Staff Paper

A Survey of Reproductive Management Strategies on US Commercial Dairy Farms

by
N. J. Olynk
C. A. Wolf

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Department of Agricultural, Food, and Resource Economics
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824

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Corresponding author: N. J. Olynk, Department of Agricultural, Food, and Resource Economics,

Michigan State University, East Lansing, MI 48824-1039, olynknic@msu.edu

INTRODUCTION

Reproductive performance on the dairy farm affects the dairy's profit because it directly affects milk production, the availability of replacements, the amounts of voluntary and involuntary culling, breeding costs, and costs associated with veterinary care (Britt, 1985). Reproductive management programs selected for implementation differ across farms due to varying on-farm costs, such as labor costs, opportunity costs of management and labor, as well as facilities, farm goals and values, and management styles. The objective of this paper is to summarize survey data in order to aid in providing economic insight into why varying types of farms utilize different methods of reproductive management and differing reproductive technologies.

METHODS

A survey was developed and mailed to 1,000 dairy farms in Michigan, New York, Texas, Wisconsin, and Florida between August and December of 2006. The survey was developed to obtain data regarding reproductive management and performance in 2005. This study ultimately seeks to explore the management and economic implications behind various reproductive management programs and reproductive technology adoption decisions.

Out of the 1,000 surveys mailed the number of farms receiving surveys in each state was selected proportionately to the total number of dairy farms in that state. Dairy farms to receive surveys were selected randomly from all those permitted to sell Grade A milk in the aforementioned states, thereby allowing a broad range of farms to receive and participate in the survey. Only those respondents who were actively operating dairy farms were included in this analysis, resulting in a total of 60 potential respondents for each question. Consistent with Michigan State University research requirements when administering a survey, respondents were presented the option to decline to answer individual questions or sections of the survey at their discretion if they chose to participate at all.

The survey included questions surrounding various aspects of dairy farm management as it relates to reproductive management and performance of both heifers and cows on the operation in 2005. Questions relating to general farm and operator characteristics, including numbers of cows, record keeping methods and responsibilities, management team members, labor utilized and associated costs, and culling (including reasons for culling) were asked in order to better understand the characteristics of the farms which used various reproductive management techniques. More in-depth questions were then asked in sections surrounding reproductive management and performance, heat detection methods, synchronization programs, and recent reproductive management changes implemented on the farm. A description of OvSynch, PreSynch with OvSynch, HeatSynch, CoSynch, controlled internal drug-releasing intravaginal insert (**CIDR**) containing progesterone with $PGF_{2\alpha,}$ and the Targeted Breeding Protocol were provided as an appendix to the reproductive management survey for the reference of the respondent in the synchronization section of the survey.

Summary statistics were computed for continuous variables. When examining the survey statistics throughout the results, the "number of total responses" accompanies all statistics, which indicates the total number of usable responses to a given question. Many questions allowed a respondent to check all answers which were applicable to the operation from a multiple choice list, and such questions were analyzed by tabulating the total number of responses and computing frequencies.

RESULTS AND DISCUSSION

Several survey based studies have been done in recent years in relation to dairy herd reproductive performance and management practices. A recent large scale survey done across multiple states by Caraviello, D. Z., et al. (2006) surveyed 153 large US dairy herds in the Alta GeneticsAdvantage Progeny Testing Program in 2004. Caraviello, D. Z., et al. (2006) asked questions regarding general management, sire selection, reproductive management, inseminator training and technique, heat abatement, body condition scoring, facility design and grouping, nutrition, employee training and management, and animal health and biosecurity. Of the 103 herds which completed the survey, the average herd size was 613 cows and 87% of those herds utilized hormonal synchronization or timed artificial insemination **(TAI)** in their reproductive management programs. Caraviello, D. Z., et al. (2006) provide an in-depth reference of management practices being used on large commercial US dairy herds in 2004 and provide a valuable resource for benchmarking or comparison purposes.

A total of 102 surveys were returned, resulting in a 10.2% response rate. The total number of usable surveys included in this analysis was 60, as only currently operating dairy farms were included. For example, custom heifer raising operations or farms solely raising dairy steers for market were excluded. Of the 60 responses used in this analysis, 10% of respondents noted explicitly in survey responses that they operated organic dairies.

This paper seeks to present survey data which informs analyses of various reproductive management programs. The results are organized into sections regarding farm and operator characteristics, reproductive management and performance, heat detection methods, synchronization programs, recent reproductive management changes, and economic and management implications.

