
Financial Implications Of rBST

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Recombinant bovine somatotropin (rBST) first became available to U.S. dairy producers in February, 1994 after Food and Drug Administration approval. The product approved, called Posilac, is manufactured and marketed by Monsanto Company. As new technologies such as Posilac become available, it is essential that dairy producers understand how to use them profitably.

A number of factors effect the profitability of cows supplemented with rBST. Some of these include: feed and labor cost, price of the product, milk price, and achieved milk production response. Other factors that affect the profitable use of rBST are number of cows milked, times per day milking, and percent of the herd receiving rBST treatment.

The objective of this paper is to evaluate the economics of rBST in a commercial setting for large dairy herds. We will consider the financial implica-

tions of rBST in terms of the whole herd, and on a per cow and per hundredweight (cwt.) basis. We will also consider rBST use under 2 times and 3 times a day milking. Information presented in this paper will help dairy producers develop a profitable program to effectively use rBST.

Feed Cost

The dry matter intake of the dairy cows supplemented with rBST will increase 2-7 weeks after the initiation of treatment. Rations should be balanced to meet the requirements for body condition and milk production.

The amount of energy required to produce an additional pound of milk is .31 Mcal(4). This assumes that the maintenance requirements of the cow have been satisfied. If a ration contains .78 Mcals per pound of dry matter, a dairy cow will have to consume an additional .397 pounds of dry mat-

TABLE 1. Feed cost associated with cows supplemented with rBST as related to the cost of Dry Matter per pound.

COST PER POUND OF DRY MATTER	FEED COST PER POUND OF MILK RESPONSE TO rBST ¹
\$0.05	\$0.020
\$0.06	\$0.024
\$0.07	\$0.028
\$0.08	\$0.032
\$0.09	\$0.036
\$0.10	\$0.040
\$0.11	\$0.044
\$0.12	\$0.048

¹ Calculations based on .31 Mcals per pound of milk above maintenance and a ration containing .78 Mcals per pound.

ter per pound of milk response, or 3.97 pounds of dry matter per 10 pounds of milk.

Table 1 on the opposite page lists the feed costs required to produce an additional pound of milk at different costs per pound of dry matter (5¢-12¢). Feed costs in Table 1 are based on .31 Mcals per pound of milk above maintenance and a ration containing .78 Mcals per pound of dry matter. In Table 2 we have calculated the daily feed cost associated with supplementing cows with rBST at different response levels (4-15 lbs). Using a combination of the information on Table 1 and 2 a producer can determine the additional feed cost associated with supplementing cows with rBST at different levels of production.

Labor

Dairy producers will need to reallocate existing labor and/or hire more labor in order to effectively implement an rBST program. Additional labor will be used to keep injection records, inject cows, and body condition score cows. The rBST program can be as simple or complex as desired. The labor cost of an rBST program will likely vary significantly from farm to farm. For example, some dairy producers will keep injection records and body condition score individual cows. Other producers will assign cows to pens which the entire pen will be supplemented with rBST every 14 days.

In this paper, we injected all eligible cows every 14 days starting at 67 days post-partum. We also

TABLE 2. Daily feed cost per cow associated with cows supplemented with rBST at different milk responses.

RESPONSE	FEED COST PER POUND OF RESPONSE			
	\$.020	\$.025	\$.030	\$.035
4	8.0	10.0	12.0	14.0
5	10.0	12.5	15.0	17.5
6	12.0	15.0	18.0	21.0
7	14.0	17.5	21.0	24.5
8	16.0	20.0	24.0	28.0
9	18.0	22.5	27.0	31.5
10	20.0	25.0	30.0	35.0
11	22.0	27.5	33.0	38.5
12	24.0	30.0	36.0	42.0
13	26.0	32.5	39.0	45.5
14	28.0	35.0	42.0	49.0
15	30.0	37.5	45.0	52.5

assumed an additional labor cost of 2¢ per treated cow per day.

Price Of rBST

The price of Posilac is currently \$5.80 per dose. The actual cost of using Posilac, however, will vary by state due to differences in sales taxes. In this paper we assumed a sales tax of 7.25%. That would raise the cost of Posilac to \$6.22 per dose, or 44¢ per day of treatment.

