other	2014 Cost	2014 Change	2014 Slide
200	$2.15	$1.20	$0.95	$1.85	-$0.30	$0.12
300	$2.30	$1.32	$0.98	$1.97	-$0.33	$0.12
400	$2.45	$1.44	$1.01	$2.09	-$0.36	$0.12
500	$2.60	$1.56	$1.04	$2.21	-$0.39	$0.12
600	$2.75	$1.68	$1.07	$2.33	-$0.42	$0.12
700	$2.90	$1.80	$1.10	$2.45	-$0.45	$0.12
800	**$3.15**	**$1.92**	**$1.23**	**$2.67**	**-$0.48**	**$0.24**
900	**$3.45**	**$2.04**	**$1.41**	**$2.94**	**-$0.51**	**$0.24**
1000	**$3.65**	**$2.16**	**$1.49**	**$3.11**	**-$0.54**	**$0.18**
1100	$3.80	$2.28	$1.52	$3.23	-$0.57	$0.12
1200	$3.95	$2.40	$1.55	$3.35	-$0.60	$0.12

2014 Feed = 75% of 2013 Costs

by Larry F. Tranel, Dairy Specialist, ISU Extension&Outreach



What's it cost* to raise a heifer from birth to freshening?

	2007	2013
Feed	$683	$1,274
Bedding	$49	$112
Veterinary	$33	$63
Breeding	$49	$48
Electric and fuel	$34	$39
Interest	$67	$69
Death loss	$3	$7
Labor (paid and unpaid)	$255	$372
Management (paid and unpaid)	$38	$32
Allocated cost (variable + fixed) + labor and mgt	$1,323	$2,274

*Survey of 32 dairy farms and custom heifer raising operations (no pasture based farms)

Vanderwerf et al., 2013 UW-Extension

Knowing Heifer Raising Costs is Important

An estimated cost of raising heifers is shown in the ISU Extension Dairy Budget on the right. For 24 months of feeding, around six tons of dry matter is needed per heifer for a total feed cost of $1,224. The livestock costs add another $273.52. Facilities and equipment add another $230.60 for a total of $1,728.12 before heifer ownership cost or labor is considered. This equates to a cost of $2.37 per head per day without labor on average or a cost of $2.73 per head per day with labor included.

For custom raisers of calves and heifers this is an important number to know. For those owning and raising heifers from birth to calving for sale, the ownership cost of $87.50 (interest on investment) and the initial calf value of $175 in this example needs to be added in to obtain a break-even sale value of $2,260 over the 24 month period.

It is important to realize that reducing the heifer raising period from 24 months to 23 months saves about $94 per heifer for a total cost of $2,166 per heifer raised. For a 100 cow herd raising 40 replacements each year, this savings would equal $3,760 per year.

Reducing the cull rate by 10% would further reduce heifers needed by four thus reducing heifer raising costs by another $7,964 ($2,166 -$175 calf value = $1,991 x 4). And, studies prove rotational grazing of dairy heifers reduces the cost of raising heifers. So, this budget has 1.25 ton of pasture forage per heifer.

It typically costs $5-$6 per calf per day to raise a calf from birth to weaning. A 56 day birth-weaning period typically has an estimated $336 of expenses. If this birth-to-weaning cost is subtracted, along with the ownership cost and initial value of the heifer, the cost to raise from weaning-to-calving is $1,661.50 over 674 days or $2.47 per day for the average weight heifer.

For custom heifer raisers who obtain the heifers after weaning without taking ownership, the above thumb-rule would be a good starting point for negotiations but could vary depending which costs above feed costs (veterinary, medicine, breeding, and bedding) need to be recovered. Returns to labor and facilities are often very negotiable from one producer to the next depending on opportunity costs of each due to facility age or demand for use.