Farm and Operator Characteristics

Pounds of milk sold per cow sold in 2005 were calculated for those 41 respondents which reported both cow numbers and lbs of milk sold. Pounds of milk sold per cow ranged from 7830 lbs/cow to 25,000 lbs/cow, with a mean of 16,111 lbs/cow. Numbers of heifers on these operations ranged from 0 to 1401 (56 responded), with 7 farms reporting the use of a custom heifer raiser. The average number of bulls on the farms was 2, with a range of 0 to 13, and a mode of zero (53 responded). The number of females per bull on the farm varied greatly across farms, from 13.2 to 250 females per bull. This range illustrates the different ways bulls are used on these operations, ranging from solely natural breeding of cows and heifers to a clean-up bull for only limited numbers of animals or problem breeders. A commonly used ratio includes one bull for every 25 females (Fricke and Niles, 2003) and the wide range of survey responses from this common ratio indicates a wide range of reproductive management practices using the bull. The range of number of dairy steers and bull calves on the farm was 0 to 76, with a mean of 6 (54 responded).

Facilities used for housing heifers and cows were reported by respondents through an inclusive list which allowed respondents to select more than one housing option if different housing types were used throughout the year for cows and/or heifers. For example, those farms which utilize stanchion barns for a portion of the year but also utilize pasture for a portion of the year for their heifers would have two heifer responses to this question. This question structure resulted in more than 60 survey responses, although there remain only 60 total respondents. In total, 105 and 107 responses were received for cow and heifer housing, respectively. Survey results regarding housing facilities are provided in Table 1.

Facilities in which heifers and cows are housed are important for ease of care and handling during reproductive management. Facilities will affect reproductive management decisions regarding ease of heat detection, handling for administering shots or performing artificial insemination **(AI)**, and time required to observe and sort cattle as necessary for reproductive management. Since facilities used for heifers and cows will affect the time required to perform such tasks as administering shots, the types of facilities available will likely influence the decisions of managers regarding reproductive programs to employ based on ease of handling, time required to administer treatments, and the costs associated with such processes. Costs associated would include not only the cost of the treatment, but also the cost of the labor to administer the treatment and an assessment of the opportunity cost of that labor on the dairy farm. Opportunity cost is defined as the next best alternative use of a resource that is given up by making a decision. In this case, the opportunity cost of the labor of administering a shot or treatment is what else could be done with that time on the dairy operation.

Record keeping is integrally important to the success of a reproductive program. Records regarding observed heats, treatments administered, behavior observed, or past problems with cows aid in efficient decision making on the dairy operation. Respondents were asked both who in their operation is responsible for record keeping and what the herd management record keeping system was. Of the 54 farms which responded on who in the operation is responsible for record keeping, 59% of farms report record keeping is done by the owner, 17% by the owner's spouse, 11% by the herdsman, 4% have shared responsibility between the herdsman and the owner, 4% by a family member involved in farm management, 2% by and employee, 2% by a trustee, and 2% by a managing partner. Farms were also asked to report all of their means of record keeping. Of those farms responding, 69 responses from the 60 farms were received in response to record keeping, indicating that some farms utilize more than a single method. Overall 41% of responses were for paper records, 28% used their Dairy Herd Improvement Association, 14% used PC Dart (Dairy Records Management Systems, www.drms.org/pcdart.htm), 12% used Dairy Comp 305 (Valley Agriculture Software, Inc., Tulare, CA) or Scout (Valley Agriculture Software, Tulare, CA), and 6% used another method. The most common entry for a method other than those options given was an in-house developed Excel (Microsoft, Seattle, WA) spreadsheet designed for individual herd record keeping.

Management teams of dairy farms often include a mixture of on-farm and off-farm expertise and collaboration to achieve the goals of the dairy. Several options, including owners/managers, veterinarians, nutritionist, bankers, accountants, AI sales representatives, herdsmen, and other employees, were provided in the survey for members of the management team and respondents were asked to indicate all of those which were involved in the management decisions of their dairy farm. Of the 59 respondents answering this question, 131 total responses were received. Of those 131 responses, 44% were owners/managers, 15% were veterinarians, 18% were nutritionists, 4% were bankers, 4% were accountants, 5% were AI sales representatives, 8% were herdsmen, and 2% were other farm employees.

