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	<p>SELECTING BEEF AI SIRES TO MAXIMIZE PROFITS</p>	
	<p>Dustin A. Baker C. Richard Shumway Charles T. Gaskins</p>	
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Selecting Beef AI Sires to Maximize Profit

Dustin A. Baker
C. Richard Shumway
Charles T. Gaskins*

Where should you invest your money to obtain highest net returns?

How can you use the AI sire selection decision to increase your profit?

More and more beef producers are using artificial insemination (AI) sires in order to increase profit. Increased profit is obtained only if speeding the rate of genetic progress in their herds translates into higher returns or lower costs.

Beef producers face a complex decision-making process when selecting semen from AI sires. AI semen varies widely in price and quality (reported as expected progeny difference (EPD) for various traits). While individual producers vary in specific production goals, their goal in genetic improvement is generally motivated by potential profit. Due to the complexity of the sire selection decision, economically optimal choices are not always clearly evident.

Purchasing AI semen is an investment in future returns due to genetic improvement. It is an investment because the expenditure does not earn income until a later date when offspring (or the offspring's descendants) are sold. To assist the producer in this decision, AI service sires have been ranked according to their net present value (NPV). This is achieved for an AI sire by discounting the future net income stream from genetic improvement to identify its value at the time the investment is made (breeding). The difference between the value of the discounted net income earnings from genetic improvement and the cost of semen is the estimated NPV of

* Dustin A. Baker is a graduate research assistant and C. Richard Shumway is professor and chair, Department of Agricultural and Resource Economics. Charles T. Gaskins is a professor in the Department of Animal Sciences. We want to thank Herb Hinman, Doug Young, and Benton Glaze for constructive comments on an earlier draft of this bulletin.

semen from that sire. The NPV figures provide a valid basis for comparing the value of expected future income and costs from alternative investments.

Due to differences in production and/or genetic goals among producers, multiple rankings of bulls may be required to find the most profitable bulls for individual producers. Separate rankings for purebred producers and commercial producers are necessary due to differences in production goals. Rankings across breeds are most useful for commercial producers who consider bulls from various breeds to best complement their cow herd. Rankings within a breed are important to purebred producers.

Separate rankings are also necessary for different ownership or management goals. For example, the producer who plans to sell calves as yearlings may achieve highest profit from a different set of sires than one who sells calves at weaning. Likewise a producer who retains some of the heifer calves for herd replacements may also benefit from a different set of sires than one who purchases all replacements.

For both the commercial crossbred and purebred beef producer, an NPV ranking was developed for each of three different ownership and management goals: (1) a one-generation planning horizon with calves sold at weaning, (2) a one-generation planning horizon with calves sold as yearlings, and (3) a three-generation planning horizon with a portion of the heifer calves retained for herd replacements and all other calves sold at weaning. In ranking (1), weaning weight EPD values were used to determine the NPV of increased weaning weight of the calf crop for each AI sire. In ranking (2), yearling weight EPD values were used similarly. In ranking (3), weaning weight and milk EPDs were used in combination to determine the present value of increased weaning weight of calves sold plus the future gains from increased weaning weight of the replacement heifers' descendants.

Rankings (1) and (2) would be most appropriate for selecting terminal sires with no replacement heifers kept from offspring. Ranking (3) would be most appropriate for selecting maternal sires with replacement heifers kept from offspring. Since these rankings do not consider birth weight, producers should still select bulls with birth weight EPDs that are appropriate for the specific cow herd, mature cow size, and acceptable level of calving difficulty.

Developing the Analysis

In the crossbred analysis, across-breed adjustment factors (Van Vleck and Cundiff 2002) were used to adjust each sire's EPD values to an Angus base. NPVs were then calculated for each sire in the across-breed analysis using these adjusted EPDs. The NPV estimates were based on the average EPDs of the cow herd being equal to a zero Angus base. This allowed economic evaluations and comparisons to be made between bulls of different breeds. The across-breed adjustment factors accounted for the effects of heterosis (hybrid vigor) displayed by crossbred calves and permitted economic gains from heterosis to be included in the NPV calculations.

To assure relevance and usefulness to purebred producers, the NPV rankings for purebred producers used breed-specific EPDs. They were based on the average EPDs of the cow herd being equal to a zero base for the respective breed.

A 62% conception rate was used in the NPV calculations. Cows were serviced a maximum of two times by AI. Cows still open after the second AI service were bred via natural service. Consequently, genetic gain from AI bulls was a function of conception rate since not all cows conceived after two AI services.

Calf price was \$0.82/lb., the simple average calf price in Washington State for 1993-2001 (WASS, 2001a). Yearling price was \$0.72/lb and cull cow price was \$0.37/lb, the simple

average of respective prices in Washington State for 1993-2001 (WASS 2000, WASS 2001b, WASS 2002). An average cost of gain for calves of \$0.20/lb was based on a grazing fee of \$12.00/animal unit month. This was the average of 2001 grazing fees on privately owned land in 17 Western states (USDA, 2001). Calves were expected to gain an average of 2.0 lb/day from birth to weaning. The cost of gain from weaning to yearling of \$0.35/lb was the simple average cost of gain for backgrounding steers and heifers from 1993 to 2001 (Cattle Fax, 2001). The period 1993-2001 was long enough to capture the full range of a typical beef cattle price cycle.

A real interest rate of 3% (approximately the historical average difference between the nominal interest rate and the inflation rate) was used to discount the future value of genetic gain.

