Dairy Free Stall Preference Field Study

A.S. Leaflet R2100

Dale Thoreson, dairy extension field specialist;
Leo Timms, associate professor of animal science;
Don Lay, associate professor of animal science, Purdue U.

Summary and Implications

The current field study was conducted to evaluate six different free stall surface options and their impact on stall usage and comfort, bedding usage, animal cleanliness and health, and economics. Results showed significantly different stall usages with different stall surfaces and a significant stall surface by week or season interaction. Sand stalls showed significantly higher usage in summer, followed by sand stall with sand traps, Pasture and Agromatic mattresses, and Dynamat rubber mats, respectively. Sand with Sand Traps and both Pasture Mats showed significantly higher stall usage during the fall and winter weeks (no differences between them) and Dynamat rubber mats showed the lowest usage in all 3 periods. The addition of Sand Traps to the sand stalls significantly reduced sand usage (69%). Greater variation in usage was seen with sand and Dynamats, as compared to the 4 other surfaces. This research substantiates differences in cow preferences for stall surface materials depending on season, temperature, surface hardness, and surface maintenance.

Introduction

Many producers are currently considering modernization and/ or expansion. Coupled to this are many questions regarding facility and stall design and comfort integrated with different manure handling systems. Sand is generally considered very comfortable for animals but is often perceived as labor intensive. Sand also presents handling problems with certain manure systems. Different mats and mattresses provide other options for stall surfaces. Many of these have an initial higher capital cost compared to sand, do require daily maintenance and adequate bedding, but offer more manure handling options, as well as a non changing surface base conformation for animals to rest on. This field study was conducted to evaluate six different free stall surfaces and their impact on stall usage / comfort, bedding usage, animal cleanliness / health, and economics.

Materials and Methods

This trial was conducted on the Dan Lyon farm in Waukon, Iowa. Dan was in the process of expansion and building a 6 row, 120 cow free stall barn with drive through feeding. Initially, Dan was going to use sand for all stalls but became interested in evaluating different stall surfaces and bedding options. Trial was conducted in cooperation with Iowa State University and the Natural Resource Conservation Service. Half of the barn (3 rows, 60 stalls) was used for the study. Six different stall surface/bedding alternatives were utilized with blocks of 3-4 stalls per surface type randomized in each row of stalls (10 total stalls/ surface type) (Figure 1). The six stall alternatives were 1) Dynamat: a 2" thick pressed rubber matrix mat with a corrugated undersurface (Dynamatrics, Inc., Pierceton, N); 2) Kraigburg soft bed system: carpet foam underlayment with a solid rubber mat top cover (Agromatic, Inc., Fond du Lac, WI); 3) Pasture Mat #1: multi celled mattress filled with crumb rubber and a fabric top cover (Promat Ltd., Ontario, Canada); 4) Pasture Mat #2: same as #3 but with a different top cover; 5) Sand alone; and 6) Sand with a Sand Trap installed: recycled tire strips cabled together on edge (Topper, Inc., Monticello, IA). Sawdust was used for bedding on stall surfaces 1-4. Stalls were maintained (swept, raked) at least twice daily and bedding added as needed. The barn was populated at 95-97% capacity throughout the trial. Animals were only removed from this barn area upon dry off or for severe health problems.

Cows were allowed to acclimate to the barn for 4 weeks prior to study initiation. During this time 7 cameras were installed for future video recording. Continuous videos of all stalls were taken for one week followed by 3-4 weeks with no video. This sequence was replicated 3 times over a 4-month period. Animal stall usage was evaluated from 4:00 am to 10:00 p.m. daily at 15-minute increments using the video. Also, observations on animal position within the stall were recorded. Stalls were visually evaluated daily during the video taping sessions. Cleanliness of each stall was evaluated using a 4-point scale. Stall usage and any abnormal wear or problems were also noted. Stalls were bedded with new materials on the day prior to initiation of video recording. Bedding amounts of sand or sawdust used were also recorded. Stall usage is reported as the square root of the number of times a stall was occupied divided by the number of stall observations.

Results

Results from all three weeks (Figure 5) showed overall differences in usage by stall type but there was a significant season (week) by stall treatment effect so each week was analyzed separately. Sand free stalls, during the summer (Figure 2), had a 0.78 usage rate, which means sand free stalls were occupied 60.8 percent of the total time the cameras observed those stalls. Sand stalls showed significantly higher usage in summer, followed by sand stall with sand traps, Pasture and Agromatic mattresses, and Dynamat rubber mats, respectively (Figure 2).

Fall and Winter weeks / trials (Figures 3 and 4) resulted in the Pasture Mat #1 and #2 and the Sand with Sand Saver stalls all having significantly greater use than the three other treatments (no significant difference among them, however).