Survey questions regarding cull rates and reasons for culling were asked. The average cull rate reported was 20.5% across the 55 herds which responded to this question, with reported figures ranging from 0 to 41%. The average cull rate of 20.5% was considerably lower than expected, although previous studies have found that average cull rates increase with herd size (Hadley, G. L. et al 2006), and 69% of the sample is comprised of herds with less than 200 cows. When cull rates were assessed for farms by herd size, herds with less than 100 cows had an average cull rate of 18%, herds between 100 and 200 cows had an average cull rate of 20%, and herds with greater than 200 cows had an average cull rate of 27%. On average, of the 31 respondents answering this question, 19% of total culls were due to poor reproductive performance. This finding is extremely similar to the previous findings of Hadley, G. L. et al (2006) who indicate that 18.9% of total culls were attributed to reproductive performance across all of the states included in their study. Clearly, with nearly a fifth of culls being attributed to reproduction, the reproductive performance of the dairy farm has far-reaching implications for not only reproductive efficiency, but culling patterns as well.

Producers were also asked to provide all of the criteria used for voluntary culling decisions. In total 86 responses were received on criteria for voluntary culling. Space available determined voluntary culling for 34% of responses, while 29% reported using springing heifer inventory, 21% used "other" criteria not listed, and 16% used current heifer and cow prices. Some of the "other" criteria reported included the season in which the cull is taking place, profitability of the cow relative to others in herd, age, herdsmen's perceived probability of completing another successful calving, and the type of injury a cow may have.

Reproductive Management and Performance

In-depth reproductive management and performance related questions were asked in the survey. Survey data collected on overall reproductive management and performance included averages ages and weights of heifers at first breeding and first calving, days open, calving intervals, voluntary waiting periods, and average lengths of dry periods. A summary of the responses to such questions, including the number of respondents answering each individual question, is provided in Table 2.

One of the most common measures used when doing economic assessments of dairy reproductive performance is the calving interval because monetary values can be easily associated this measure. The average calving interval found in this survey was 13 months, which is similar to the previously published survey data of Caraviello, D. Z., et al. (2006) reporting 13.8 months as the average calving interval found in their study surveying 103 herd managers. Other measures of reproductive performance that were asked in the survey were the heat detection rate and conception rate, which allowed calculation of services per conception. The average heat detection rate reported for cows was 52%, with the majority of those responses linked to the use of visual heat detection. The average heat detection rate reported for heifers was 68%, which is significantly higher than expected. Possible reasons for this unusually high heat detection rate include relatively fewer responses for heat detection rates in heifers versus cows or possibly overzealous survey responses regarding heat detection rates on-farm. The average conception rates reported for cows and heifers were 41% and 60%, respectively. Average services per conception, as computed from the individual conception rates reported were 2.66 for cows and 1.8 for heifers.

Respondents were asked to select what breeding criteria they used for heifers on their operation from age, percentage of mature bodyweight, frame size, and other. Respondents were then asked to depict the exact criteria used, for example, if age was selected the survey then asked at which age heifers were bred. Respondents could select more than one criteria, and in total 84 responses were received. Table 3 summarizes breeding criteria used for heifers including the average criteria measurements reported. Of the 6% of responses that indicated that some criteria other than those listed was used, the most commonly reported other criteria was weight, in which responses ranged from breeding at 700 pounds to 850 pounds. Additional responses for other criteria included overall appearance and body condition score.

A series of in-depth questions regarding AI usage were asked in the survey, including whether AI is used on cows and/or heifers or not, the average cost of semen used, and who is responsible for insemination. A summary of the results to these questions surrounding the use of AI is presented in Table 4.

Overall, 78% and 64% of farms surveyed indicated that AI was used to breed cows and heifers, respectively for at least some services. Caraviello, D. Z., et al. (2006), in their survey of dairy farms, also sought to determine the extent of AI use and found that 58 of their 103 herd surveyed used solely AI. Zwald (2003), in comparing 14,500 herds, found that approximately half of the herds used a bull for at least some services. In order to assess the reasons for not using only AI to service cows and heifers, respondents were asked to select the reasons for not using only AI. For cows, the reason representing the highest percentage of responses is a lack of labor for estrus detection and to perform AI. The most prominent reason reported for not using solely AI on heifers was a lack of handling facilities in which to easily catch and handle the heifers. Several respondents indicated that there were reasons for not using solely AI beyond those given in the survey and listed above. Some of those other reasons given in survey responses were that natural service allows longer seasons for solely pasture use, increased convenience with natural service, poor heat detection rates with AI, seasonal calving schedule requires tight breeding window which is better accomplished through natural service, poor conception rates with AI, and natural service yielded better results during summer heat stress.