Depending on producer management and culling criteria, cow replacement rates can vary from 8% to 26% of the herd per year (Clarke et al. 1982). A cow replacement rate of 20% per year and a 12-month calving interval were used in calculating NPV values for planning horizons beyond one generation. Cull cows were sold immediately after weaning. Yearling weight EPD's were used as a proxy for the EPDs of cull cow weights. Mortality rates were 1% per year for cows, 5.5% from birth to weaning (including calves born dead) (APHIS, 1998), and 1% from weaning to yearling.

Data used included EPDs and accuracies of weaning weight, yearling weight, and milk, as well as semen prices for available U.S. Spring 2002 beef sires. Maternal weaning weight EPDs were calculated from weaning weight and milk EPDs.

Sires evaluated in the Spring 2003 analysis included all sires for seven breeds listed by four semen providers – Genex (GEN), Accelerated Genetics (ACG), ABS Global (ABS), and Select Sires (SS). A total of 552 bulls were evaluated – 264 Angus bulls, 84 Red Angus bulls, 81

Simmental bulls, 42 Charolais bulls, 37 Hereford bulls, 20 Limousin bulls, and 24 Gelbvieh bulls.

Rankings for Crossbred Service

For brevity, the tables included in this bulletin focus on the top 20 sires selected by ranking (3). This ranking is based on a three-generation planning horizon with a portion of heifer calves retained for herd replacements and all other calves sold at weaning. Other rankings can be developed by using the linked spreadsheets referenced on the next page. Instructions are included in the appendix.

Table 1 presents the 20 most profitable sires for crossbreeding to Angus dams as ranked by NPV for a three-generation planning horizon. Estimating net present value to three generations is most appropriate for producers with a relatively long planning horizon who expect to realize benefits of genetic improvement by retaining replacement heifers from their own herd.

The average NPV for the 20 most profitable sires was \$19 higher than the average of all bulls in the sample. The difference in profit would total more than \$9,500 per year for a producer with a herd of 500 cows.

Of particular note, the average semen price from the top 20 bulls was \$4 lower per unit than the average of all bulls. Yet, the average genetic improvement from this group was higher in each category than the average of all bulls. This means that producers can benefit from substantial genetic improvement and economic returns with below-average semen cost by selecting from among the top 20 bulls. The most profitable sires provided sizeable genetic improvement at very moderate cost.

While semen from any bull listed in Table 1 is expected to produce considerably higher profit than the average of all bulls, additional profit can be obtained by careful selection from

among the top 20 bulls. For example, semen from Duke (the top bull) is expected to yield more than 50% greater profit than semen from Victory (#19). This result is due to the fact that Duke's EPD for weaning weight is much higher than Victory's. Duke's EPD for milk is also modestly higher than King's.

Although not used to compute NPV, the EPDs for birth weight are also reported in the tables. To reduce calving problems, a producer should select semen from a bull with low EPD for birth weight. Among the top 20 sires, Trendsetter is expected to yield nearly as much profit as the average of the top 20 (\$18 above the average of the entire sample of 552 sires). It has an EPD for weaning weight that is little more than a third of the average of the top 20 and less than the average of the entire sample.

Rankings for Purebred Service

Table 2 presents the 20 most profitable Angus sires for breeding to Angus dams as ranked by NPV for a three-generation planning horizon. The most profitable sires for purebred service with other breeds are in Tables 3-8.

In the purebred analyses, the top 20 bulls ranked by NPV for a three-generation planning horizon averaged \$5 to \$11 higher than the average of all AI Sires for their respective breeds. For a 500-cow herd, these differences ranged from \$2,500 to \$5,500 per year. As with the crossbred analysis, average semen costs for the top 20 bulls were consistently lower than the average for all bulls of each breed in the sample. The reduction in average semen cost ranged from \$2 to \$5 per unit of semen. In addition, the average genetic improvement from this group was nearly always higher in each category than the average of all bulls.

Conclusion

The most profitable sires in all rankings offered substantial genetic improvement at moderate cost. Producers can purchase profit-maximizing genetic improvement at less than the cost of average genetic improvement. In some rankings, as few as one-quarter of bulls that ranked in the top 20 by EPD remained in the top 20 when the same bulls were ranked by the net present value of expected progeny difference.

To Tailor Rankings to Your Herd

A set of linked spreadsheets can be accessed at the following website: <http://farm-mgmt.wsu.edu> click on Publication Links, then under Livestock click on (Beef, Sheep, and Horse) or order a compact disk from the same site. Instructions are included in the Appendix to help you determine the best AI bulls for your herd.