Profitability On A Per Cow Basis

Milk response to rBST and the market price of milk will have dramatic effects on the profitability of using rBST. The profitability of using supplemental rBST on a per cow basis is evaluated in Table 3. We used 12 milk response levels (4-15 pounds) and six mailbox milk price levels (\$9-\$14)¹. The costs of Posilac and labor remained constant in the analysis. Feed cost, however, increased with the level of milk response.

The mailbox milk price will have a significant effect on profitability at a given level of milk response to rBST use. For example, a \$9 milk price

at a 10 lbs. milk response generates a profit of 12¢ per treated cow. That compares to a 42¢ profit per treated cow at a \$12 milk price at the same milk response level.

On the other hand, the level of milk response to rBST use is also extremely important in effectively using this new technology. If we assume a constant milk price of \$10 per cwt, an 8 lbs. response to rBST will generate a 15¢ per treated cow profit compared to a 35¢ per treated cow profit from a 12 lbs. response.

Financial Implications Of Using rBST In Dairy Herds Milking 2 Times And 3 Times Per Day

In this section we will analyze the profitability of rBST in a representative Western dairy herd. One issue that will be explored is whether it is more profitable to use rBST with twice a day (2X) milking and three times per day (3X) milking. While 3X milking results in a production increase, 2X milking allows

¹: Net milk price paid to producer

TABLE 3. Profitability per cow supplemented with rBST per day by milk response and milk price.

RESPONSE LBS.	EXPENSES ²				MAILBOX MILK PRICE ^{1,3}													
					\$9.00		\$10.00		\$11.00		\$12.00							
	POSILAC	FEED	LABOR	TTL COST	CWT LB.	INCOME	PROFIT	CWT LB.	INCOME	PROFIT	CWT LB.	INCOME	PROFIT	CWT LB.	INCOME	PROFIT		
4	\$0.44	\$0.13	\$0.02	\$0.59	\$0.36	(\$0.23)	\$0.40	(\$0.19)	\$0.44	(\$0.15)	\$0.48	(\$0.11)	\$0.52	(\$0.07)	\$0.56	(\$0.03)	\$0.60	\$0.01
5	\$0.44	\$0.16	\$0.02	\$0.62	\$0.45	(\$0.17)	\$0.50	(\$0.12)	\$0.55	(\$0.07)	\$0.60	(\$0.02)	\$0.65	\$0.03	\$0.70	\$0.08	\$0.75	\$0.13
6	\$0.44	\$0.19	\$0.02	\$0.66	\$0.54	(\$0.12)	\$0.60	(\$0.06)	\$0.66	\$0.00	\$0.72	\$0.06	\$0.78	\$0.12	\$0.84	\$0.16	\$0.90	\$0.24
7	\$0.44	\$0.22	\$0.02	\$0.69	\$0.63	(\$0.06)	\$0.70	\$0.01	\$0.77	\$0.08	\$0.84	\$0.15	\$0.90	\$0.21	\$0.96	\$0.26	\$1.02	\$0.30
8	\$0.44	\$0.26	\$0.02	\$0.72	\$0.72	(\$0.00)	\$0.80	\$0.08	\$0.88	\$0.16	\$0.96	\$0.24	\$1.00	\$0.28	\$1.08	\$0.32	\$1.10	\$0.34
9	\$0.44	\$0.29	\$0.02	\$0.75	\$0.81	\$0.06	\$0.90	\$0.15	\$0.99	\$0.24	\$1.08	\$0.30	\$1.10	\$0.32	\$1.20	\$0.40	\$1.20	\$0.40
10	\$0.44	\$0.32	\$0.02	\$0.78	\$0.90	\$0.12	\$1.00	\$0.22	\$1.10	\$0.32	\$1.20	\$0.40	\$1.30	\$0.40	\$1.40	\$0.50	\$1.50	\$0.60
11	\$0.44	\$0.35	\$0.02	\$0.82	\$0.99	\$0.17	\$1.10	\$0.28	\$1.21	\$0.39	\$1.32	\$0.51	\$1.40	\$0.51	\$1.50	\$0.60	\$1.60	\$0.70
12	\$0.44	\$0.38	\$0.02	\$0.85	\$1.08	\$0.23	\$1.20	\$0.35	\$1.32	\$0.47	\$1.44	\$0.60	\$1.50	\$0.60	\$1.60	\$0.70	\$1.70	\$0.80
13	\$0.44	\$0.42	\$0.02	\$0.88	\$1.17	\$0.29	\$1.30	\$0.42	\$1.43	\$0.55	\$1.56	\$0.70	\$1.60	\$0.70	\$1.70	\$0.80	\$1.80	\$0.90
14	\$0.44	\$0.45	\$0.02	\$0.91	\$1.26	\$0.35	\$1.40	\$0.49	\$1.54	\$0.63	\$1.68	\$0.80	\$1.70	\$0.80	\$1.80	\$0.90	\$1.90	\$1.00
15	\$0.44	\$0.48	\$0.02	\$0.94	\$1.35	\$0.41	\$1.50	\$0.56	\$1.65	\$0.71	\$1.80	\$0.90	\$1.80	\$0.90	\$1.90	\$1.00	\$2.00	\$1.10