Dynamat ranked lowest in each of the trials with occupancy rates of 12, 30 and 26 percent of the time respectively for summer, fall and winter weeks. Stall treatment usage ranged from a high of 60.8% for the Sand stall treatment during the summer replicate to 12% for the Dynamat (also during summer treatment).

Bedding materials consisted of washed sand used on the Sand and Sand Saver treatments and kiln dried sawdust (Hawkeye Sawdust, Des Moines, IA.) on the four mattress treatments. Sand usage was 52 pounds per stall on sand stalls, and 16 pounds per Sand Saver stall each day (69% reduction in sand usage). Each stall of the four mattress treatments received 3.2 pounds of sawdust per day.

Weather data was gathered from the Northeast Iowa Research Farm located near Nashua (~ 50 miles SW of the Lyon farm). Average weekly temperatures were 76.05, 60.18, and 42.94 degree Fahrenheit respectively for the first, second and third week of trials (deviations from 29 year average of +4.28, -1.51, and +9.43, respectively). Data from personal observations of the stalls and cows twice a day during each of the three weeks of trials by the technician, nor individual daily variation in stall usage within each treatment week have been analyzed. The reduced use of the sand free stalls from summer to the winter period is surprising. Authors believe that during colder temperatures, initial bedded sand may have been more uneven and cold. Cooperating farmer reported that he spent more time cleaning and maintaining the sand free stalls than the other five treatments, although no data on labor use per stall was collected. This may have also influenced usage.

Several public events were conducted to expose the agricultural community to this field trial. An open house was held prior to the acclimation period. Over 200 persons attended. A Minnesota farm study tour of 42 dairy farmers and agricultural businesses visited the trial. Numerous individual visitors stopped by the farm to observe the cow's usage of the different free stall surface.

Conclusions

Results showed significantly different stall usages with different stall surfaces and a significant stall surface by week or season interaction. Sand stalls showed significantly higher usage in summer, followed by sand stall with sand traps, Pasture and Agromatic mattresses, and Dynamat rubber mats, respectively. Sand with Sand Traps and both Pasture Mats showed significantly higher stall usage during the fall and winter weeks (no differences between them) and Dynamat rubber mats showed the lowest usage in all 3 periods. The addition of Sand Traps to the sand stalls significantly reduced sand usage (69%). This research substantiates hat there are different cow preferences for stall surface materials depending on season, temperature, surface hardness, and surface maintenance.

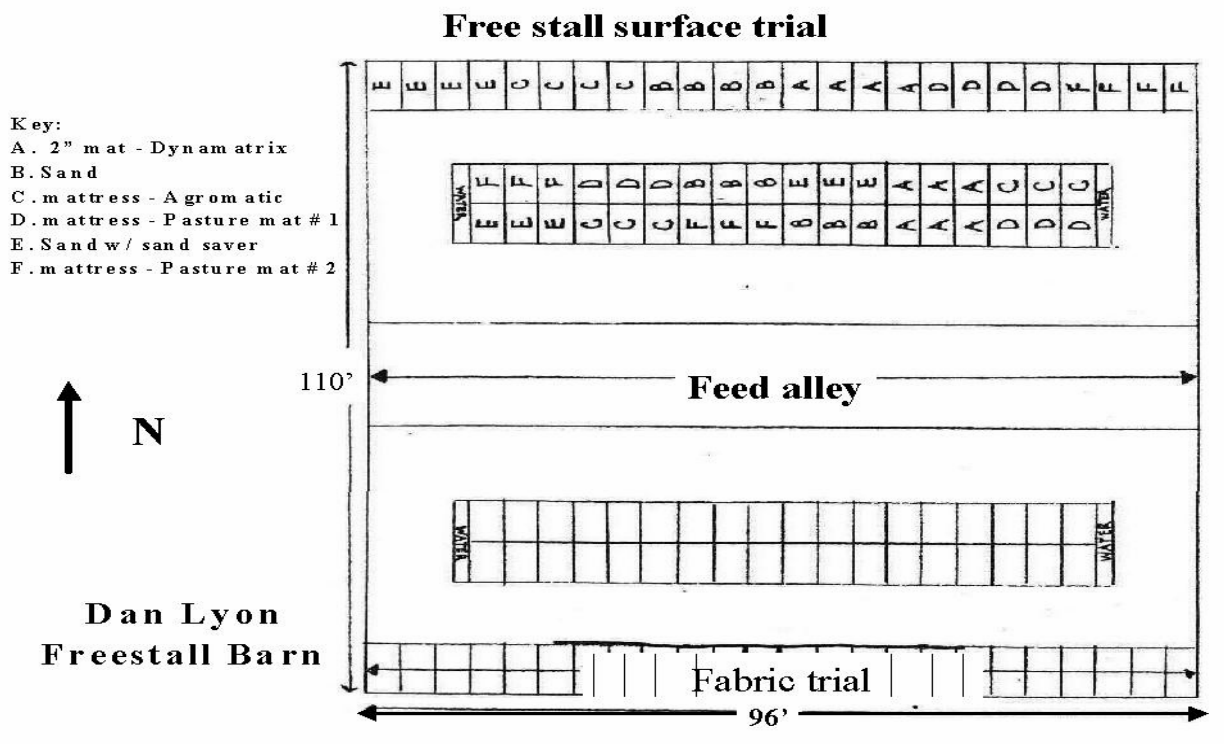

Figure 1. Free stall surface trial design.