The ISU Extension Dairy Budget

*Itemized Costs -- 2014	Heifer Raising Budget		
	1 Heifer	for 24 months	
Feed Costs (DM = Dry Matter)	**Feed Costs**		
Hay/Haylage - DM	$508	2.50	ton
Pasture Forage - DM	$124.12	1.25	ton
Corn Silage - DM	$110.45	0.75	ton
Corn Equivalent - US No. 2	$126.36	26.00	bu.
By Product Feed			
Protein Supplement	$186.62	720.00	lb.
Salt and Minerals	$7.56	50.00	lb.
Fat Supplement	$1.13	3.00	lb.
Milk Replacer/Calf Feed	$159.84	200.00	lb.
	$1,224	6.00	DM ton/hd
Livestock Costs	**Livestock Costs**		
Dairy Supplies	$10.00		head
Freight/Trucking/Hauling	$5.00		head
Veterinary & Medicine	$70.00		head
Breeding Fees	$42.00		head
DHIA/Accounting/Legal	$3.00		head
Marketing	$1.00		head
Bedding Costs	$100.00	1	ton
Gas/Fuel/Oil	$15.52	4	gal.
Electricity	$17.00	170	kWh
Other (oper. int., phone)	$10.00		head
Facilities & Equipment Costs	**Facilities & Equip Costs**		
		Cost/Head/Day	
Milking Center/Parlor	$20.70	$0.03	head
Dairy Housing	$156.98	$0.23	head
Manure Storage	$52.92	$0.08	head
Heifer Housing	$2.37	Cost/head/day	
Machinery and Equipment	$2.73	with labor included	
	$87.50	Ownership Cost/hd	
	$175.00	Initial Calf Value	
Cow Ownership Costs	$264.00	22.00	hrs/hd
Heifer Replacement Costs	$2,260	Total Cost (24 mon)	
Labor and Mgt Costs	$2,166	23	Month Cost

ISU Extension Dairy Budget 2014, By Kristen Schulte, Larry Tranel and Lee Kilmer

Consult the table below for more detailed information on various costs at various ages. Realize 2013 feed costs used in the table below may be substantially different relative to current feed costs.

The effect of weight and age on variable, fixed and total cost associated with raising one heifer on Wisconsin operations (n=32) 2013

Weight (lbs)	Age (mo)	Feed	Bedding	Vet & Med	Breeding	Electric & Fuel	Paid Labor	Unpaid Labor	Paid Mgt	Unpaid Mgt	Interest	Death Loss	Equip	Buildings	Manure	Total Cost $/Hd/day
238	2.5	1.18	0.15	0.09	0.00	0.02	0.19	0.17	0.01	0.04	0.06	0.004	0.03	0.19	0.01	2.15
321	4.0	1.45	0.17	0.08	0.00	0.02	0.22	0.21	0.02	0.02	0.08	0.005	0.06	0.26	0.01	2.63
406	5.5	1.41	0.14	0.11	0.00	0.03	0.31	0.10	0.03	0.02	0.08	0.004	0.07	0.47	0.01	2.79
576	8.0	1.52	0.12	0.07	0.00	0.04	0.19	0.18	0.02	0.02	0.08	0.004	0.04	0.20	0.02	2.52
653	10.0	1.38	0.05	0.10	0.00	0.04	0.17	0.23	0.01	0.02	0.07	0.007	0.13	0.35	0.03	2.63
737	11.5	1.81	0.03	0.08	0.04	0.05	0.20	0.21	0.03	0.01	0.09	0.000	0.02	0.27	0.03	2.86
839	13.5	1.57	0.09	0.12	0.10	0.06	0.33	0.23	0.03	0.03	0.09	0.005	0.11	0.28	0.04	3.08
924	15.0	1.86	0.16	0.06	0.21	0.06	0.55	0.25	0.02	0.01	0.11	0.012	0.09	0.37	0.03	3.86
1056	18.0	2.03	0.10	0.05	0.03	0.07	0.16	0.24	0.03	0.01	0.10	0.012	0.07	0.38	0.07	3.37
1100	19.5	2.09	0.14	0.11	0.00	0.08	0.24	0.21	0.01	0.03	0.11	0.015	0.09	0.25	0.04	3.49
1171	22.0	2.35	0.21	0.06	0.00	0.08	0.11	0.23	0.00	0.02	0.13	0.007	0.08	0.30	0.08	3.93

Total costs includes all costs except the opportunity cost of the calf. Pre-weaning costs not included. **University of Wisconsin-Extension**