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Table 1. Twenty Most Profitable Bulls for Crossbred Service to Angus Cows

Stud	Breed	Code	Name	NPV		WW		Milk		BW		Semen Price
				PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	
ACG	Charolais	014CH5005	DUKE	\$31.14	\$20.90	96.2	0.68	17.8	0.15	16.1	0.76	\$18.00
ACG	Simmental	014SM03018	RAB BIG TIME G2158	\$25.80	\$14.83	76.4	0.34	22.3	0.25	9.1	0.34	\$15.00
SS	Simmental	7SM33	ORLANDO	\$24.66	\$18.42	76.5	0.76	17.3	0.62	8.3	0.81	\$15.00
SS	Charolais	7CH85	BENEFIT	\$24.15	\$14.09	67.3	0.65	18.5	0.25	10.5	0.78	\$12.00
SS	Charolais	7CH80	PERFECT MARK	\$22.99	\$18.09	62.0	0.89	14.4	0.80	11.3	0.92	\$10.00
ACG	Charolais	014CH5004	KING	\$22.65	\$12.06	62.0	0.62	23.7	0.21	14.5	0.70	\$12.00
SS	Charolais	7CH84	CHOICE PLUS	\$22.50	\$15.80	80.9	0.82	27.0	0.57	11.9	0.89	\$20.00
ACG	Simmental	014SM03020	DDC BACKDRAFT H852	\$22.34	\$12.42	75.3	0.47	10.7	0.28	8.7	0.47	\$15.00
GEN	Simmental	1SM0035	RIGHT TIME	\$22.09	\$17.81	73.7	0.92	13.1	0.89	10.1	0.93	\$15.00
SS	Simmental	7SM44	MIGHTY MIKE YSP-II	\$21.99	\$10.05	63.1	0.23	18.9	0.21	9.2	0.24	\$12.00
ACG	Simmental	014SM03024	BF K065 TALLADEGA	\$21.91	\$10.73	71.6	0.32	17.0	0.23	10.3	0.32	\$15.00
ABS	Simmental	29SM0319	FUTURE MODERATOR	\$21.48	\$16.22	60.7	0.84	22.1	0.80	8.9	0.86	\$12.00
SS	Simmental	7SM36	AUTOBAHN	\$21.39	\$13.07	61.5	0.66	19.9	0.32	8.2	0.75	\$12.00
SS	Charolais	7CH87	KOJACK	\$21.38	\$7.63	69.0	0.28	20.5	0.19	7.3	0.41	\$15.00
GEN	Charolais	11CH1012	SIR PRIDE	\$21.16	\$3.51	76.0	0.00	21.1	0.00	14.2	0.00	\$18.00
GEN	Angus	36AN0664	TRENDSETTER	\$20.81	\$18.72	68.0	0.82	20.0	0.65	3.9	0.85	\$15.00
SS	Simmental	7SM43	RED ANSWER YSP-II	\$20.68	\$9.37	62.6	0.32	14.8	0.23	9.6	0.35	\$12.00
SS	Charolais	7CH81	KING	\$20.50	\$12.50	49.3	0.73	42.1	0.52	10.9	0.81	\$12.00
SS	Charolais	7CH82	VICTORY	\$20.47	\$7.06	61.6	0.36	16.0	0.15	13.7	0.59	\$12.00
ACG	Simmental	014SM03017	RAB RED MAN G2134	\$20.20	\$9.21	60.9	0.34	16.6	0.25	10.2	0.34	\$12.00
			Average of top 20 sires	\$22.51	\$13.13	68.7	0.55	19.7	0.38	10.3	0.61	\$13.95
			Average of 552 sires	\$3.23	-\$2.03	44.3	0.68	16.8	0.54	4.2	0.72	\$17.95

Column codes and units: PV3\$ = NPV to three generations, LCI = lower limit of 67% confidence interval of PV3\$, EPD = expected progeny difference (lb), ACC = accuracy of EPD, WW = weaning weight, BW = birth weight, Semen price (\$/unit).

Table 2. Twenty Most Profitable Bulls for Purebred Service to Angus Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen Price
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	
GEN	36AN0664	TRENDSETTER	\$20.81	\$18.84	68.0	0.82	20.0	0.65	3.9	0.85	\$15.00
ACG	014AN00206	ONION HOLLOW LIFETIME 807	\$16.54	\$14.67	41.0	0.85	22.0	0.62	3.5	0.85	\$8.00
GEN	11AN1020	RITO 8K4	\$15.86	\$14.12	59.0	0.85	25.0	0.68	4.4	0.85	\$16.00
GEN	1AN1001	HALL OF FAME	\$14.66	\$12.70	53.0	0.85	11.0	0.63	-0.7	0.85	\$12.00
SS	9AN75	HHF IDEAL	\$14.57	\$11.89	54.0	0.73	25.0	0.62	4.7	0.80	\$15.00
ACG	014AN00234	HYLINE RIGHT WAY 781	\$14.32	\$8.53	54.0	0.34	24.0	0.26	2.5	0.32	\$15.00
SS	7AN226	BULLSEYE	\$13.89	\$8.72	44.0	0.41	27.0	0.34	0.6	0.41	\$12.00
ABS	29AN1502	DESIGN PLUS	\$13.81	\$12.11	54.0	0.85	22.0	0.68	4.2	0.85	\$15.00
GEN	11AN1002	VENTURE 4423	\$13.70	\$12.28	46.0	0.85	22.0	0.80	2.8	0.85	\$12.00
SS	7AN192	RIPTIDE	\$13.39	\$12.25	45.0	0.91	23.0	0.77	1.4	0.96	\$12.00
SS	7AN222	PREDESTINED	\$13.38	\$11.52	45.0	0.85	23.0	0.62	5.2	0.85	\$12.00
GEN	1AN1024	EXT 6106	\$13.10	\$11.46	50.0	0.85	22.0	0.71	0.0	0.85	\$14.00
ABS	29AN1558	RELIANT	\$12.93	\$11.37	47.0	0.85	39.0	0.73	3.2	0.85	\$16.00
GEN	1AN1005	SENTRY	\$12.91	\$11.60	45.0	0.85	21.0	0.85	2.2	0.85	\$12.00
SS	7AN183	5TR8	\$12.77	\$12.06	41.0	0.96	29.0	0.87	4.8	0.97	\$12.00
ACG	014AN00209	TOKACH TOP HONORS 9540	\$12.69	\$10.57	50.0	0.82	26.0	0.60	1.8	0.85	\$15.00
SS	7AN231	VOLUNTEER YSP-II	\$12.68	\$7.07	45.0	0.36	20.0	0.28	0.6	0.37	\$12.00
SS	7AN225	MAYOR	\$12.63	\$9.84	38.0	0.71	24.0	0.57	0.8	0.78	\$10.00
SS	7AN181	CONGAREE	\$12.38	\$11.13	31.0	0.88	38.0	0.81	0.9	0.94	\$10.00
SS	7AN162	3X17	\$12.33	\$12.02	43.0	0.98	23.0	0.94	4.2	0.99	\$12.00
Average of top 20 sires			\$13.97	\$11.74	47.7	0.78	24.3	0.65	2.5	0.79	\$12.85
Average of 264 sires			\$3.07	\$0.99	41.8	0.80	21.9	0.67	1.9	0.81	\$18.06