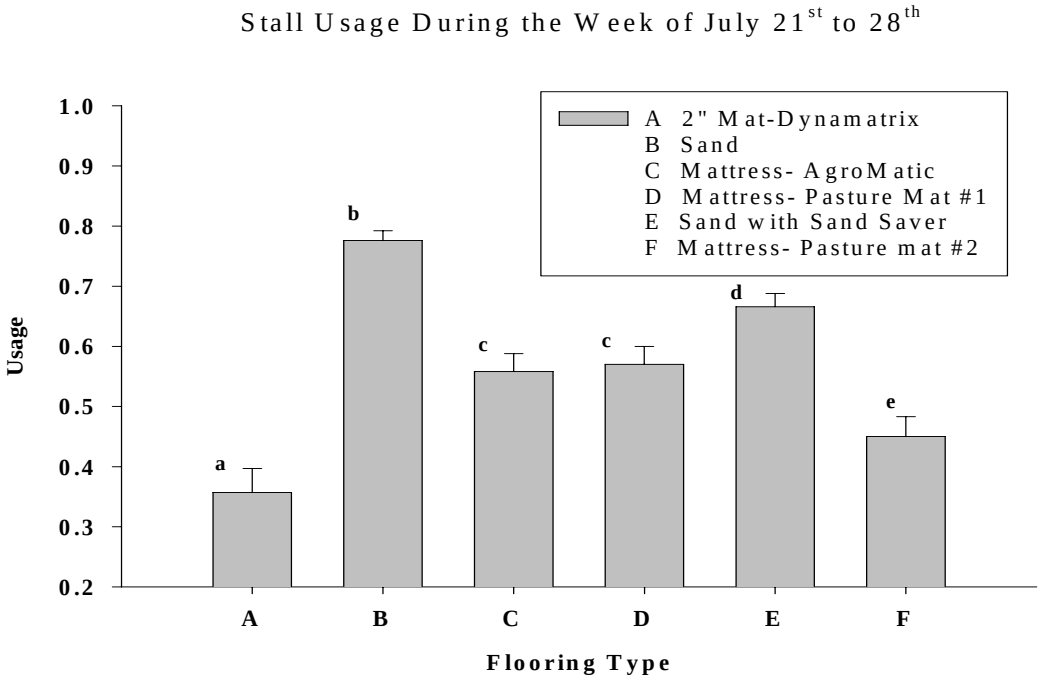

Figure 2. Stall usage during the first video week of the trial.

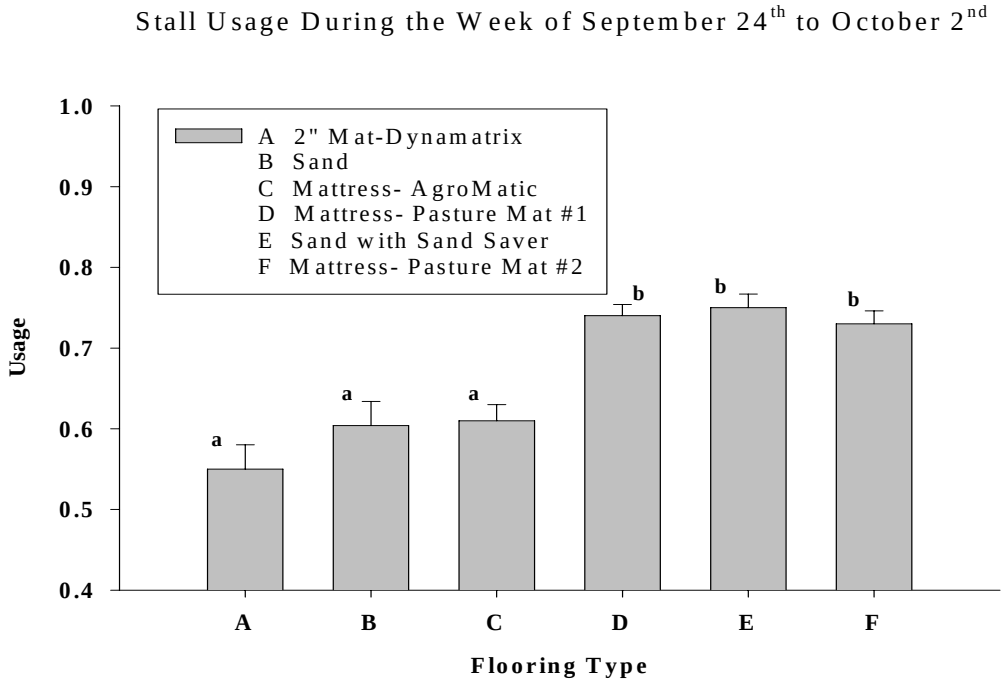

Figure 3. Stall usage during the second video week of the trial.

