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## Willingness-to-Pay for Value Added Bred Heifer Characteristics

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Abstract

## **Willingness-to-Pay for Value Added Bred Heifer Characteristics**

The cattle industry has developed a value based marketing system to meet changing consumer demand. However, cattle producer's management decisions are hindered because of their inability to source breeding stock of known quality. In 1997 The University of Missouri Department of Animal Science and College of Veterinary Medicine established a quality based bred heifer production program to educate and assist producers in enhancing the quality of bred heifers to be retained back into the herd or to be sold through the market place. Producers who participate in the Missouri Show-Me-Select Replacement Heifer Program<sup>®</sup> follow a production protocol that ensures both quality and health requirements are met throughout the development of the calf into a bred heifer. Since the inception of this program 7,684 heifers have sold through sanctioned Show-Me-Select sales with gross receipts of \$6,947,512. Program heifers typically sell at a price premium to non-program heifers. Yet, little is known about which quality characteristics are the premium centers within an individual pen of heifers. Assessing buyer value can help heifer program producers make better management decisions and enhance the value of their herd. The objective of this research is to present results from a buyer survey of Missouri Show-Me-Select Replacement Heifer in order to ascertain buyer willingness-to-pay for quality attributes (e.g., EPDs of calf) and market fundamental factors (e.g., synchronization of calving period).

Missouri holds the number two ranking in the United States in regard to the number of beef cows with 1.99 million head. There are approximately 60,000 beef cattle farms throughout the state that generate nearly \$1 billion in annual revenue for beef cattle and calves ("Missouri Beef Facts" 2001). Missouri's largest source of agriculture revenue is the forage-based beef cattle industry that carries potential to become even bigger player in the state's total agriculture

revenue and on-farm income (Missouri Agricultural Statistical Service). The profitability of beef cow/calf operations largely depends upon the pounds of weaned calf per breeding cow. Also, improvements in reproductive management should facilitate an upgrade in production efficiency (Patterson and Randle).

The selection of female replacements has one of the more significant long-term effects on a beef herd's profitability in addition to its production efficiency. Producers need to evaluate the long-term and short-term consequences of their heifer selection and how those choices can be affected by market price and the productiveness of long-term reproduction. Decisions made solely on short-term consequences of selecting replacement heifers often fail to recognize the importance of many different managerial strategies such as: replacement rate, reproductive soundness, death and morbidity rates, conception rate, incidence of disease, calving interval effects on weaning weight and prices, the effect of birth weight on dystocia, and comparative reproductive capacity between heifers and cows.

Given many farmers have not integrated an ideal management system into their business, the situation indicates that adequate efforts have not been made to proliferate producer awareness in the area. Given the potential for improvements in farm income, productivity, reproductive efficiency, and traceability, there is considerable value to the beef industry from the replication of this program to other areas of the country. Thus, producers, veterinarians, animal scientists, agricultural economists, and beef industry persons can use the information presented here to effectively motivate producers to enhance certain characteristics of heifers.

## **Program Background**

In 1994, a National Animal Health and Monitoring Service nationwide survey indicated that producers underutilized useful management procedures for replacement heifers. Information such as this motivated educators throughout the state to develop a program to teach producers the importance of applying certain managerial strategies to their operation.

In 1997, the initial efforts of the Show-Me-Select Heifer Program started in primarily two regions of Missouri, the northeast and southwest, and included 33 different farms. Now the program is “the first comprehensive, statewide, on farm beef heifer development marketing program in the U.S” (Patterson et. al 2003).

As one can see from table one, the program has extended to every part of the state during the given six-year time frame. The Show-Me-Select Program has had entered 45,432 heifers during the time frame. The regions with the largest number of heifers entered are the northeast and southeast while the north central region has the greatest percentage increase (387.5%) from 1999, the first year that every region had a heifer entered into the program, to 2002. Participation in the program has included 451 farms, 158 veterinarians, 17 regional extension livestock specialists, and 10 regional livestock coordinators.