Using Intensive Grazing to Reduce Costs

Intensive grazing of dairy heifers can reduce cost of labor and feed by reducing manure management and the feeding of harvested forages. The table to the right from Cornell University illustrates the dramatic effect rotational grazing can have on reducing heifer costs for various size heifers. If each heifer averages 1.5 grazing seasons before calving using the savings on the average size heifer, total costs per heifer can be decreased by $284 per heifer ($189 x 1.5) or more than 12% over confinement raised heifers using . If the 150 day grazing season illustrated is lengthened to 210 days, another $75 per heifer could be saved for a total of $360 per heifer or 15% saving over confinement raised heifers.

Reducing costs of raising heifers by grazing

Stage of heifer growth	200-700 lb	700-850 lb	850-calving
Feed and Labor, $/day*			
Confinement	$2.18	$2.76	$3.69
MIG	$1.30	$1.50	$1.50
Difference	$0.88	$1.26	$2.19
X 150 grazing period	$132	$189	$329

*costs based on 2008 feed and labor costs
Benson, 2012 Cornell Cooperative Extension

Reducing costs by grazing heifers on productive crop ground depends on management skills, yield and assumptions used. Two heifer raisers (MN and WI) shared about the same following results from their operations:

A good quality acre can support 1,350 pounds of animals (or 1.68 head of 800 lb. heifers). Dry Matter Intake was about 18 pounds over 210 days multiplied by 1.68 head per acre for 3.17 tons of dry matter harvested per acre. A 1.7 lbs. daily rate of gain times 210 days equals 357 lbs gain/head. This 357 lbs. gain/head multiplied by 1.68 head/acre equals 600 pounds gain per acre. If each pound of gain is worth $1.50, for example, the gross gain per acre is $900. If the gain is only worth $1 per pound (current heifer market prices) the gross gain is $600 per acre.

Per Acre Returns to a Pasture Heifer Enterprise:

Costs Value of Gain/lb.>	$1.50	$1.00
Fencing: $75 per acre over 15 years	$5	$5
Water: $40 per acre over 10 years	$4	$4
Fertilizer: Only heifer manure was used		
Seed: $80 per acre over 10 years	$8	$8
Land Rent: $250 per acre	$300	$300
Lane: $50 per acre over 10 years	$5	$5
Grain: (1 lb x 210 days x 1.68/head)	$44	$44
Labor: (4.5 hours/acre x $10/hour)	$45	$45
Total Expenses Per Acre:	$361	$361
Return to Management:	$539	$239
Return to Labor/Management per acre:	$584	$284

Health Benefits of Grazing Dairy Heifers

Cornell data showed early lactation health problems were reduced in first calf heifers which were rotationally grazed for 5 months prior to their freshening date, compared to a duplicate group which was raised in confinement prior to freshening. These results were consistent with previous research completed by the University of Minnesota from 2000 through 2002, which also compared raising pregnant dairy replacements in confinement vs. rotationally grazed. Their results showed that the animals raised in intensively grazed pastures had fewer post-partum problems than their counterparts.

NY Study: Health Benefits of Grazing Heifers

Farm 1	Animals	Treated	Calving Ease
Grazed	25	6	1.26
Confinement	25	12	1.6
Farm 2			
Grazed	25	0	1.62
Confinement	25	12	1.75

Benson, A.Fay, Cornell, 2009

	Continuously grazed paddocks	Rotationally grazed paddocks	Feedlot raised
# animals	20	21	21
DA's	3	2	7
Difficult calving	2	3	5
Metritis	0	0	1
Ketosis	2	0	3
Skeletal injury	0	2	2

Chester-Jones, H., M. Rudstrom, and L. Torbert. MN

Weight and milk production gains with heifers raised on pasture compared to confinement have also been realized. In a study by Posner and Hedtke, 2012, (CIAS Research Brief #89), yearling heifers gained 1.97 and 1.86 pounds per day on pasture and in confinement, respectively. For ME Milk production, the first lactation heifers produced 25,328 and 23,415, pounds of milk respectively for those raised on pasture versus those raised in confinement.