One of the more recently commercially available reproductive technologies available that was asked about in the survey was the use of sex-sorted semen. Only 10.5% of farms responding to the survey report having used sexed semen on their operation in 2005. For those farms reporting the use of sexed semen on their operation, respondents were asked to report what groups of animals it was used on. Of the farms using sexed semen, 80% report using sexed semen only on heifers, while an additional 20% used sexed semen on both heifers and cows.

Heat Detection Methods

In-depth questions regarding heat detection methods used in cows and heifers were asked to assess the current reproductive management program of dairy farms. Respondents were asked to select from a multiple choice list all of those heat detection methods used in 2005 in cows and heifers. Heat detection methods provided in the survey included visual heat detection without aides, passive mount detectors, and electronic heat detection aides. Respondents were also invited to add any additional methods that they employed that were not listed as options in the survey. Passive mount detectors listed for selection in the survey included Kamar Heatmount Detectors (Steamboat Springs, CO), chin ball markers, tail chalking or crayon, and a section for other passive mount detectors. Electronic aides listed in the survey included HeatWatch Estrus Detection System (CowChips, LLC, Denver, CO), pedometers, AfiAct System and associated herd management software (SAE Afikim, Kibbutz Afikim, Israel), or other electronic aided heat detection method. Multiple responses were allowed for both cows and heifers, causing the total number of responses to be 82 for cows and 53 for heifers. A summary of the heat detection methods used by respondents is presented in Table 5. Visual heat detection without the use of aids was the most prominent heat detection method observed in both cows and heifers. Also for both cows and heifers, tail chalking, crayons, or paint was the second most common method of heat detection employed. Caraviello et al. (2006) also found that tail chalk was the most common estrus detection aid used out of their list of tail chalk, pedometers, pressure patches, and other, with tail chalk receiving 60 of the 80 responses reported for estrus detection aides used. Several farms indicated on the survey that they used none of the heat detection methods listed in the survey. The majority of responses for farms selecting none of the given heat detection methods was having cows and heifers bull bred. In addition, respondents selecting none of the methods listed indicated that they used TAI and therefore did not have a heat detection protocol in place.

If visual heat detection was being used in either cows or heifers, respondents were asked to provide additional information regarding the times per day animals were observed, at what times of the day they were observed, for how long animals were observed each time, and who is responsible for heat detection. For the farms using visual heat detection without any aides, large proportions of the cows and heifers on those farms were bred by visual heat detection. Of those farms reporting the use of visual heat detection in cows, on average 78% of the cows on those operations were bred solely by visual heat detection. Of those farms reporting the use of visual heat detection in heifers, on average 90% of the heifers on those operations were bred solely by visual heat detection. These questions regarding visual heat detection were asked separately for cows versus heifers to allow for differences in treatments between these groups. In addition to collecting information on the methods employed for heat detection in cows and heifers, a key performance measure, namely the heat detection rate, was also collected for cows and heifers.

On average, cows and heifers were observed for estrus 3 and 2.2 times per day, respectively. This finding regarding estrus detection is similar to those found by Caraviello et al. (2006) where cows were reportedly checked for estrus 2.8 times per day on weekdays and 2.5 times per day on weekends. In addition, Stevenson, J. (2003) indicated that in a survey of top dairy herds as measured by yearly rolling herd averages, cows were observed for estrus 3.1 times per day, on average, and that this was likely responsible for their success with AI breeding. The most commonly reported times for estrus detection were moving cows, pre-milking and postmilking, and while feeding. Of the 31 farms reporting estrus detection times the average time spent observing cows was 43 minutes per observation. Heifers were observed for estrus for, on average, 19.5 minutes per observation. Compared to previous survey results by Caraviello et al. (2006) which indicated cows were observed for 27 minutes on weekdays and 25 minutes on weekends per observation, cows were reportedly observed for longer and heifers were observed for a shorter time period. The times per day and length of time per observation played a key role in comparing costs associated with different reproductive management programs and using current reproductive performance to determine the costs and benefits of switching to different management techniques.

Questions regarding where estrus detection takes place and who on the farm is responsible for estrus detection did not provide multiple choices for respondents, but allowed respondents to indicate locations and people as they wished. Locations and job types were then grouped accordingly and tabulations and frequencies calculated. Of the 39 total responses for the location of estrus detection of cows, 54% of responses indicated pasture, 26% indicated within the barns, 15% were in corrals or drylots, and 5% indicated parlors or holding areas as the area used for estrus detection. The high proportion of responses indicating estrus detection is performed in the pasture is somewhat surprising, given Caraviello et al. (2006) found the barn to be the most popular response for location of estrus detection. The high proportion of responses indicating the use of pasture for estrus detection may be attributed to a smaller average herd size of survey respondents or the proportionately high level of organic dairy farms responding to the survey. Of the 42 total responses for the person responsible for heat detection of cows, the person most commonly responsible was the owner with 55% of responses, followed by a shared responsibility by all employees receiving 26% of responses, herdsman with 17% of responses, and milkers with 2% of responses.