Producers who wish to participate in the program have guidelines that have to be met for a participating heifer. Heifers that are candidates for the program have to be owned a minimum of sixty days before they are bred. There are also vaccination guidelines for the heifer during calthood, weaning, prebreeding, and when the heifer receives her pregnancy check. Furthermore, the heifers must have all of the horns and scurs removed, be treated for internal and external parasites within 30 days of sale, and have been serviced by bulls of known breed and ID. They must weigh a minimum of 800 pounds, receive a minimum body condition score between 5 and

7, and be free of specified blemishes. The program heifers will have a reproductive evaluation exam before the sale in addition to being inspected by a certified screening committee for quality attributes. It is recommended that a brucellosis test is administered and that the animal is free from any implants. Heifers who are approved by a certified team of inspectors will receive a “Show-Me-Select” eartag.

Table 2 provides a summary analysis of average sale prices for SMS heifers marketed through sanctioned SMS heifer sales. Over the past couple of years SMS heifers have brought around \$1,000, with a premium for artificially inseminated heifers. Conventional bred heifers during this period were bringing between \$750 and \$850/head (Missouri Agricultural Statistical Service).

### **The Survey Instrument**

The data for this analysis was compiled from a Fall 2002 survey distributed to all SMS heifer sale attendees (registered buyers) of Missouri Show-Me-Select Replacement Heifers who purchased animals between Fall 1997 and Spring 2002. Nearly 1200 surveys were distributed, 200 were returned with address unknown, and approximately 250 surveys were returned completed. Questions posed of buyers included demographic information, herd composition, on- and off-farm economic factors, and questions pertaining to willingness-to-pay for specific quality attributes and market fundamental factors. Willingness-to-pay questions were posed as \$/head premium one is willing to pay for the specific heifer characteristic. Categories for premiums allowed by those surveyed to respond are \$0/head, \$1-\$25/head, \$26-\$50/head, \$51-75\$/head, \$76-\$100/head, \$101-\$150/head, and > \$150/head. For some quality attributes and market fundamental factors survey participants were asked to rank or provide their willingness-to-pay. These factors were pen uniformity, AI to a calving ease bull, birthing period

synchronization, heifer size, breed, vaccination, EPDs, and muscling. For rankings, a four-point likard scale was used from the highest score of “4 = most important” to the lowest score of “1 = not important.”

Summary statistics for survey responses are presented in table 3. The average age of the survey respondents is similar to the 1999 Census of Agriculture average age reported in Missouri, after adjusting for the time lag between 1997 and 2002. Survey respondents indicated they have owned cattle for nearly 30 years, their average herd size is 90 animals, and they own four bulls. The average herd size reported by survey respondents is nearly three times larger than the average Missouri cow herd size of between 30 and 35 animals (Missouri Agricultural Statistics Service). Angus breed is the predominant genetic type reported by survey respondents, at 73%. And, the average of four bulls per respondent is in line with the ratio of 20 to 25 cows per bull breeding ratio. A very small percentage of respondents indicated that artificial insemination is used for breeding animals. Of those responding to the survey, 61% indicated they have previously purchased SMS heifers at one of the SMS bred heifer sanctioned sales.

## **Results**

The results reported here reflect survey respondent perceptions of the importance and value of quality factors. A series of questions were asked of those surveyed that referred to the importance of certain heifer quality, disposition and temperament, and market factors. Figure 1 lists three bar graphic charts for twelve separate questions about survey respondent perceptions about characteristics related to bred heifer development and SMS heifer program. The questions are arranged from the most important to the least important factors. While no monetary values are assigned to these factors, they do provide an indication of relative importance for production