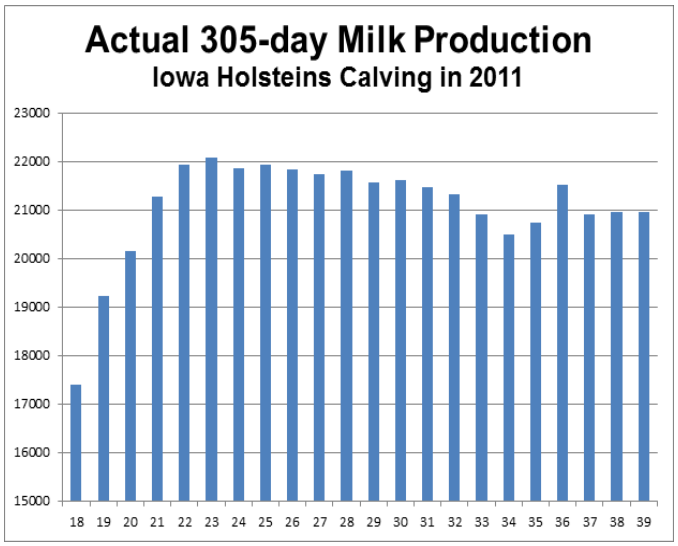
Thus, from reducing costs, increasing health and milk production, raising heifers on pasture makes sense.

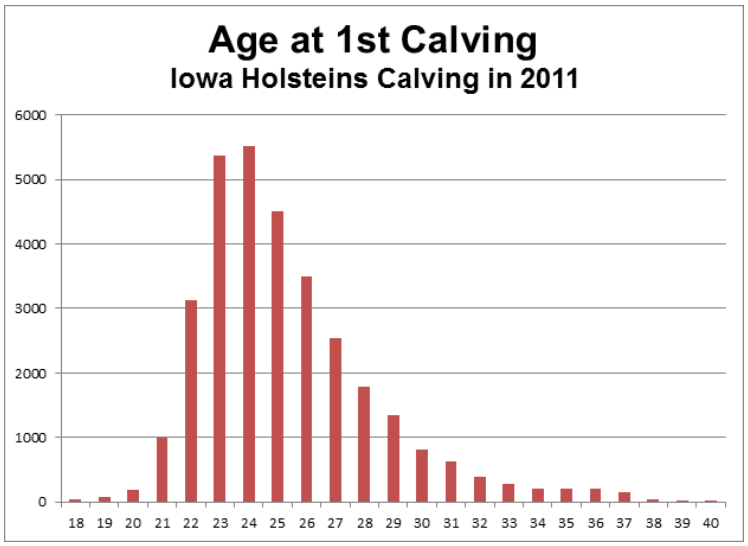
Producers should make every effort to grow heifers faster so that they reach the target weights by 13 months of age so that they can be bred.

The following graphs represent all Holsteins on DHIA that calved for the first time in 2011 and depict the distribution of heifers by age (in months) when they first calved and the actual 305-day milk production of these heifers. More Holsteins calved at 23 or 24 months of age than any other age and these heifers produced more milk in their first lactation than heifers that calved at an older age. Thus there is no economic advantage to calving heifers at 26 months or older.

Dairy Heifer growth guidelines

Breed	Birth Weight lb	Breeding BW lb	Breeding Age mo.	Calving BW lb	Calving Age mo.	Aver. Daily Gain lb/d	Mature BW lb
Holstein Brown Swiss	100	750-850	13-15	1200-1300	22-24	1.7	1500
Guernsey Ayrshire	75	600-700	13-15	900-1000	22-24	1.4	1250
Jersey	65	550-600	13-15	850-950	22-24	1.3	1100





Summary

Raising replacement dairy heifers is a costly enterprise and it may be less expensive for many producers to purchase their replacements rather than raise their own. These costs can be reduced by improved feeding and management that will allow heifers to be bred at a younger age, so that they will calve sooner and start to generate income for the operation. Using various by-product feedstuffs may be one way for reducing feed costs. However, reducing the age at first calving will have one of the greatest impacts on reducing the total costs of raising replacement dairy heifers from birth to calving. Another great impact would be the doubling of the birthrate from birth to weaning may actually increase costs during that time frame but the milk production benefits later on far outweigh the added costs. And lastly, raising heifers on intensively managed pastures offers an opportunity to reduce heifer raising costs 12-15% while at the same time raising bred heifers on pasture may give added post-partum health and milk production benefits as well.