Of the 25 total responses for the location of estrus detection of heifers, 32% of responses indicated pasture, 40% indicated within the barn, and 28% were in corrals or lots. Of the 42 total responses for the person responsible for heat detection of heifers, the person most commonly responsible was the owner with 55% of responses, followed by a shared responsibility by all employees receiving 26% of responses, herdsman with 17% of responses, and milkers with 2% of responses.

Synchronization Programs

Survey respondents were asked whether synchronization programs were used on their operations in 2005. Separate responses were invited for cows and heifers to allow for differing management programs. In total, 56 and 45 responses were received for whether any synchronization program was used for cows and heifers in 2005, respectively. Synchronization programs were used proportionately more in cows than heifers, with 45% of responses indicating the use of some synchronization program in cows versus only 27% in heifers. In comparison to previous survey analysis by Caraviello et al. (2006), a significantly smaller proportion of respondents used synchronization programs. Cataviello et al. (2006) found that the majority of herds in their survey analysis used hormonal synchronization or TAI programs. Possible explanations for this difference are the difference in average herd size between the two surveys, the relatively high proportion of organic herds included, or even the differing sampling methods. Given that prior studies are often associated with seeking farms associated with a given organization, the type of organization that is used for selection may affect the willingness of survey participants to use certain technologies. For example, surveys of farms associated with an

AI-related company may yield more farms using AI than exist in the dairy farm population as a whole. Admittedly, however, such affiliations are often helpful in increasing number of and quality of responses by farms and a tradeoff exists between using farms with affiliations that may arguably affect management practices and willingness to participate in studies.

Respondents who indicated no synchronization programs were used, were asked to select all reasons why they did not use a synchronization program from multiple choice list. Possible reasons provided for cows and/or heifers included that expense of synchronization program, manager or breeder preference to breed cows to a visually detected estrus, inadequate facilities to restrain cows for injections, lack of management time to manage a synchronization program, not being convinced of the benefits of synchronization for their farm, poor previous conception rates to TAI, and other. A summary of the responses to why synchronization programs were not used is provided in Table 6.

Farms responding that cows and/or heifers were being synchronized in 2005 were asked various questions regarding the uses of synchronization on their operation. How synchronization was used on the farm, for example whether it used to set up animals for their first AI versus only on anovular of cystic cows, for cows or heifers was asked via a multiple choice question. A summary of how synchronization programs were used in both cows and heifers is provided in Table 7. Survey results indicated that the most prevalent reasons to use synchronization was to breed problem breeders, followed by synchronization for first AI or resynchronization for second or greater AI services. Given these reasons for use, costs associated with breeding programs using synchronization versus those using AI with heat detection or maintaining bulls for natural service can be compared generally for setting cows up for initial AI or resynchronization for second or greater AIs.

In order to determine which synchronization programs were used, a list of common programs was provided, along with a detailed appendix explaining the protocols associated with program, and respondents were asked to select any programs they used on cows or heifers from the list or provide information on any other protocols they may have used. Separate answers were encouraged for heifers and cows to allow for differing management programs. More responses to programs used were collected than the number of farms reporting using synchronization programs, therefore, the farms which are using synchronization programs are using multiple programs for different groups of cows or heifers. In addition to what programs were used for cows and heifers, respondents were asked to report what percentage of the herd each program was used on. The proportion of the herd on which a program is used is enlightening as to what programs are used as a widespread method across multiple groups, and which seem to be generally reserved for smaller numbers of, possibly harder to breed, cows. Given the small sample of farms which used synchronization programs for heifers in 2005, the proportion of the herd having used each program was not calculated due to insufficient number of farms using each program to make the proportion of the herd valuable. Table 8 provides a summary of the responses for cows and heifers related to how many farms used various synchronization programs.