of quality-based heifers. For instance, disposition and temperament of the heifer (or pen of heifers) was ranked as very important. This indicates that good management practices do generate value. Survey respondents ranked a complete vaccination program as an important component. A complete vaccination program is one requirement of the SMS heifer program, which indicates that potential buyers place value on this factor. A narrow calving window was deemed important. Proper breeding management practices can substantially reduce the calving window. Furthermore, the use of artificial insemination significantly reduced the calving window period. This causality relationship, however, is in stark contrast to survey respondents ranking artificial insemination of heifer as the least important characteristic in their purchase decision. It may be that buyers of artificially inseminated heifers don't fully realize all of the production benefits of artificial insemination. Yet, buyers do demand these production benefits. The percentage of artificially inseminated heifers sold through sanctioned SMS heifer sales has increased since inception of the program. Interestingly, buyer survey respondents ranked previous experience with seller relatively low. This may be an indication that in an organized quality-based heifer program – with specific production protocol – previous interaction is less important than typical commodity transactions. A last interesting point, survey respondents ranked the importance of a third-party verification system, in verifying the stated attributes of the animal, low. It may be that buyers are unaware of the importance of extension, veterinarians, and state department of agriculture persons in ensuring heifers meet the rigorous protocol set forth with this program.

One production question was asked of those surveyed to assess the savings from purchasing heifers developed under a production protocol. Those surveyed, who had previously purchased SMS heifers, were asked to provide a categorical rank of the their herd and SMS

heifer cull rate. Over 80% of those responding to this question indicated that SMS heifers purchased had a cull rate of less than 5%, while less than 40% of respondents indicated their overall herd cull rate was less than 5%. Culling animals and sourcing replacement animals is time consuming and costly. The results here provide one assessment of the potential economic benefit of a quality based livestock production program, decreased cull rate. One caveat to this finding is that SMS heifers may be younger than the average cow in the herd, so a future follow-up survey may be necessary to assess the staying power of cull rates for quality heifers.

Survey respondents categorically ranked their willingness to pay for pen uniformity (figure 3). Pen uniformity refers to how closely correlated all heifers in the pen are relative to weight, muscling, body condition score, and size. The vertical axis represents the percentage of respondents indicating a willingness to pay for pen uniformity in the value category listed on the horizontal axis. Most, respondents, 81%, indicated a willingness-to-pay of at least \$25 to \$50 per head for pen uniformity.<sup>1</sup> This result indicates that for larger lots there is likely a value to sorting the animals into uniform pens.

Almost 75% of respondents indicated a willingness-to-pay of at least a \$25/head premium for heifers bred to a calving ease bull. This value represents the economic costs associated with having to deal with heifer labor problems, e.g., time, veterinarian costs, and the potential loss of heifer and calf. Clearly, being artificially inseminated to a calving ease bull is an important characteristic that buyers are willing to pay a premium for.

Survey respondents indicated that on average they are willing to pay at least a \$25/head premium for a pen of heifers synchronized to calve within a two to three week period (figure 5).

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<sup>1</sup> All respondents indicating a willingness-to-pay over \$25 were summed to get a cumulative percentage willingness to pay value, i.e., someone willing to pay \$100/head would also be willing to pay \$25 per head.

Synchronization of calving period has many cost saving implications. First, time management allows for the herd manager to better plan for when to be on the watch for calving. Second, synchronization allows for cows to be re-bred within a certain time period so that calving the following year has a higher probability of being within a known window. Lastly, uniformity of the calves is important for small herds where it is preferred to market all calves at once.

Survey respondents clearly indicated a willingness-to-pay substantial premium for larger heifers (figure 6). Nearly 70% of respondents indicated a willingness-to-pay premium of at least \$50/head for heifers weighing between 1100 and 1200 pounds. This premium is related to overall additional weight of the animal, the probability that the heifer will have an easier time calving, and overall longevity of the animal in the herd.