Other Methods to Reduce Feed Costs for Dairy Heifers by Dale Thoreson

Raising dairy replacement heifers contributes a sizeable percent of the total costs of the dairy herd. Weather you raise your own heifers or have them custom raised, eventually the milking herd has to pay their rearing costs.

Heifer raising goals (Holsteins) are to have the heifers gain between 1.7 and 1.9 pounds pre day, calve at 23 to 24 months of age and weigh between 1300 and 1350 pounds , pre-calving. Wither height should be at least 56 inches and the heifer should be a body condition score 3.5 (1 to 5 scale).

Feed costs make up the largest share of the costs to raise a calf to freshening. One method to reduce feed costs is to combine corn co-products with low quality forages. Low quality forages, such as corn stalks, oat hay, sorghum-Sudan grass, etc, are low in energy, protein, calcium and phosphorous but high in Neutral Detergent Fiber (NDF). Corn co-products such as distillers grains are high in protein, energy, phosphorous yet low in calcium and NDF.

Can we combine wet distillers grains and solubles with corn stalks for growing heifers? Studies have been conducted on this proposal at South Dakota State University. Dairy farmers in Iowa are using these feedstuffs for their 500 + pound heifers. South Dakota researchers mixed ground corn stalks and wet distillers at a ratio of 69% WDGS and 31% corn stalks, as-fed. Then they mixed this blend at 86% with 14% rye straw, minerals and vitamins. They compared this diet to a traditional diet of alfalfa and grass hays, alfalfa haylage, corn silage dried distillers grains and solubles (DDGS), earlage, vitamins and minerals.

Heifers on both diets gained too fast (2.82 vs. 2.31 pounds per day traditional verses co-product/corn stalks ration. Interestingly, the cost of feed was reduced from $0.86 per day to $0.52 per day by feeding the WDGS/corn stalks ration. This trial was conducted in 2004.

What might a ration for an 800 pound heifer look like? We've developed heifer rations using ground or shredded corn stalks, WDGS (30% dry matter), minerals and vitamins to achieve a 1.6+ pound average daily gain. The ration consisted of 7.82 pounds WDGS, 9.8 pounds of corn stalks, 0.02 pounds of limestone and 0.05 pounds of trace mineral and vitamins pack, all on a dry matter basis. These are all mixed as a total mixed ration (TMR) to get the WDGS to adhere to the corn stalks. This ration resulted in a 16% crude protein, 0.68Mcal NEm, 0.40 Mcal NEg, 62% NDF, 5.03% fat, 0.31% calcium, 0.29 % phosphorous ration at a current cost of $1.06 per day.

At the time of this writing (2008), this ration cost $0.69 per day. A more traditional ration similar to the "traditional" ration used by the SDSU study would cost $1.29 per day. A difference of $0.23 per head per day doesn't sound like a lot until you consider the 800 pound heifer to be the "average" size heifer in a dairy herd. So a herd of 100 cows would have about 75 heifers that could be fed this lower cost ration. In one year that is a saving of over $6,000.

There are some precautions to be aware of when using co-products. We need to make sure the fat content of the WDGS is between 10 and 12 percent. Too much fat will result in fatty uddered heifers that will not milk to their potential. Most heifer rations would not contain excess sulfur, but the entire ration sulfur content should be less that 0.4 percent of the dry matter. Be sure to watch consistency of the product, from a moisture, fat and sulfur standpoint.

Finally, we have seen research that shows little deterioration in WDGS if it is bagged with no pressure and filled in a down-hill position. That could allow a smaller dairy to purchase WDGS at one time and store it for up to a year. We do need to feed 6 to 8 inches off the face daily to keep the product fresh. Most of our Iowa farms are purchasing a weekly quantity from local ethanol plants.