Farms were asked to provide cost information for any hormones or treatments used in cows or heifers. Costs per dose were collected and ranged significantly across farms in the survey. For example, $PGF_{2\alpha}$ costs per dose ranged from \$1.25 to \$6.00 per dose. Given the large variation in costs per dose reported, the costs of hormones available to a specific farm may indeed be different than those available to another, and such differences may alter decisions made regarding reproductive management programs. Volume discounts through larger herds or buying with other dairy producers likely account for some of the variation in prices reported. Overall, the average costs per dose reported were $3.59 per dose for GnRH, $2.52 per dose for $PGF_{2\alpha}$, $4.00 for estradiol cypionate **(ECP)**, and $9.22 per CIDR.

In order to more completely assess farm's reproductive management programs and decisions, respondents were also asked what facilities were used to administer injections, the amount of time needed per cow to give a single injection, and the person responsible for giving synchronization program related injections. It is important for accurate economic assessments of the synchronization programs that the actual amount of time provided by an employee in order to administer an injection is accounted for. Time required for injections and the facilities used for injections varied considerably across farms, ranging from 17 seconds where shots are given to cows are already in the parlor to 10 minutes where heifers must be caught in a freestall and put into a headlocks only one at a time. Surely, given the wide variation in facilities used and the time it takes to give an injection, ideal reproductive management programs will be different for farms with varying circumstances. Across the wide variety of facilities used for cows and heifers on the 26 farms responding to this question the average time taken to give an injection was 2.1 minutes. Facilities used to administer injections and the people responsible for giving the injections were reported by respondents without any choices having been presented in the survey. Twenty in-depth responses were received regarding the facilities used and those responses were categorized. The facilities used, in order of frequency, included head locks, stanchion or tiestall barns, other areas (not specifically named by respondents) within freestall barns, and the milking parlor. In addition, the following places were mentioned specifically only once each: holding pens, palpation rails in freestall barn, and a setup involving catching heifers in a headlock one at a time. Twenty-seven responses were received regarding the person responsible for injections related to synchronization programs and were categorized. The person on the dairy responsible for synchronization-related injections the majority of the time was the owner with 59% of responses. Following the owner, in order of frequency were the herdsman or herd manager, milkers, AI technicians and farm family members.

Farm size was found to affect the on-farm costs associated with synchronization programs, including time required for injections and the cost of hormones per shot. For comparison, a on-farm costs were broken down by farm size and are presented in Table 9.

Recent Reproductive Management Changes

Respondents were asked to comment on their most recent major reproductive management change and report in what year it took place in order to assess the changes occurring in reproductive management on farm in recent times. Several farms indicated the initiation of a synchronization program was their latest reproductive management change. Several farms reported their most recent change as moving to using more AI and no longer keeping bulls on the farm. Also, several farms reported their most recent change as switching to natural service and no longer using AI. Other changes reported included increased time devoted to visual heat detection rather than relying upon heat detection aides, switching AI technicians, or ceasing use of hormones for synchronization completely. Of those 26 farms detailing their most recent change in response to the survey, 77% of farms latest reproductive management change took place between 2000 and 2005. With such a high percentage of farms making reproductive management changes in the past 5 years, the recently increased volumes of research revolving around reproductive management programs and technologies are certainly warranted.

In light of recent developments in reproductive technologies for on-farm use, such as ultrasound for pregnancy detection and sex-sorted semen allowing altered sex ratios, perhaps the most surprising changes reported were the several farms that reported a departure from the use of reproductive technologies. Examples include giving up a synchronization program in favor of unaided visual heat detection or moving from an AI based breeding system in favor of natural breeding in order to house cows on pasture for increased portions of the year. AI has been said to have been the most readily accepted technology on the dairy farm, with the exception of the milking machine (Stevenson, 2003). Several reasons are often given for using bulls for natural service over using AI, ranging from citing costs associated with AI, the belief that the bull is best at heat detection and will instill a higher conception rate, and even that calving ease will be improved if a young bull is used. There are, however, several concerns associated with keeping a dairy bull, or a number of dairy bulls, with your dairy herd. Costs associated with the bull can range from daily maintenance costs to costs for diseases spread by bulls throughout the herd to injury or even death of people in contact with bulls on the farm. Heat detection rates, conception rates, and calving ease are all common reasons for maintaining a bull within the dairy herd, even if just for clean-up of cows or heifers which did not breed to AI, but without testing the fertility of 'Barnyard Bennie' is unknown. Other unknown factors which can be challenging with bulls used for natural service are adequate libido and mating ability, both of which may not found in the same bull at the same time (Fricke and Niles, 2003). In addition, Fricke and Niles (2003) warn that in many cases, bulls costs of maintaining bulls can approach or exceed AI related costs without consideration of the long-term genetic advantages of using AI. Overall, the decision to abandon AI in favor of natural breeding should be carefully assessed, in particular with respect to the dangers associated with managing and handling a bull on the dairy farm.

