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| Supplemental Table S1. Description of farm traits and lactating cow housing for 21 Vermont organic dairy herds participating in the study | | | | | | |
|  |  | Categorical descriptors | | Continuous descriptors | | |
| Parameter | Level of parameter | Number | Percentage | Mean | SD | Range |
| Facility type | Bedded pack | 5 | 23.8 |  |  |  |
|  | Freestall | 6 | 28.6 |  |  |  |
|  | Tiestall | 10 | 47.6 |  |  |  |
| Bedding type | Bedded pack | 5 | 23.8 |  |  |  |
|  | Sand | 1 | 4.8 |  |  |  |
|  | Wood | 15 | 71.4 |  |  |  |
| Facility and bedding combination used | Bedded pack | 5 | 23.8 |  |  |  |
|  | Freestall with sand | 1 | 4.8 |  |  |  |
|  | Freestall with wood | 5 | 23.8 |  |  |  |
|  | Tiestall with wood | 10 | 47.6 |  |  |  |
| County | Addison | 2 | 9.5 |  |  |  |
|  | Caledonia | 1 | 4.8 |  |  |  |
|  | Chittenden | 2 | 9.5 |  |  |  |
|  | Franklin | 4 | 19 |  |  |  |
|  | Lamoille | 1 | 4.8 |  |  |  |
|  | Orange | 5 | 23.8 |  |  |  |
|  | Orleans | 4 | 19 |  |  |  |
|  | Washington | 1 | 4.8 |  |  |  |
|  | Windham | 1 | 4.8 |  |  |  |
| Predominant breed | Holstein | 8 | 38.1 |  |  |  |
|  | Jersey | 10 | 47.6 |  |  |  |
|  | Other | 3 | 14.3 |  |  |  |
| Herd size category (no. cows) | 30 to 55 | 6 | 28.6 | 64.9 | 17.1 | 32-99 |
|  | 56 to 69 | 6 | 28.6 |  |  |  |
|  | 70 to 100 | 9 | 42.8 |  |  |  |
| Rolling herd average (pounds) |  | 20 |  | 14,163 | 3,096 | (9,000-21,204) |
| Feed a supplemental source of vit. E and selenium for lactating or dry cows | Yes | 12 | 60 |  |  |  |
|  | No | 8 | 40 |  |  |  |
|  | Was not sure | 1 |  |  |  |  |
| Air quality (producer-assessed) | Poor/Fair | 6 | 28.6 |  |  |  |
|  | Good | 8 | 38.1 |  |  |  |
|  | Excellent | 7 | 33.3 |  |  |  |
| Age of housing facility for lactating cows (years) |  |  |  | 47 | 42 | 2-200 |
| Laying surface | Deep bedded | 8 | 38.1 |  |  |  |
|  | Mattress or concrete | 13 | 61.9 |  |  |  |
| If facility is freestall: |  |  |  |  |  |  |
| Freestall stocking density1 |  | 6 |  | 1.16 | 0.38 | 0.84-1.76 |
| If facility is tiestall: |  |  |  |  |  |  |
| Trainers in tiestall | Yes | 3 | 30 |  |  |  |
|  | No | 7 | 70 |  |  |  |
| If facility is bedded pack: |  |  |  |  |  |  |
| Cows fed on bedded pack | Yes | 3 | 60 |  |  |  |
|  | No | 2 | 40 |  |  |  |
| Number of cows on bedded pack |  | 5 |  | 52.2 | 17.1 | 35-80 |
| Resting area per cow on bedded pack (m2/cow) |  | 5 |  | 8.1 | 1.7 | 6.3-10.2 |
| Bedding pack stocking density (percent)2 |  | 5 |  | 1.09 | 0.23 | 0.84-1.39 |
| 1 Current number of lactating cows divided by number stalls available in freestall | | | | | | |
| 2 Stocking density as percentage of ideal stocking density (suggested 9.29 meters sq/cow Holsteins, 7.9 for Jerseys; University of Minnesota; https://extension.umn.edu/dairy-milking-cows/compost-bedded-pack-barns-dairy-cows): i.e., (no. cows x 9.29 m2)/(no. cows x calculated cow density); a stocking density for a farm of 1.00 would exactly match the suggested stocking density for a bedded pack. | | | | | | |

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| Supplemental Table S2. Description of lactating bedding management for 21 Vermont organic dairy herds participating in the study | | | | | | |
|  |  | Categorical descriptors | | Continuous descriptors | | |
| Parameter | Level of parameter | Number | Percentage | Mean | SD | Range |
| If use wood products in bedding:1 |  |  |  |  |  |  |