See Table 1 for explanation of column codes.

Table 3. Twenty Most Profitable Bulls for Purebred Service to Red Angus Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	Price
SS	7AR41	HO HO	\$14.41	\$9.56	43.9	0.51	18.8	0.23	1.0	0.63	\$15.00
SS	7AR46	CATALYST YSP-II	\$11.10	\$5.57	49.1	0.39	21.8	0.26	1.7	0.48	\$8.00
ACG	014AR02014	PAY DAY	\$11.08	\$7.39	48.0	0.67	24.0	0.30	3.4	0.77	\$16.00
ACG	014AR02008	SLOW TREE	\$10.41	\$7.27	51.0	0.65	15.0	0.58	6.7	0.69	\$12.00
GEN	1AR0879	MILLENIUM	\$10.05	\$7.23	45.0	0.73	26.0	0.53	1.3	0.81	\$15.00
ACG	014AR00104	SOMETHIN SPECIAL	\$9.95	\$8.47	34.0	0.85	11.0	0.82	4.1	0.86	\$15.00
SS	7AR40	VIRILE	\$9.78	\$6.07	38.5	0.63	22.6	0.45	-0.3	0.76	\$12.00
ACG	014AR02002	RED CENTURIAN	\$9.45	\$3.92	42.9	0.39	12.0	0.28	7.6	0.47	\$15.00
SS	7AR44	TOP DESIGN	\$9.09	\$2.74	35.9	0.27	14.4	0.21	2.2	0.35	\$12.00
ACG	014AR02011	JACOMA	\$7.19	\$1.84	44.0	0.43	17.0	0.27	2.3	0.52	\$12.00
ACG	014AR02015	RED SPREAD	\$6.82	\$4.49	44.0	0.76	32.0	0.68	1.9	0.81	\$12.00
ABS	29AR0197	PROTOCOL	\$6.52	-\$0.23	49.0	0.25	20.0	0.14	0.8	0.35	\$14.00
ABS	29AR0192	HIGH CAPACITY	\$6.17	\$1.12	48.0	0.47	21.0	0.29	4.4	0.57	\$16.00
SS	7AR48	RAMBLER YSP-II	\$5.70	-\$0.65	31.6	0.28	20.9	0.22	-1.9	0.36	\$12.00
ACG	014AR02019	TOP MONEY	\$5.55	-\$0.85	39.0	0.27	21.0	0.21	1.5	0.34	\$12.00
SS	7AR42	EMBOSSSED	\$5.41	\$0.07	32.8	0.42	17.2	0.26	1.3	0.52	\$15.00
GEN	1AR0880	GRAND SLAM	\$5.39	\$0.93	47.0	0.56	20.0	0.27	4.1	0.71	\$12.00
SS	7AR33	DUKE	\$5.18	\$1.49	34.5	0.64	12.9	0.43	-1.2	0.72	\$10.00
ACG	014AR02001	LAKOTA	\$4.59	\$1.19	24.0	0.64	11.0	0.56	1.7	0.70	\$10.00
SS	7AR47	CUSTER YSP-II	\$4.07	-\$2.29	28.9	0.27	20.2	0.20	-4.9	0.35	\$12.00
		Average of top 20 sires	\$7.90	\$3.27	40.6	0.50	18.9	0.36	1.9	0.59	\$12.85
		Average of 84 sires	\$0.08	-\$3.52	33.6	0.62	18.5	0.47	-0.5	0.70	\$16.39

See Table 1 for explanation of column codes.