### **Conclusions**

The selection and management of replacement heifers in a cow-calf operation has both short and long-term impacts on the process and profitability of that phase in the beef production system. Cow-calf producers have had to make significant management changes during the last few years in response to low farm prices and consumers demanding a better quality product. The most significant change in herd management has occurred through herd genetics to improve product quality and production efficiency. Herd genetics can be partially altered by sire selection and holding back breeding stock; however, to ultimately change herd genetics, replacements for cull cows must be of better genetic quality than current herd genetics.

This study used primary level data to empirically examine buyer willingness-to-pay for quality characteristics in a quality based heifer production system. Specifically, buyers are willing to pay premiums for bred heifers characteristics that lead to calving ease, longevity in the herd, management efficiencies, and type of breed.

The results of this study will help buyers and sellers of replacement heifers make informed management, purchasing, and marketing decisions. Additionally, if the cattle industry is to develop a widely accepted value based marketing system, cattle producers need to produce cattle of known quality that will add value to the animal. The first step toward a true value based marketing system in the cattle industry is establishing the value for quality replacement heifers.

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Table 1. Show-Me-Select Replacement Heifer Program Number of Heifers Entered into Program by Region, per Enrollment Year (Patterson et. al, 2003).

Missouri region	1997		Spring 1998		Spring 1999		Spring 2000		Spring 2001		Spring 2002		Total Head
	1997	1998	1999	1999	2000	2000	2001	2001	2002	2002			
Northeast	1193	1430	2191	0	1895	0	2097	152	2223	226			11407
North Central	0	0	367	0	730	0	1069	10	1352	70			3598
Southeast	0	638	1108	1436	821	1353	885	333	835	6			7415
Southwest	680	934	848	0	600	0	642	239	772	438			5153
West Central	0	0	942	0	606	0	577	130	582	154			2991
Central	0	378	594	0	448	0	617	0	651	0			2688
Central	0	0	339	0	493	0	220	0	252	6			1310
South Central	0	322	319	0	57	0	0	0	0	0			698
South Central	0	0	472	0	667	0	901	279	775	503			3597
Northwest	0	724	482	0	510	0	359	0	363	26			2464
Other	0	763	1137	0	1211	0	0	842	151	7			4111
Total	1873	5189	8799	1436	8038	1353	7367	1985	7956	1436			45432

Table 2. Show-Me-Select Replacement Heifer Program Bred Heifer Sales 1998-2002 Sale Averages Per Year

Year	Regional Totals				All AI Bred Lots				All Natural Bred Lots				Mixed AI and Natural Bred Lots			
	Lot	Hd	Dollars	Avg	Lot	Hd	Dollars	Avg	Lot	Hd	Dollars	Avg	Lot	Hd	Dollars	Avg
1998	331	1427	\$1,094,250	\$767	165	721	\$562,445	\$780	137	567	\$422,150	\$745	29	139	\$109,655	\$789
1999	535	2059	\$1,696,695	\$824	215	864	\$737,902	\$854	246	892	\$713,495	\$800	74	303	\$245,295	\$810
Spring 2000	34	126	\$132,500	\$1,052	19	85	\$91,575	\$1,077	12	30	\$30,300	\$1,010	3	11	\$10,625	\$966
2000	435	1544	\$1,615,885	\$1,047	165	627	\$695,400	\$1,109	217	717	\$708,965	\$989	53	200	\$211,520	\$1,058
Spring 2001	51	175	194,172	\$1,110	20	75	\$89,475	\$1,193	22	67	\$68,947	\$1,029	9	33	\$35,750	\$1,083
2001	520	1936	\$1,870,235	\$966	239	905	\$905,475	\$1000	249	908	\$842,040	\$927	33	123	\$122,720	\$997
Spring 2002	117	333	373,995	\$1,123	49	155	\$180,550	\$1,165	56	146	\$158,545	\$1,086	12	32	\$34,900	\$1,091

Table 3. Summary statistics of survey respondents to questions about a their perceptions of a quality based heifer program.