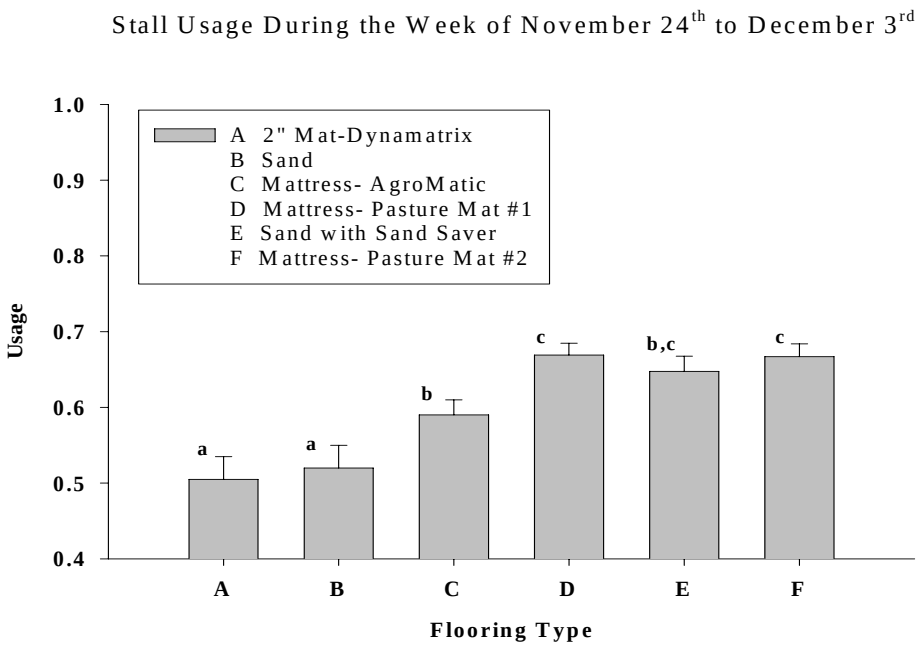

Figure 4. Stall usage during the third video week of the trial.

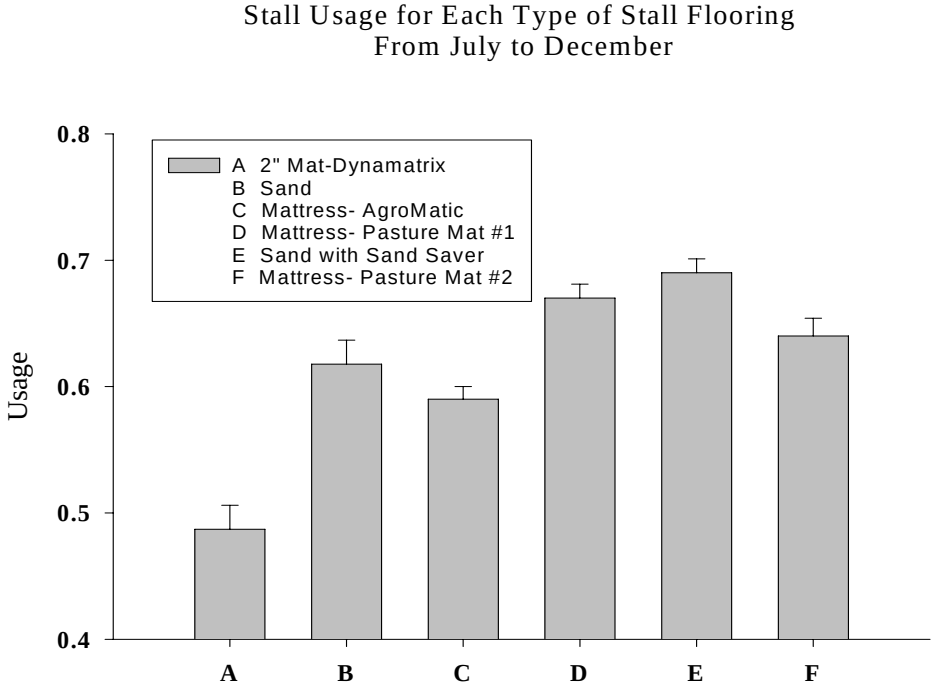

Figure 5. Stall usage for the entire trial (all weeks combined).