| If use shavings/sawdust/woodchips for bedding material, moisture-content? | Kiln-dried | 8 | 40 |  |  |  |
|  | Fresh or raw | 12 | 60 |  |  |  |
| If shavings/sawdust not used immediately, where is it stored?2 | Outside uncovered | 1 | 5.6 |  |  |  |
|  | Under cover | 17 | 94.4 |  |  |  |
| If use fiber in bedding: |  |  |  |  |  |  |
| What type is it? | Both straw and hay | 2 | 66.7 |  |  |  |
|  | Hay | 1 | 33.3 |  |  |  |
| Where is it sourced from? | Grown on-farm | 1 | 33.3 |  |  |  |
|  | Purchased | 2 | 66.7 |  |  |  |
| Is it wrapped or dry? | Wrapped round bales | 1 | 33.3 |  |  |  |
|  | Dry round bales | 2 | 66.7 |  |  |  |
| Where is it stored? | Outside uncovered | 1 | 33.3 |  |  |  |
|  | Under cover | 1 | 33.3 |  |  |  |
|  | Both | 1 | 33.3 |  |  |  |
| Bedding conditioner used? | Yes | 5 |  |  |  |  |
|  | No | 16 |  |  |  |  |
| If facility is freestall or tiestall: | |  |  |  |  |  |
| Frequency of adding new bedding to stalls  (times per week) |  | 16 |  | 12.2 | 10 | 1-28 |
|  |  | 16 |  | 27.6 | 13.6 | 14-56 |
| Depth of bedding in stalls (cm)3 |  | 15 |  | 4.5 | 3.5 | 1.3-12.7 |
| How is alleyway cleaned (freestall)?4 | Continuous automated scraper | 2 | 33.3 |  |  |  |
|  | Skid steer | 4 | 66.7 |  |  |  |
| Frequency of running gutter cleaner (tiestall)5 | Once daily | 3 | 30 |  |  |  |
|  | Twice daily | 7 | 70 |  |  |  |
| If facility is bedded pack: |  |  |  |  |  |  |
| Frequency of tilling pack (times per week)6 |  | 0 (n = 2) |  |  |  |  |
|  |  | 3.5 (n = 1 |  |  |  |  |
|  |  | 14 (n = 2) |  |  |  |  |
| Depth of tilling pack (cm), if tilled:7 |  | 10.2 (n = 1) |  |  |  |  |
|  |  | 23.3 (n = 1) |  |  |  |  |
|  |  | 30.5 (n = 1) |  |  |  |  |
| "Attentiveness to bedded pack" score8 | n = 5 (0.7, 0.9, 0.9, 1.0, 1.0) |  |  | 0.9 | 0.12 | 0.7-1.0 |
| Depth of bedded pack (m) |  | 0.9 (n = 1) |  |  |  |  |
|  |  | 1.2 (n = 2) |  |  |  |  |
|  |  | 1.5 (n = 1) |  |  |  |  |
|  |  | 1.7 (n = 1) |  |  |  |  |
| 1 n = 1 farm used new sand, so was the only one of the 21 farms not using a wood product at all | | | | | | |
| 2 n = 2 bedded pack farms used fresh woodchips immediately on delivery | | | | | | |
| 3 n = 15; n =1 deep-bedded sand producer unable to estimate bedding depth in stalls | | | | | | |
| 4 n = 6 freestalls | | | | | | |
| 5 n = 10 tiestalls | | | | | | |
| 6 n = 5 bedded packs | | | | | | |
| 7 n = 3 bedded packs that tilled surface | | | | | | |
| 8 Variable created by combining 4 categorical variables from survey into 1 numeric scale (0-1.0). Assigned 0.8 if answered “yes” to "add new bedding to pack daily," and additional 0.1 added if answered “yes” to any of following: monitor pack for temperature, monitor pack for moisture, monitor pack for density. | | | | | | |

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| Supplemental Table S3. Description of mastitis control practices for 21 Vermont organic dairy herds participating in the study | | | |
| Parameter | Level of parameter | Number | Percentage |
| If answer to question, "How do you detect a case of CLINICAL mastitis?" included some sort of clinical sign (abnormal cow/abnormal udder) AND forestripping (check for abnormal milk) | Yes | 8 | 38.1 |
|  | No | 13 | 61.9 |
| Clip or flame udders one or more times per lactation | No | 16 | 76.2 |
|  | Yes | 5 | 23.8 |
| Trim switches on tails | No | 2 | 9.5 |
|  | Yes | 19 | 90.5 |
| Do you keep a record of clinical mastitis events? | Always | 8 | 38.1 |
|  | Sometimes | 4 | 19 |
|  | Temporarily | 3 | 14.3 |