Characteristic	Average Response
Age (years)	52
Length of time owning cattle (years)	27
Average head of cattle owned (head)	90
Average number of bulls owned (head)	4
Breed composition of buyer herd (% of respondents indicating)	
Angus	73.40%
Simmental	6.40%
Gelbvieh	5.42%
Hereford	5.91%
Charolais	5.42%
Limousin	2.96%
Percent of herd artificially inseminated (% of respondents indicating)	
0-25	87.18%
26-50	7.2%
51-75	3.1%
76-100	2.6%
Percent indicating they have a registered herd	22%
Percent of respondents who have previously purchased SMS heifers	61%

Figure 1. Ranking of Importance of Heifer Quality Characteristics (4 = extremely important .....1= not important)

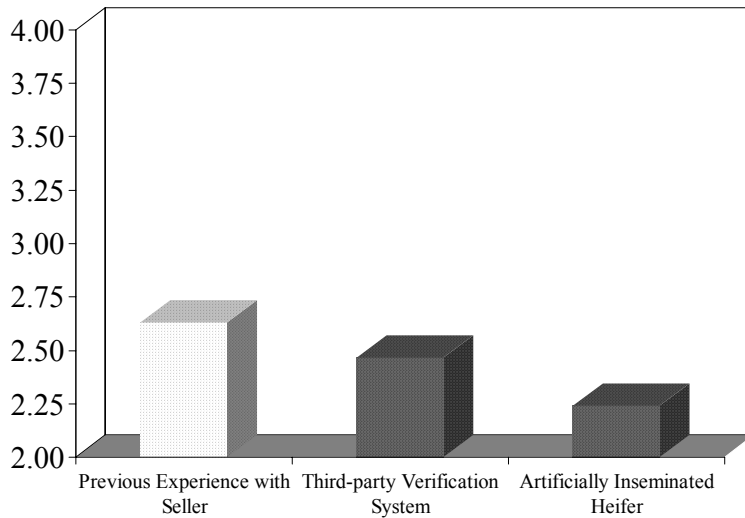
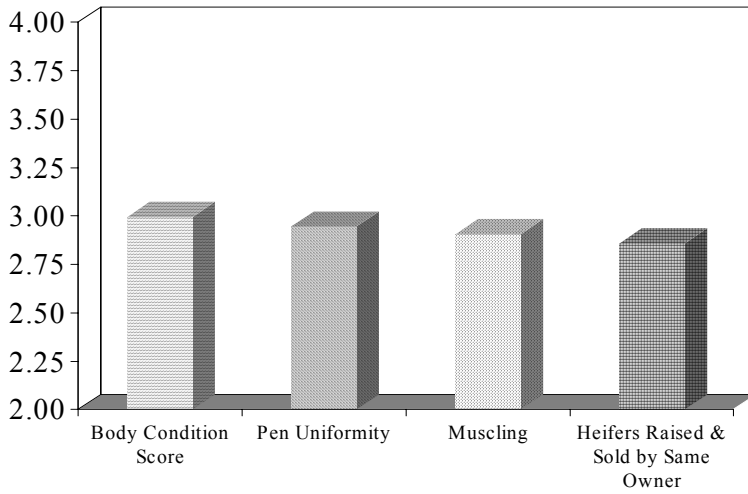
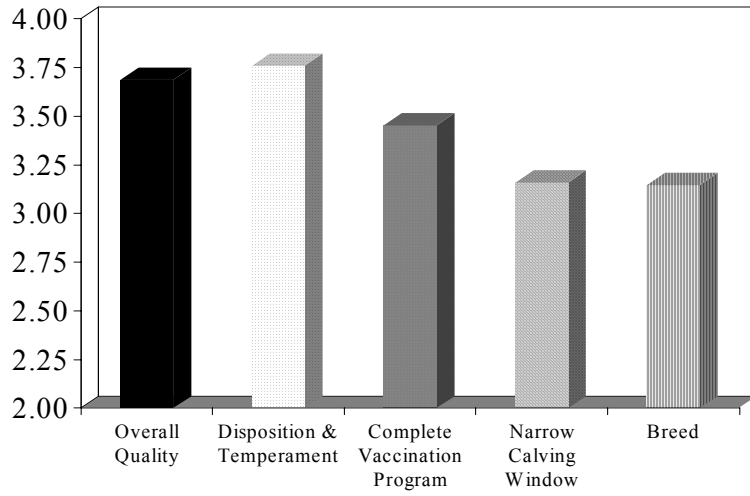