Table 4. Twenty Most Profitable Bulls for Purebred Service to Simmental Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen Price
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	
ACG	014SM03018	RAB BIG TIME G2158	\$12.01	\$4.05	54.8	0.34	13.3	0.25	2.7	0.34	\$15.00
SS	7SM33	ORLANDO	\$10.87	\$7.69	54.9	0.76	8.3	0.62	1.9	0.81	\$15.00
ACG	014SM03020	DDC BACKDRAFT H852	\$8.55	\$1.68	53.7	0.47	1.7	0.28	2.3	0.47	\$15.00
GEN	1SM0035	RIGHT TIME	\$8.30	\$7.07	52.1	0.92	4.1	0.89	3.7	0.93	\$15.00
SS	7SM44	MIGHTY MIKE YSP-II	\$8.21	-\$0.68	41.5	0.23	9.9	0.21	2.8	0.24	\$12.00
ACG	014SM03024	BF K065 TALLADEGA	\$8.13	\$0.00	50.0	0.32	8.0	0.23	3.9	0.32	\$15.00
ABS	29SM0319	FUTURE MODERATOR	\$7.69	\$5.53	39.1	0.84	13.1	0.80	2.5	0.86	\$12.00
SS	7SM36	AUTOBAHN	\$7.60	\$2.48	39.9	0.66	10.9	0.32	1.8	0.75	\$12.00
SS	7SM43	RED ANSWER YSP-II	\$6.89	-\$1.28	41.0	0.32	5.8	0.23	3.2	0.35	\$12.00
ACG	014SM03017	RAB RED MAN G2134	\$6.42	-\$1.53	39.3	0.34	7.6	0.25	3.8	0.34	\$12.00
ACG	014SM03023	KSU MANHATTAN 38J	\$5.83	-\$0.56	44.9	0.53	9.7	0.27	3.8	0.53	\$15.00
SS	7SM37	SIR LIGHT	\$5.65	-\$0.61	48.0	0.52	2.3	0.27	4.0	0.69	\$15.00
SS	7SM40	FORTUNE	\$5.33	-\$3.79	38.2	0.22	5.6	0.19	1.6	0.23	\$12.00
ABS	29SM0335	BOLD CAT	\$4.66	\$3.15	45.0	0.89	10.3	0.81	5.7	0.91	\$16.00
SS	7SM39	TWISTER	\$2.57	-\$3.34	39.0	0.57	9.3	0.25	-0.9	0.64	\$15.00
ABS	29SM0269	BOLD FUTURE	\$2.50	\$1.82	36.9	0.96	13.5	0.95	1.7	0.96	\$15.00
GEN	1SM0465	PERFECTOR	\$2.37	\$0.03	54.1	0.86	3.7	0.67	5.2	0.88	\$20.00
ABS	29SM0361	JW TAYLOR	\$2.20	-\$4.93	57.3	0.43	-3.8	0.25	-0.3	0.49	\$20.00
ACG	014SM03016	S/M BEST WESTERN E422	\$1.98	-\$4.47	38.6	0.48	24.3	0.32	4.7	0.48	\$18.00
ACG	014SM03022	HART BACK FIRE J283	\$1.79	-\$3.14	39.9	0.68	4.4	0.27	-0.7	0.68	\$15.00
Average of top 20 sires			\$5.98	\$0.46	45.4	0.57	8.1	0.42	2.7	0.60	\$14.80
Average of 81 sires			-\$4.60	-\$8.98	37.4	0.66	6.9	0.51	1.4	0.70	\$19.14

See Table 1 for explanation of column codes.

Table 5. Twenty Most Profitable Bulls for Purebred Service to Charolais Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	Price
ACG	014CH5005	DUKE	\$8.64	\$1.19	55.1	0.68	15.8	0.15	5.6	0.76	\$18.00
SS	7CH85	BENEFIT	\$1.64	-\$5.67	26.2	0.65	16.5	0.25	0.0	0.78	\$12.00
SS	7CH80	PERFECT MARK	\$0.49	-\$1.66	20.9	0.89	12.4	0.80	0.8	0.92	\$10.00
ACG	014CH5004	KING	\$0.15	-\$7.78	20.9	0.62	21.7	0.21	4.0	0.70	\$12.00
SS	7CH84	CHOICE PLUS	-\$0.01	-\$4.31	39.8	0.82	25.0	0.57	1.4	0.89	\$20.00
SS	7CH87	KOJACK	-\$1.12	-\$12.24	27.9	0.28	18.5	0.19	-3.2	0.41	\$15.00
GEN	11CH1012	SIR PRIDE	-\$1.35	-\$16.25	34.9	0.00	19.1	0.00	3.7	0.00	\$18.00
SS	7CH81	KING	-\$2.00	-\$7.24	8.2	0.73	40.1	0.52	0.4	0.81	\$12.00
SS	7CH82	VICTORY	-\$2.03	-\$12.54	20.5	0.36	14.0	0.15	3.2	0.59	\$12.00
SS	7CH86	IMPRESSIVE	-\$2.46	-\$12.26	19.9	0.44	13.8	0.15	0.1	0.54	\$12.00
SS	7CH83	SKYMONT	-\$3.34	-\$6.69	23.3	0.85	19.4	0.70	1.0	0.90	\$15.00
ABS	29CH0182	PRIME UP	-\$5.14	-\$12.27	33.9	0.71	6.0	0.15	2.0	0.80	\$18.00
ABS	29CH0187	WRANGLER	-\$5.38	-\$20.09	33.3	0.00	17.5	0.00	-1.5	0.00	\$20.00
SS	7CH78	MAC'S FACTOR	-\$5.43	-\$6.99	25.4	0.92	6.6	0.86	4.1	0.94	\$15.00
ACG	014CH5003	SIR MAC	-\$5.73	-\$8.16	17.8	0.88	21.6	0.77	-4.2	0.91	\$15.00
GEN	1CH0929	SCHURRSHOT	-\$5.94	-\$9.78	37.5	0.81	6.1	0.63	4.1	0.87	\$20.00
ABS	29CH0184	SMOKIN JOE	-\$6.24	-\$13.19	33.6	0.73	13.4	0.15	4.0	0.80	\$20.00
GEN	1CH0932	EASE	-\$6.49	-\$9.57	32.5	0.86	3.7	0.69	1.3	0.89	\$18.00
ABS	29CH0176	MR ELIMINATOR	-\$7.09	-\$10.67	28.5	0.84	10.2	0.63	-4.3	0.89	\$18.00
GEN	1CH0931	FIRESTEEL	-\$8.93	-\$17.22	14.2	0.59	16.5	0.15	1.1	0.71	\$15.00
		Average of top 20 sires	-\$2.89	-\$9.67	26.7	0.63	15.9	0.39	1.0	0.71	\$15.75
		Average of 42 sires	-\$9.68	-\$15.48	22.5	0.69	14.0	0.46	0.4	0.76	\$18.29