|  | Never | 6 | 28.6 |
| If you do keep a record of clinical mastitis events, how is this done? | Written (paper, whiteboard) | 11 | 26.7 |
|  | Software | 4 | 73.3 |
| Routinely perform bacteriological culture of mastitic milk | Always | 4 | 19 |
|  | Sometimes | 9 | 42.9 |
|  | Never | 8 | 38.1 |
| Routinely perform bacteriological culture of high somatic cell count cows | Always | 3 | 14.3 |
|  | Sometimes | 6 | 28.6 |
|  | Never | 12 | 57.1 |
| Routinely perform bacteriological culture of fresh cows | Always | 0 | 0 |
|  | Sometimes | 0 | 0 |
|  | Never | 17 | 81 |
|  | Only if there is an issue noticed | 4 | 19 |
| Routinely perform bacteriological culture of cows before dry-off | Always | 0 | 0 |
|  | Sometimes | 0 | 0 |
|  | Never | 17 | 81 |
|  | Only if there is an issue noticed | 4 | 19 |
| Where are cultures from mastitic cows performed? | On-farm or local veterinarian | 9 | 42.9 |
|  | Reference lab | 5 | 23.8 |
|  | Never culture | 7 | 33.3 |
| Routinely use vaccines for mastitis control | No | 17 | 81 |
|  | Yes | 4 | 19 |
| Use any sort of intramammary product at dry-off | No | 15 | 71.4 |
|  | Yes | 6 | 28.6 |
| Regular parenteral supplementation of dry cows with selenium and vitamin E | All lactating cows regularly | 5 | 23.8 |
|  | Occasionally as needed (sick cow) | 5 | 23.8 |
|  | No | 11 | 52.4 |

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| Supplemental Table S4. Description of milking hygiene practices for 21 Vermont organic dairy herds participating in the study | | | |
| Parameter | Level of parameter | Number | Percentage |
| Do milkers wear gloves during milking? | Yes, all milkers consistently | 11 | 55 |
|  | No, no one does | 4 | 20 |
|  | Some milkers or inconsistent use | 5 | 25 |
| Frequency of milking cows | 2 times per day | 20 | 95.2 |
|  | Automated milking system (AMS) | 1 | 4.8 |
| Type of milking system used (if not AMS) | Parlor | 7 | 35 |
|  | Tiestall | 13 | 65 |
| If milk in a parlor: |  |  |  |
| Parlor type | Herringbone | 3 | 42.8 |
|  | Step-up | 2 | 28.6 |
|  | Swing | 2 | 28.6 |
| Are milking units routinely washed/sprayed off between uses? | Yes, routinely between milking individual cows; or occasionally, if the milking unit gets very dirty | 5 | 71.4 |
|  | No, only at the completion of milking | 2 | 28.6 |
| Pre-dip teats with a chemical disinfectant | Yes | 21 | 100 |
| Type of pre-dip used | Iodine-based | 18 | 85.7 |
|  | Hydrogen peroxide-based | 3 | 41.3 |
| Post-dip teats with a chemical disinfectant | Yes | 21 | 100 |
| Type of post-dip used | Iodine-based | 20 | 95.2 |
|  | Chlorhexidine-based | 1 | 4.8 |
| Routinely forestrip as a part of udder prep | Yes | 18 | 85.7 |
|  | No | 3 | 14.3 |
| Udders routinely wiped dry with any kind of towel prior to attaching the milking unit | Yes | 20 | 95.2 |
|  | No (automated milking system) | 1 | 4.8 |
| If wipe udders dry: |  |  |  |
| Paper or cloth towels? | Cloth | 3 | 15 |
|  | Paper | 17 | 85 |
| How many cows are wiped with each towel? | One | 16 | 80 |
|  | Two; or depends how dirty the udder is | 4 | 20 |

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| Supplemental Table S1. Predictors selected from univariate analysis offered to multivariable models for eight udder health, production, and hygiene outcomes | | | | |
| Outcome | | Group | Sample size | *P-*value from univariate analysis |
| Bulk tank milk somatic cell count (cells/mL) | |  |  |  |
|  | Predominant breed | Holstein | n = 8 | 0.09 |