¹ Cost of rBST is \$5.80 per 14 day dose with 7.25% sales tax.
² Feed to milk ratio: Calculations based on .31 Mcals per pound of milk above maintenance, ration containing .78 Mcals per pound of dry matter. At a cost of \$.08 per pound of dry matter.
³ Information developed by Posilac Profitability Estimator, Dr. John F. Smith, NMSU Box 3AE, Las Cruces, NM 88003

more total cows to be milked through the parlor. This analysis will take place using a dairy financial simulation model called Commercial Agriculture Dairy Simulation Model (CADSIM).

The Model (CADSIM)

The CADSIM model was developed by the University of Missouri Extension to help dairy producers evaluate the financial implications of expansion or management changes. The model is a whole-farm financial planning tool that incorporates a detailed dairy enterprise with an ability to project financial statements over a 5-year planning horizon. The model consists of five interactive modules: Production, Feed, Labor, Loan, and Expense. These modules are then used to calculate financial statements and measures that lenders and/or investors will need to evaluate a loan or investment package.

The model simulates production and financial information over a 5-year period. A dairy enterprise budget is then estimated from a simple average of the financial information in the profit/loss statement over the 5-year period.

\$12.00 CWT	\$13.00 CWT	\$14.00 CWT		
\$0.12 LB.	\$0.13 LB.	\$0.14 LB.		
PROFIT	INCOME	PROFIT	INCOME	PROFIT
(\$0.11)	\$0.52	(\$0.07)	\$0.56	(\$0.03)
(\$0.02)	\$0.65	\$0.03	\$0.70	\$0.08
\$0.06	\$0.78	\$0.12	\$0.84	\$0.18
\$0.15	\$0.91	\$0.22	\$0.98	\$0.29
\$0.24	\$1.04	\$0.32	\$1.12	\$0.40
\$0.33	\$1.17	\$0.42	\$1.26	\$0.51
\$0.42	\$1.30	\$0.52	\$1.40	\$0.62
\$0.50	\$1.43	\$0.61	\$1.54	\$0.72
\$0.59	\$1.56	\$0.71	\$1.68	\$0.83
\$0.68	\$1.69	\$0.81	\$1.82	\$0.94
\$0.77	\$1.82	\$0.91	\$1.96	\$1.05
\$0.86	\$1.95	\$1.01	\$2.10	\$1.16

Assumptions Used In The Model

The profitability of rBST use was evaluated by simulating the profitability of a representative Western dairy operation. This was accomplished by entering production, expense, and financial data into the CADSIM model in order to develop a baseline. The data used for this exercise was provided by the accounting firm of Genske, Mulder & Company.¹

We assumed a herd size of 1,170 cows (milking and dry) that would milk 3X with daily average production of 66.1 lbs. per cow with no BST. That would translate into a 365-day rolling herd average of 20,470 lbs. The following were also assumed:

- \$12.50 gross milk price
- 13-month calving interval
- 60-day dry period
- 29% cull rate
- 2% death rate
- 3% of milk not shipped

Two rations were fed for milking cows: a 2 week start-up ration (cost of \$3.24 per day) and a high production ration (\$3.73 per day) for the balance of the days in milk.