See Table 1 for explanation of column codes.

Table 6. Twenty Most Profitable Bulls for Purebred Service to Hereford Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	Price
GEN	1HH0100	L1 DOMINO	\$15.24	\$10.14	42.0	0.44	26.0	0.29	2.9	0.61	\$10.00
GEN	1HP0814	NEW DIMENSION	\$14.13	\$7.92	80.0	0.33	23.0	0.10	3.2	0.52	\$25.00
GEN	1HP0810	JJJ VICTOR	\$14.01	\$8.80	43.0	0.45	19.0	0.24	2.4	0.61	\$10.00
ABS	29HP0898	BENNETT H119	\$11.20	\$5.70	56.0	0.43	24.0	0.17	2.2	0.56	\$18.00
ACG	014HP01007	HUTH PROSPECTOR K085	\$10.51	\$4.18	56.0	0.29	21.0	0.15	0.7	0.47	\$18.00
SS	7HP96	KARAT	\$10.47	\$4.01	41.0	0.27	20.0	0.15	-1.0	0.34	\$12.00
SS	7HP95	LIMITED EDITION	\$8.96	\$3.12	55.0	0.34	17.0	0.21	1.3	0.43	\$18.00
GEN	1HP0811	VICTOR 780	\$8.93	\$2.36	32.0	0.25	22.0	0.11	0.6	0.33	\$10.00
SS	7HP92	PYRAMID	\$8.92	\$4.66	40.0	0.59	16.0	0.30	1.9	0.69	\$12.00
ACG	014HP01003	KE MILKER 381C	\$8.66	\$6.15	52.0	0.73	6.0	0.63	2.5	0.79	\$15.00
ABS	29HP0894	BENNETT H268	\$7.72	\$1.63	46.0	0.31	15.0	0.20	3.6	0.48	\$15.00
ABS	29HH0819	DOMINO 5362	\$6.63	\$4.97	23.0	0.81	21.0	0.78	-1.8	0.85	\$8.00
ABS	29HP0899	GENETIC PHASE	\$6.42	\$0.35	47.0	0.34	24.0	0.15	2.1	0.46	\$18.00
SS	7HP89	KCF VICTOR X4	\$5.59	\$4.39	41.0	0.88	17.0	0.86	2.5	0.91	\$15.00
ABS	29HP0896	MASTER DUTY	\$4.05	-\$2.23	43.0	0.28	23.0	0.17	1.9	0.36	\$18.00
ABS	29HP0897	KILLARNEY	\$3.94	-\$2.11	41.0	0.29	16.0	0.22	1.5	0.36	\$16.00
SS	7HP93	FORMULA	\$3.82	-\$0.65	30.0	0.55	17.0	0.30	2.7	0.65	\$12.00
SS	7HP91	JMS VICTOR	\$2.41	\$0.55	26.0	0.80	20.0	0.74	0.8	.85	\$12.00
GEN	1HP0813	COWMAKER	\$2.24	-\$3.43	43.0	0.37	27.0	0.24	4.5	0.54	\$20.00
GEN	11HH1002	DOMINO 552	\$1.92	-\$1.05	41.0	0.71	19.0	0.52	-0.9	0.80	\$18.00
Average of top 20 sires			\$7.79	\$2.97	43.9	0.47	19.7	0.33	1.7	0.54	\$15.00
Average of 37 sires			\$2.87	-\$1.65	39.5	0.51	19.2	0.35	1.5	0.59	\$16.78

See Table 1 for explanation of column codes.

Table 7. Ten Most Profitable Bulls for Purebred Service to Limousin Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	Price
ACG	014LM4505	FREE LANCE	-\$2.94	-\$8.50	39.0	0.66	4.0	0.33	3.2	0.69	\$18.00
SS	7LM7	QUADRANGLE	-\$5.89	-\$15.14	18.0	0.30	4.0	0.15	4.0	0.51	\$12.00
ACG	014LM4504	KING WULF	-\$8.06	-\$16.56	17.0	0.38	14.0	0.15	2.9	0.49	\$15.00
GEN	1LM0011	DUTCH	-\$8.72	-\$17.84	19.0	0.30	7.0	0.15	4.1	0.47	\$15.00
GEN	1LM0013	SHAMGOD	-\$10.40	-\$16.72	22.0	0.60	-6.0	0.21	3.1	0.75	\$15.00
SS	7LM3	HEADLINER	-\$10.40	-\$13.53	3.0	0.78	7.0	0.66	0.7	0.86	\$10.00
ABS	29LM0042	POLLED MANHATTAN	-\$11.93	-\$13.01	6.0	0.93	22.0	0.88	1.0	0.95	\$15.00
ABS	29LM0047	YANKEE	-\$16.35	-\$17.50	4.0	0.94	14.0	0.89	-4.9	0.96	\$16.00
SS	7LM9	EQUITY	-\$16.54	-\$18.96	7.0	0.85	18.0	0.70	2.1	0.89	\$18.00
ABS	29LM0079	CROWN'N 7	-\$17.44	-\$27.20	40.0	0.29	10.0	0.00	1.9	0.36	\$30.00
		Average of top 10 sires	-\$10.87	-\$16.50	17.5	0.60	9.4	0.41	1.8	0.69	\$16.40
		Average of 20 sires	-\$18.00	-\$22.91	17.9	0.67	8.4	0.45	0.9	0.75	\$21.55

See Table 1 for explanation of column codes.