CONCLUSIONS

Through surveying the dairy industries across 5 states we identified key parameters affecting dairy farm reproductive management decisions. By collecting such data industry professionals and dairy farmers alike are better able to benchmark and compare their individual operations to the industry overall. By identifying those programs which are widely used and gathering some insight into what factors dairy producers are taking into account in selecting programs we are better able to determine which programs are likely to be efficient for a given farm operation.

REFERENCES

Britt, J. H. 1985. Enhanced Reproduction and its economics implications. J. Dairy Sci. 68:1585-1592.

Caraviello, D. Z., Wiegel, K. A., Fricke, P. M., Wiltbank, M. C., Florent, M. J., Cook, N. B., Nordlund. K. V., Zwald, N. R., and C. L. Rawson. 2006. Survey of Management Practices on Reproductive Performance of Dairy Cattle on Large US Commercial Farms. J. Dairy Sci. 89:4723-4735.

Fricke, P. and D. Niles. 2003. Don’t fall for the bulls-are-cheaper, more-fertile myth. Hoards Dairyman. Oct 25:8.

Hadley, G. L., C. A. Wolf, and S. B. Harsh. 2006. Dairy cattle culling patterns, explanations, and implications. J. Dairy Sci. 89:2286-2296.

Stevenson, J. 2003. Why natural service is not the solution. Hoards Dairyman. Oct. 25:6.

Wolf, C. A. 1999. Analyzing Reproductive Management Strategies on Dairy Farms. Michigan State University Agricultural Economics Staff Paper 99-23.

Zwald, N. 2003. Does the extra effort of AI pay off? Hoards Dairyman. Oct 25:11.

Table 1. Summary of survey responses regarding facilities used to house cows and heifers

Housing Type	Cows	Heifers
Stanchion Barn	27%	5%
Freestall Barn	29%	23%
Bedded Pack Barn	7%	24%
Drylot	13%	13%
Pasture	24%	34%
Other	0%	1%
Total Number of Responses	**105**	**107**

[1] Per survey instruction, pasture was selected as a housing type if pasture was used as primary housing for cows or heifers for any portion of the year.

Table 2. Summary of survey responses to questions regarding general reproductive management parameters with corresponding means

Question	Response (number of respondents)
Age of heifers at first AI or breeding	15.5 months (53)
Weight of heifers at first breeding	842 pounds (43)
Age of heifers at first calving	24.5 months (52)
Weight of heifers at first calving	1,205pounds (41)
% of lactating cows open greater than 150 days in milk	19.6% of herd (48)
Average number of days open	106.8 days (46)
Voluntary waiting period	63 days (51)
Average number of days to first service	70.7 days (51)
Calving interval	13 months (50)
Average length of dry period	54.3 days (58)

Table 3. Summary of survey responses regarding heifer breeding criteria used on farms in 2005 (number of responses = 84)

	% of Total Responses	Average Criteria Measurement Reported
Age	52%	15.6 months
Percentage of Mature Bodyweight	18%	71.7% at breeding 88% at calving
Frame Size (measured in inches at withers)	24%	48 inches
Other	6%	

Table 4. Summary of survey results to questions regarding AI usage on farms in 2005