Labor was calculated based on time spent milking, feeding, and other chores. Annual milking labor was calculated based on 3X milking, 1 hour per shift cleanup and setup, and throughput of 160 cows per hour (assumes a double-20 parallel parlor). Total annual labor was calculated as follows:

- 23,662 hours for milking
- 5,265 hours for feeding and other chores
- \$202,486 hired labor bill
- \$40,000 for salaried herdsman
- \$14,549 total company benefits

The baseline is presented in the first three columns of table 4. Notice that the baseline indicates a total herd profit of \$130,895, which is \$112 per cow and 55¢ per hundredweight of milk sold. This scenario is called the baseline and all other scenarios discussed below are compared to it.

¹: The authors wish to thank Wayne Cunningham for his assistance.

Using rBST

Use of supplemental rBST is considered in order to improve overall farm profits. The following assumptions are made regarding use of rBST:

1. All eligible cows receive rBST supplementation according to label.
2. Supplementation begins at day 67, with a 10 lbs. per day response.
3. rBST costs of \$5.80 per 14-day dose, with a

7.25% sales tax.

4. Cows supplemented with rBST for 268 days.
5. Annual feed cost per cow increased by \$74 per cow.
6. Labor hours per cow increased by 0.71.

The financial implications of rBST use on the representative farm is presented in columns 4-6 in table 4. Use of rBST improves total milk production and production per cow. Feed costs for the herd and per

Table 4. Net Income for the Dairy Enterprise milking 3X With and Without rBST

	Without rBST ¹			With rBST ²		
	Herd	Per Cow	Per CWT	Herd	Per Cow	Per CWT
INCOME FROM OPERATIONS:						
Milk sales	2,992,514	2,558	12.50	3,353,361	2,866	12.50
Calf sales	84,389	72	0.35	84,389	72	0.31
Total gross receipts	3,076,903	2,630	12.85	3,437,749	2,938	12.81
OPERATING EXPENSES:						
Feed:						
Concentrates	825,076	705	3.45	873,204	746	3.25
Forages	687,153	587	2.87	726,044	621	2.71
Total feed	1,512,229	1,293	6.32	1,599,251	1,367	5.96
Herd replacement costs						
Depreciation--dairy cows	164,768	141	0.69	164,768	141	0.61
Loss on sale of cows	92,621	79	0.39	92,621	79	0.35
Total herd replacement costs	257,389	220	1.08	257,389	220	0.96
Labor (includes SS & Medicare)	272,027	233	1.14	278,531	238	1.04
Marketing ³	218,272	187	0.91	244,592	209	0.91
BST cost	0	0	0.00	125,925	108	0.47
Interest	191,300	164	0.80	191,300	164	0.71
Depreciation--not cows	57,367	49	0.24	57,367	49	0.21
Other Operating costs	439,210	374	1.83	487,023	415	1.83
TOTAL OPERATING EXPENSES	2,946,008	2,518	12.31	3,248,613	2,769	12.08
NET INCOME FROM OPERATIONS	130,895	112	0.55	197,676	169	0.74

¹Total herd size of 1,170 cows (milking and dry) with average daily milk production of 66.1 pounds per day in year 1.

²Total herd size of 1,170 cows (milking and dry) with average daily milk production of 74.1 pounds per day in year 1.

³Includes milk hauling, State and Federal promotion, and coop/marketing fees.

cow increase due to greater feed intake. Labor costs for the herd increased \$6,504 over the baseline when rBST was used. An additional .71 hours of labor was used per cow per year to manage the rBST program. Labor costs on a per cwt. basis, however, decline due to greater milk production levels. Marketing costs (for hauling, federal assessments, and capital retains) increases for the herd and per cow due to greater milk production levels. The cost of

the rBST is estimated at \$108 per cow per year, or 47¢/cwt. Most other costs remain the same on a per herd and per cow basis, but fall on a per cwt. basis due to greater milk production. Overall net farm profits increased by \$66,781 from rBST use, or by \$57 per cow and 19¢/cwt. of milk sold.