Table 8. Ten Most Profitable Bulls for Purebred Service to Gelbvieh Cows

Stud	Code	Name	NPV		WW		Milk		BW		Semen
			PV3\$	LCI	EPD	ACC	EPD	ACC	EPD	ACC	Price
ACG	014GV3500	BCC AMBUSH	\$9.63	\$6.19	39.0	0.75	21.0	0.64	0.4	0.80	\$12.00
GEN	21GV0006	POLLED SHIMMER	\$8.96	\$2.84	45.0	0.58	22.0	0.29	4.0	0.72	\$15.00
SS	7GV1	TANK	\$7.67	\$6.85	42.0	0.94	23.0	0.92	3.3	0.95	\$15.00
SS	7GV6	BLACK TIE	\$7.06	\$5.36	29.0	0.88	21.0	0.82	-0.8	0.91	\$10.00
SS	7GV4	PROSPECTOR	\$6.19	\$5.07	27.0	0.94	22.0	0.90	-2.3	0.96	\$10.00
SS	7GV5	CAPTAIN DOC	\$5.70	\$4.34	32.0	0.91	20.0	0.86	1.1	0.93	\$12.00
ACG	036GV00069	LANDMARK	\$5.35	-\$3.61	52.0	0.30	20.0	0.22	-1.0	0.58	\$20.00
SS	7GV9	Z138	\$5.01	\$0.64	27.0	0.72	17.0	0.47	-1.8	0.84	\$10.00
GEN	1GV0007	PREMINITION	\$4.70	\$0.02	44.0	0.70	7.0	0.41	1.6	0.79	\$15.00
GEN	1GV0008	RC	\$4.69	-\$1.62	48.0	0.57	26.0	0.31	2.7	0.69	\$20.00
		Average of top 10 sires	\$6.49	\$2.61	38.5	0.73	19.9	0.58	0.7	0.82	\$13.90
		Average of 24 sires	\$1.81	-\$2.95	35.8	0.68	21.4	0.44	-0.3	0.77	\$16.54

See Table 1 for explanation of column codes.

Appendix

AI Beef Sire Economic Analyzer

Users Manual (August 2003 with data for Spring 2003)

Introduction

Beef producers face a complex decision-making process when selecting from among artificial insemination (AI) sires that range widely in price and expected progeny difference (EPD) for various traits. While individual producers vary in specific production goals, their goal in genetic improvement is generally motivated by potential profit. Due to the complexity of the sire selection decision, economically optimal choices are not always clearly evident.

Purchasing semen of an AI sire is an investment in increased returns due to genetic improvement since this expenditure does not earn income until offspring are sold. To assist the producer in this decision, the Sire Analyzer allows the user to rank AI service sires according to their EPDs, net present values (NPVs) and Lower Bound of the Confidence Interval of NPV's. The NPV of an AI sire is estimated by discounting the future net income stream from genetic improvement to its value at the time the investment is made (breeding). The difference between the value of the discounted net income earnings from genetic improvement and the cost of semen is the NPV of semen from that sire.

Like EPDs, the NPV of one bull is intended for comparison to the NPVs of other bulls. Therefore, for purposes of ranking bulls, it is the difference in NPV of the target bull from the NPVs of other bulls that is most important rather than the actual value of the target bull's NPV. Purebred NPVs are useful in comparing bulls within the same breed, and crossbred NPVs for comparing bulls from different breeds.

The AI Beef Sire Economic Analyzer program used Spring 2003 data for all sires available for seven breeds listed by four service/semen providers (studs) – Genex (GEN),

Accelerated Genetics (ACG), ABS Global (ABS), and Select Sires (SS). Breeds were selected based on the number of available bulls and included Angus, Red Angus, Simmental, Hereford, Charolais, Gelbvieh, and Limousin. The NPV analysis reported in this bulletin evaluated the changes in bull rankings due to different management goals at typical conception rates, cattle prices, cost of gain, and real interest rate.

Computer Requirements and Installation

The AI Beef Sire Economic Analyzer is a Microsoft Excel-based program. Because of the size of the program, computational demands are high. To use the Sire Analyzer, it is helpful to have at least the following computer capacity:

1. Windows 2000 or Windows XP
2. Pentium 3
3. 750 MHz processor speed
4. 128 MB of memory (RAM)

Even with this capacity, the program requires considerable time, ranging from several seconds to more than a minute, to perform various operations. Among the more time-intensive operations are recomputing NPVs and sorting sires.

Note: This program has not been tested on Macintosh operating systems.