Figure 2. If Ever Purchased SMS Heifers, then Cull Rate (% of respondents indicating stated cull level)

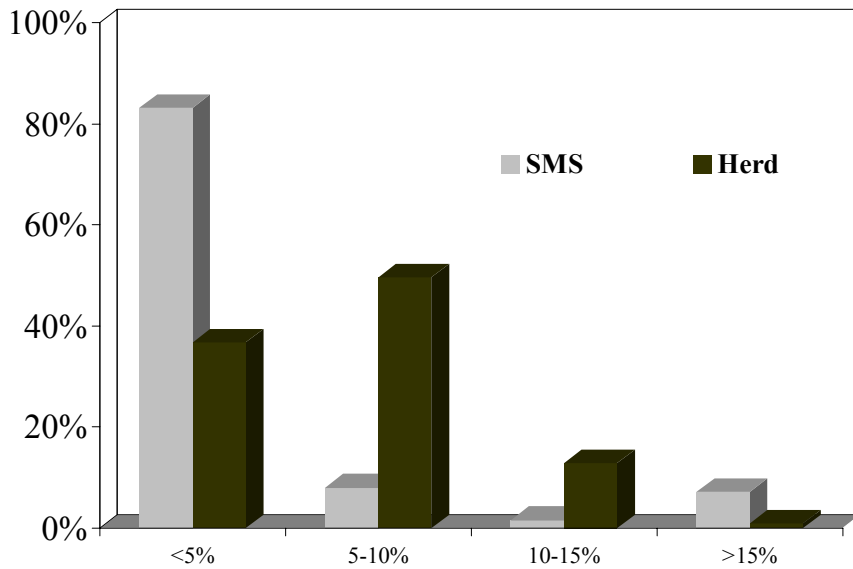


Figure 3. Willingness to Pay for Pen Uniformity (\$/head) (% of respondents indicating they would pay the stated value)

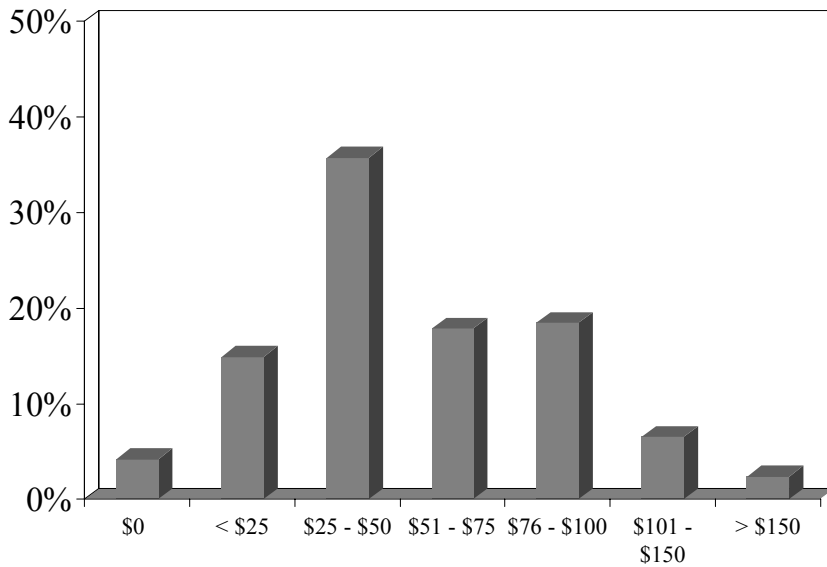


Figure 4. Willingness to Pay for AI to Calving Ease Bull (\$/head) (% of respondents indicating they would pay the stated value)

