Producer assessment of dairy extension programming in Kentucky

R. A. Russell and J. M. Bewley

Department of Animal and Food Sciences, University of Kentucky, Lexington 40546

ABSTRACT

To assess the dairy production issues extension programming should be addressing, a survey was distributed to all licensed milk producers in Kentucky ($n = 1,074$). A total of 236 surveys were returned; 7 were omitted due to incompleteness, leaving 229 for subsequent analyses (21% response rate). Mean herd size was 83.0 ± 101.8 cows with a projected increase to 102.1 ± 114.4 cows by 2013. Mean producer age was 50.9 ± 12.9 with a range of 22 to 82. Mean milk production (kg/cow per day) was 23.9 ± 5.4 with a range of 6.8 to 38.6 kg. Mean somatic cell counts (SCC) were $304,824 \pm 123,580$ with a range of 75,000 to 750,000 cells/mL. When asked about meeting attendance frequency, 25% of producers indicated they attended meetings annually, whereas 29% attended twice yearly, 13% quarterly, 3% monthly, 2% at least twice monthly, and 28% indicated they never attended meetings. Surveyed producers were asked to assess what level of importance should be placed on a predetermined list of management topics. Mean response to each topic was calculated after assigning the following numeric values to producer response categories: not important: 1, important: 3, and very important: 5. Producers indicated mastitis and milk quality was the most important management topic with a response of 4.35 ± 1.05 , followed by animal well-being (4.05 ± 1.14), disease prevention and vaccinations (4.01 ± 1.06), cow comfort (3.97 ± 1.09), disease treatment (3.95 ± 1.10), and lameness and hoof health (3.95 ± 1.16). Producers were asked to identify their preferred information delivery method. The most effective delivery methods were printed farm magazines (81.0%), agricultural newspapers (77.4%), printed newsletters from county agricultural agents (75.7%), printed newsletters from university extension (65.0%), and local or regional meetings (55.8%). The least effective delivery methods were university website (11.9%), indirect access through allied industry consultants (11.5%), webinars (2.7%), podcasts (0.4%), and blogs (0.4%). These results provide invaluable insight

for future dairy-related Cooperative Extension Service programming efforts.

Key words: dairy extension, survey, educational program

INTRODUCTION

The trend toward fewer, larger dairy operations in the United States has considerable influence on dairy extension programming. During the last 25 yr, the number of dairy farms in the United States has decreased by 74% (Chase et al., 2006). From 2003 to 2008, the number of dairy farms in KY decreased from 1,630 to 1,060 (USDA-NASS, 2010). Hutjens et al. (2004) noted that the dairy industry of the future will be characterized by fewer family farms, low-input dairy systems, and more intensive dairy farms. The number of dairy farms in the United States is expected to decrease from 105,000 in 2000 to 16,000 by 2020, with large farms (>500 cows) increasing from 2,700 to 3,400 and small farms (<100 cows) decreasing from 84,000 to 7,000 over the same time period (LaDue et al., 2003). Further, as farm size increases, more of the daily work activities on dairy farms will be accomplished by hired employees. Between 2002 and 2007, the percentage of operations that had employees increased from 47.2 to 75.7% (USDA, 2009). Last, commodity milk prices are characterized by tremendous volatility and this volatility is increasing with decreased governmental price regulation. Ultimately, increased volatility changes dairy management strategies and priorities. These changing dairy farm demographics necessitate a reevaluation of dairy extension programming. Dairy extension programming efforts must continually evolve to meet the needs of a changing clientele base.

A major objective of dairy extension programming is to provide dairy producers with objective, research-based recommendations through local meetings and written materials. Delivery methods used by extension professionals have changed in the last 25 yr (Chase et al., 2006). Dairy producers face difficult choices in dividing the time they dedicate to continuing education between magazines, newspapers, newsletters, the Internet, farm visits, and meetings (Fultz and Schwartz, 2001). Although many Americans rely heavily on Internet re-

Received September 19, 2010.

Accepted January 10, 2011.