Using the Program

The program has been divided into several linked pages or “sheets”. The first page is the **Input** sheet where users can specify Herd Management Options and Statistics and expected Market Prices and Production Costs. The following eight sheets each correspond to a distinct NPV analysis -- the Crossbred analysis and the purebred analyses for Angus, Red Angus,

Simmental, Charolais, Hereford, Limousin, and Gelbvieh breeds, respectively. Pages can be selected by clicking on the tab at the bottom of the page.

Input Sheet (Input)

The user can change any red value on this page and also select options from the drop-down menu. Yellow values cannot be changed by the user, but are calculated by the program based on information selected by the user in the red cells and drop-down menu.

Herd Management Options and Statistics

The user can select Expected First Service Conception Rate, Expected Cow Mortality Rate, Expected Calf Death Loss, and a variety of other management options that best describes the herd of interest. In the drop down menu, the user selects from among three Cow Annual Replacement Rates the one that best describes the herd. Default values based on historical industry averages are included for each variable.

Market Prices and Production Costs

The user can enter expected Weaned Calf, Yearling, and Cull Cow Prices, Feed costs, and Real Interest Rate. Real interest rate is the nominal interest rate less inflation and has averaged about 3% over the past several decades. Default prices are average Washington or Northwest prices for the period, 1993-2001.

Crossbred Analysis Sheet (XBreed)

The crossbred page and purebred pages are organized similarly. Sires can be sorted by clicking on any one of the red buttons at the top of the columns. Columns on the left specify the semen provider (Stud), breed, sire code, and sire name. Columns to the right allow the user to scroll back and forth to see each sire's EPDs and corresponding accuracies (Acc) for Birth Weight (BW), Weaning Weight (WW), Yearling Weight (YW), and Milk. Additional columns

provide several categories of NPVs. Specific descriptions of NPVs are listed below in the Ranking and Comparisons section.

In the crossbred analysis, across-breed adjustment (ABA) factors reported by Van Vleck and Cundiff (2002) are used to adjust each sire's EPD values to an Angus base. NPVs are calculated for each sire in the across-breed analysis using these adjusted EPDs. The NPV estimates assume that average EPDs of the cow herd are equal to a zero Angus base. This allows economic evaluations and comparisons between bulls of different breeds to be made. The ABA factors account for the effects of heterosis (hybrid vigor) displayed by crossbred calves and allow economic gains from heterosis to be included in the NPV evaluation.

Purebred Analysis Sheets (Ang, RAng, Sim, Char, Her, Lim, Gel)

To assure relevance and usefulness to purebred producers, the NPV rankings within breeds (purebred producers) use breed-specific EPDs. They also treat average EPDs of the cow herd to be equal to a zero base for the respective breed.

Ranking and Comparisons

The first five rows of each analysis sheet give the following information: Average of the First 20 (10 for Limousin and Gelbvieh) Sires, the Average of All Sires, the difference between the First 20 (10 for Limousin and Gelbvieh) and the average of all sires (Avg. First 20 Minus Avg. All Sires), and the high (Largest Value) and low (Smallest Value) in each EPD, Acc, or NPV category. Changing ranking choices (e.g., WW EPD vs. PV3\$) will change the value reported for the First 20 Sires and Avg. of the First 20 Minus Avg. All Sires. This allows comparisons to be made. For example, average PV3\$ of the top 20 Angus bulls (Ang Sheet) as ranked by WW EPD can be compared to the Average PV3\$ of the top 20 Angus bulls when they

are re-ranked by PV3\$ to see the economic difference in the top 20 sires by WW EPD vs. the top 20 sires by PV3\$.

Sires can be sorted by Weaning Weight EPD (WW EPD), Yearling Weight EPD (YW EPD), Maternal Weaning Weight EPD (MWW EPD), and Net Present Value (NPV). Sires can be sorted by NPV according to any one of six criteria:

1. WW\$, NPV of one generation of offspring with calves sold at weaning.
2. WW\$-1, Lower limit of the 67% confidence interval of WW\$.¹
3. YW\$, NPV of one generation of offspring with calves sold as yearlings.
4. YW\$-1, Lower limit of the 67% confidence interval of YW\$.¹
5. PV3\$, NPV of three generations of offspring with calves sold at weaning. This NPV measure includes the value (from additional weaning weight from WW EPD and Milk EPD) of keeping two generations of replacement heifers sired by an AI bull.
6. PV3\$-1, Lower limit of the 67% confidence interval of WW3\$.¹

Risk

In comparing proven and young sires, it is important to account for the risk associated with the possible future change that could occur in the EPDs of sires with low EPD accuracies. Accuracy values reported for each EPD are used to calculate within-breed standard deviations and 67% confidence intervals of EPD estimates for each bull.

In the purebred and crossbred analyses, the lower limit of the 67% confidence interval of the EPDs (EPD minus one standard deviation) is used to calculate a risk-averse estimate of the NPV for each bull. The risk-averse producer may want to use rankings by the lower limit of the NPV in choosing sires when considering both high and low accuracy bulls. While this selection

¹ The lower limit of the confidence interval criterion should be selected by producers who are willing to forego some profit in order to reduce risk. See subsequent Risk section.

criterion will reduce expected NPV from the chosen sires, it will also reduce risk. In all analyses, the reported NPV is the expected (or average) value for the sire, which means the producer has a 50% probability of achieving at least that economic return. Bulls selected based on the lower limit of the 67% confidence interval provide the producer an 83.3% probability of achieving at least the stated economic return.

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