|  | | Jersey/Other | n = 13 |  |
|  | Herd size | All herds | n = 21 | 0.06 |
| Percent cows with newly-elevated SCS (%)1 | |  |  |  |
|  | Herd size category | 30-55 lactating cows | n = 5 | 0.01 |
|  | | 56-69 lactating cows | n = 6 |  |
|  | | 70-100 lactating cows | n = 8 |  |
|  | Bedding conditioner use | No | n = 14 | 0.17 |
|  | | Yes | n = 5 |  |
|  | Air quality (technician-assessed) | Fair | n = 5 | 0.02 |
|  | | Good | n = 14 |  |
|  | Glove use during milking | All milkers consistently | n = 9 | 0.11 |
|  | | No one does/ Some milkers or inconsistent use | n = 9 |  |
|  | Keep a record of clinical mastitis events | Always | n = 7 | 0.09 |
|  | | Never | n = 6 |  |
|  | | Sometimes/Keep temporary record | n = 6 |  |
| Percent cows with chronically-elevated SCS (%)1 | |  |  |  |
|  | Herds that clip or flame udders one or more times per lactation | No | n = 14 | 0.16 |
|  | | Yes | n = 5 |  |
|  | Bedding conditioner use | No | n = 14 | 0.18 |
|  | | Yes | n = 5 |  |
|  | Proportion of cows with udder hygiene scores ≥3 | All herds with available test data | n = 19 | 0.05 |
|  | Feed a supplemental source of vit. E and selenium for lactating or dry cows | No | n = 7 | 0.06 |
|  | | Yes | n = 11 |  |
| Percent cows with SCS ≥ 4.0 on current test date (%)1 | |  |  |  |
|  | Bedding conditioner use | No | n = 14 | 0.08 |
|  |  | Yes | n = 5 |  |
|  | Average hygiene score | All herds with available test data | n = 19 | 0.09 |
| Average SCS of cows on farm2 | |  |  |  |
|  | Herds that regularly do parenteral supplementation of dry cows with vit. E and selenium | Regular or occasional supplementation | n = 9 | 0.15 |
|  | | No parenteral supplementation | n = 11 |  |
|  | Herds that use any sort of approved organic intramammary product at dry-off | No | n = 15 | 0.18 |
|  | | Yes | n = 5 |  |
|  | Bedding conditioner use | No | n = 15 | 0.14 |
|  |  | Yes | n = 5 |  |
|  | Feed a supplemental source of vit. E and selenium for lactating or dry cows | No | n = 8 | 0.09 |
|  | | Yes | n = 11 |  |
|  | Average hygiene score | All herds with available test data | n = 20 | 0.11 |
| Proportion of cows with udder hygiene scores ≥3 | |  |  |  |
|  | Air quality (technician-assessed) | Fair | n = 5 | 0.16 |
|  | | Good | n = 16 |  |
| Average hygiene score | |  |  |  |
|  | If answer to question, "How do you detect a case of CLINICAL mastitis?" included some sort of clinical sign (abnormal cow/abnormal udder) AND forestripping (check for abnormal milk) | No | n = 13 | 0.19 |
|  | | Yes | n = 8 |  |
|  | Where are cultures from mastitic cows performed? | Never perform culture | n = 7 | 0.14 |
|  | | On-farm/local veterinarian/ Reference lab | n = 14 |  |
| Standardized 150-day milk (pounds)2 | |  |  |  |
|  | Herds that regularly do parenteral supplementation of dry cows with vit. E and selenium | Regular or occasional supplementation | n = 7 | 0.06 |
|  | | No parenteral supplementation | n = 11 |  |
|  | Herd size category | 30-55 lactating cows | n = 5 | 0.09 |
|  |  | 56-69 lactating cows | n = 5 |  |
|  |  | 70-100 lactating cows | n = 8 |  |
|  | Routinely perform bacteriological culture of high somatic cell count cows | Never | n = 10 | 0.10 |
|  |  | Sometimes/Always | n = 8 |  |
| 1 DHIA data available for n = 19 herds. One herd included in average linear score analyses is seasonal and had no recent test data. | | | | |
| 2 DHIA data available for n = 20 herds. | | | | |
| 3 STD 150-day milk data available for n = 18 herds. | | | | |