Switching Back To 2X Milking

Use of rBST has allowed many producers to retain cows in the milk string that would otherwise have

Table 5. Net Income for the Dairy Enterprise milking 2X With and Without rBST

	Without rBST ¹			With rBST ²		
	Herd	Per Cow	Per CWT	Herd	Per Cow	Per CWT
INCOME FROM OPERATIONS.						
Milk sales	4,000,361	2,256	12.50	4,547,206	2,564	12.50
Calf sales	127,899	72	0.40	127,899	72	0.35
Total gross receipts	4,128,260	2,328	12.90	4,675,159	2,636	12.85
OPERATING EXPENSES:						
Feed:						
Concentrates	1,196,599	675	3.74	1,269,547	716	3.49
Forages	997,990	563	3.12	1,056,934	596	2.91
Total feed	2,194,590	1,238	6.86	2,326,480	1,312	6.40
Herd replacement costs:						
Depreciation--dairy cows	323,617	182	1.01	323,617	182	0.89
Loss on sale of cows	95,422	54	0.30	95,422	54	0.26
Total herd replacement costs	419,040	236	1.31	419,040	236	1.15
Labor (includes SS & Medicare)	297,189	168	0.93	307,047	173	0.84
Marketing ³	291,784	165	0.91	331,675	187	0.91
BST cost	0	0	0.00	190,852	108	0.52
Interest	250,397	141	0.78	250,397	141	0.69
Depreciation--not cows	57,367	32	0.18	57,367	32	0.16
Other Operating costs	591,568	333	1.85	664,037	375	1.84
TOTAL OPERATING EXPENSES	4,100,016	2,312	12.81	4,545,704	2,563	12.50
NET INCOME FROM OPERATIONS	28,244	16	0.09	129,456	73	0.36

¹Total herd size of 1,773 cows (milking and dry) with average daily milk production of 58.3 pounds per day in year 1.

²Total herd size of 1,773 cows (milking and dry) with average daily milk production of 66.3 pounds per day in year 1.

³Includes milk hauling, State and Federal promotion, and coop/marketing fees.

been culled for low milk production without rBST use. This change has resulted in lower cull rates and an increase in herd sizes. In order to milk more cows in a 24-hour period without expanding the parlor, the decision could be made to switch from 3X milking back to 2X milking. But is this move profitable?

To evaluate this, one must first consider what happens to profitability when switching from 3X without rBST use to 2X without rBST. The following assumptions are made:

- Switch from 3X to 2X milking.
- Lower cow throughput from 160 to 150 cows per hour (due to more milk per milking).
- Lower the herd lactation curve by 10%.
- Lower the cull rate to 19% in year 1 and 25% in year 2.
- Purchase 976 cows in year 1 to increase herd size to 1,773 cows.
- Reduce ration costs by 5% per day.

The herd size was increased in order to keep the parlor milking 22 hours per day. Daily milk production was reduced in order to reflect the switch from 3X to 2X milking. The financial results are presented in columns 1-3 in table 5. They indicate that switching from 3X milking without rBST use to 2X milking without rBST use will lower annual profits by \$102,651 or by \$96 per cow. While gross income for the herd increases under 2X milking, per cow income declines due to lower milk production per cow. Total feed costs increase due to more cows, but declines on a per cow basis due to lower nutritional demands. Total interests costs increase due to debt on purchased cows. Likewise, all other costs increase on a herd basis, but decrease slightly on a per cow basis due to more cows to spread these cost

Ranking The Results:

1. The most profitable scenario is rBST use with 3X milking.
2. The least profitable scenario is 2X milking without rBST use.
3. The difference in total profits between these two extremes is \$169,432.
4. Total profit for the 2X scenario with rBST use is comparable to herd profits for the 3X scenario without rBST use.
5. There is no gain in profits from switching from 3X without rBST to 2X with rBST.
6. Milking 2X is less profitable than milking 3X with or without rBST.

over.

What happens if rBST is used with 2X milking? To determine the effect, assumptions were used in the 3X scenario with rBST use. The financial implications of rBST use with 2X milking are presented in columns 4-6 in Table 5. This scenario indicates a \$57 per cow improvement in profits relative to the 2X scenario without rBST.

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