<table>
<tr><th>Question</th><th colspan="3">Answer</th><th>Responses</th></tr>
<tr><td>% of farms using AI to breed cows</td><td colspan="3">78%</td><td>58</td></tr>
<tr><td>% of farms using AI to breed heifers</td><td colspan="3">64%</td><td>57</td></tr>
<tr><td>Average percentage of cows being bred AI of farms using AI</td><td colspan="3">87%</td><td>45</td></tr>
<tr><td>Average percentage of heifers being bred AI of farms using AI</td><td colspan="3">89%</td><td>37</td></tr>
<tr><td>% of farms using sexed semen</td><td colspan="3">10.5%</td><td>48</td></tr>
<tr><td>Average price/straw of semen used on cows</td><td colspan="3">$17.30</td><td>43</td></tr>
<tr><td>Average price/straw of semen used on heifers</td><td colspan="3">$18.83</td><td>35</td></tr>
<tr><td rowspan="7">Person(s) responsible for AI</td><td>Choices</td><td>Average # of breeders</td><td>% of responses</td><td rowspan="7">58</td></tr>
<tr><td>Owner/operator</td><td>1.25</td><td>40%</td></tr>
<tr><td>Herdsman</td><td>1.55</td><td>21%</td></tr>
<tr><td>Heifer manager</td><td>2</td><td>3%</td></tr>
<tr><td>Breeding manager</td><td>1</td><td>5%</td></tr>
<tr><td>Outside AI technician</td><td>1.5</td><td>29%</td></tr>
<tr><td>Other</td><td>1.5</td><td>2%</td></tr>
<tr><td>% of responses indicating reasons for using natural service for farms not using 100% AI</td><td colspan="2">Reason</td><td>% of responses</td><td></td></tr>
<tr><td rowspan="5"><u>Cows</u></td><td colspan="2">Cost of semen</td><td>24%</td><td rowspan="5">34</td></tr>
<tr><td colspan="2">Lack handling facilities</td><td>9%</td></tr>
<tr><td colspan="2">Lack labor for heat detection and AI</td><td>35%</td></tr>
<tr><td colspan="2">Use clean up bull</td><td>12%</td></tr>
<tr><td colspan="2">Other</td><td>21%</td></tr>
<tr><td rowspan="5"><u>Heifers</u></td><td colspan="2">Cost of semen</td><td>12%</td><td rowspan="5">34</td></tr>
<tr><td colspan="2">Lack handling facilities</td><td>26%</td></tr>
<tr><td colspan="2">Lack labor for heat detection and AI</td><td>20%</td></tr>
<tr><td colspan="2">Use clean up bull</td><td>12%</td></tr>
<tr><td colspan="2">Other</td><td>21%</td></tr>
</table>

Table 5. Summary of survey results to questions regarding heat detection methods used for cows and heifers (number of responses = 82 and 52 for cows and heifers, respectively)

Type of heat detection method		**% of responses for cows**	**% of responses for heifers**
Visual heat detection	Visual heat detection without aides	62%	74%
Passive mount detectors	Kamar HeatMount Detectors	5%	2%
	Chin ball markers	0%	0%
	Tail chalking, crayon, or paint	20%	11%
	Other passive mount detectors	2%	6%
Electronic aided heat detection	HeatWatch	1%	2%
	Pedometers	0%	0%
	AfiAct and associated herd management program	1%	0%
	Other electronic aided heat detection program	0%	0%
Other	Other method not categorized above	9%	5%

Table 6. Summary of survey results regarding reasons why synchronization programs were not used for cows or heifers (number of responses = 25 and 43 for cows and heifers, respectively)

Reason	**% of responses for cows**	**% of responses for heifers**
Synchronization protocols too expensive	16%	12%
Prefer to breed to visually detected estrus	28%	24%
Inadequate handling facilities	4%	21%
Lack of management time	8%	9%
Not convinced of benefits of synchronization	16%	12%
Poor previous conception rate to TAI	8%	3%
Other	20%	21%
Organic dairy farm	75% of other	83% of other
Prefer natural service	25% of other	17% of other

[1] Other reasons were provided by farm managers by selecting 'other' in the multiple choice question and providing a self-written reason why synchronization programs were not used. All the other responses written by farm managers fit clearly into two categories. These categories have been included above.

Table 7. Summary of survey results regarding how synchronization programs are used in cows and heifers (number of responses = 76)

Use	% of respondents
Setting up cows for first postpartum AI or heifers for first AI	22%
Resynchronization for second or greater AI	22%
Synchronizing and breeding problem breeders	25%
Breeding known cystic animals	18%
Breeding known anestrus of anovular animals	11%
Other	1%

Table 8. Summary of survey responses regarding synchronization programs used (number of responses = 53 and 15 for cows and heifers, respectively)

Question	% of responses for cows	% of responses for heifers	% of cows in the herd on this program for those herds using this program
OvSynch	38%	33%	42%
PreSynch	13%	7%	72%
CoSynch	6%	0%	57%
HeatSynch	2%	0%	10%
CIDR with $PGF_{2\alpha}$	19%	20%	7%
Targeted breeding protocol	6%	20%	63%
Single $PGF_{2\alpha}$ injection (with AI upon detected estrus)	13%	20%	…
Single $PGF_{2\alpha}$ injection with TAI	2%	0%	…
Other	2%	0%	14%

Table 9. On-Farm costs for synchronization programs broken down by farm size

Farm Size (Cows)	HD Time (Minutes per day for group)	Cost per AI	Minutes per shot	Cost of GnRH per dose	Cost of PGF_{2a} per dose
<100	160	21	1.7	4.49	3.1
100-200	122	17	6	3.13	2.13
>200	94	11	1.9	2.7	2.1