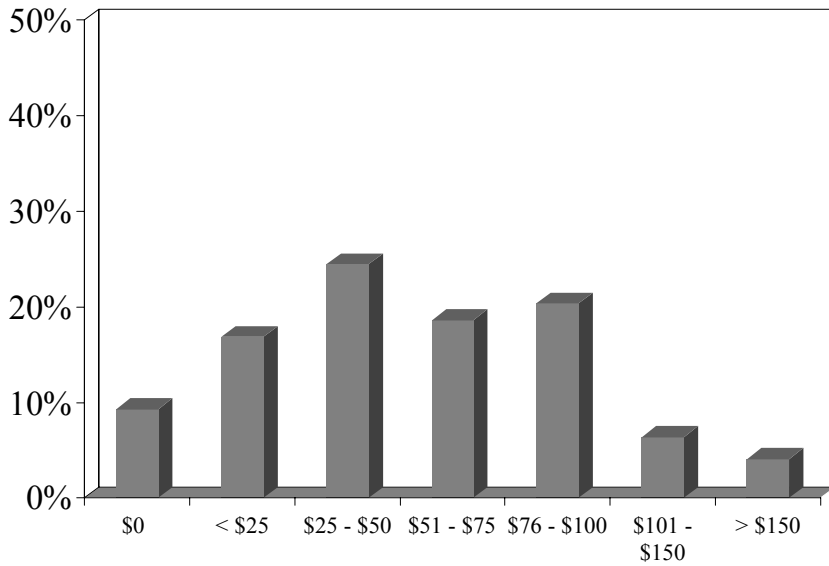


Figure 5. Willingness to Pay for Synchronization of Pen to 2 to 3 wk. period (\$/head) (% of respondents indicating they would pay the stated value)

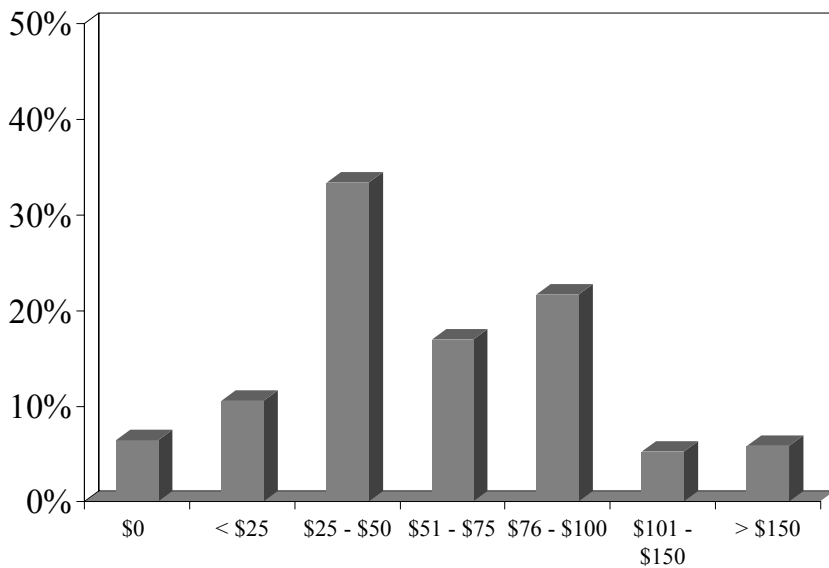


Figure 6. Willingness to Pay for Size (1100 – 1200 lbs) of Heifer (\$/head) (% of respondents indicating they would pay the stated value)