¹Corresponding author: jrbewley@uky.edu

sources to obtain information, concerns remain about availability and use of the Internet among the farming population. Maurer and Fast (2007) reported that only 58% of dairy producers in Kentucky had computer access in their home, whereas 56% of dairy producers had Internet access. In 2009, 77% of large US dairy farms (annual sales and government payments >\$250,000) had Internet access, whereas only 41% of small US dairy farms (annual sales and government payments <\$250,000) had Internet access (USDA-NASS, 2009). Extension professionals dedicate considerable time toward development of targeted local, regional, and state meetings to address dairy producer educational needs (Chase et al., 2006). Ostrom et al. (2000) reported that the visibility of extension decreased because of increased roles of alternative media and agribusiness. Thus, in this environment, extension professionals must provide information that dairy producers may not obtain through these outlets. Additionally, improved understanding of producer interests and needs should provide extension professionals guidance in developing new programs and enhancing existing programs.

To facilitate future dairy extension programming, a survey was designed to ask Kentucky dairy producers directly about dairy extension programming. The objectives of the 2008 Kentucky Dairy Extension survey were to (1) evaluate extension programming efforts, (2) determine effective ways to deliver information to producers, (3) improve meeting attendance and content, (4) assess producer opinions about various dairy management topics, and (5) guide future extension programming efforts. This manuscript provides a summary of these efforts. The results of this survey can offer new insight to extension professionals about the needs of today's dairy producers.

MATERIALS AND METHODS

A 5-page survey was distributed to all licensed milk producers in Kentucky ($n = 1,074$). Surveys were mailed on July 1, 2008. Each survey was labeled with a number that corresponded to a name and address to maintain producer anonymity. The list of producers' names and addresses was only used to determine who to send follow-up surveys to and was not referred to after final survey distribution. Two weeks after the first mailing, a follow-up postcard was mailed to remind producers to return the survey. On August 1, 2008, the survey was resent to producers who had not returned the initial survey. A total of 236 surveys were returned; 7 were omitted because they were incomplete, leaving 229 for subsequent analyses (21% response rate). The survey consisted of questions covering educational meeting attendance, times, and dates, management topics,

programming ideas, information delivery preferences, and programming area priorities. Meeting attendance, dates, times, and delivery methods were assessed using "check all that apply" questions. Management topics and prioritization of programming areas were determined using "check a single box for each item" questions. For some questions, producers were asked to select a number on a 1 to 5 Likert (1932) scale with 1 indicating not important and 5 indicating very important.

Data were entered into an online survey tool (Key-Survey, Braintree, MA). Statistical analyses were conducted using SAS (Cary, NC). Surveys were categorized by herd size, production system, region within the state, operator age, and production level. Herds were categorized by herd size to reflect management similarities as follows: 1 to 49, 50 to 99, 100 to 149, 150 to 199, and 200 to 1,200 cows. Producers were asked to categorize their dairy production system by selecting the option that best described their situation as pasture-grazing, partial confinement, or total confinement. Regions within the state were categorized as East, South Central, North Central, West, and Far West. Operator age categories were defined as follows: < 35, 35 to 44, 45 to 54, 55 to 64, and ≥ 65 yr of age. Herds were categorized into terciles based on reported milk production levels as follows: low (<22.7 kg/cow per day), mid (22.7 to 26.4 kg), and high (≥ 26.4 kg). Least squares means among categories were calculated for quantitative variables using the GLM procedure of SAS. The Tukey test for multiple comparisons was used and statistical differences were considered significant using a 0.05 significance level. For qualitative variables, χ^2 analyses were conducted using the FREQ procedure of SAS. Statistical differences were considered significant at a 0.05 significance level.

RESULTS AND DISCUSSION

A summary of general respondent demographics is in Table 1. Mean herd size was 83.0 ± 101.8 cows with a projected increase to 102.1 ± 114.4 cows by 2013. Mean herd size was similar to the 82.1 cows reported by USDA-NASS at the end of 2008, indicating that survey respondents were representative of the state's dairy population (USDA-NASS, 2010). Mean milk production and SCC for surveyed herds were lower than mean test-day yields (28.8 kg) and SCC (356,000 cells/mL) for Kentucky DHIA herds in 2008 (Norman et al., 2009). The milk production discrepancy likely reflects differences between herds enrolled in DHIA compared with those not enrolled in DHIA. The SCC discrepancy may indicate producers underestimated their herd SCC when answering the survey question or lower SCC associated with lower production levels. Test-day milk yield

Table 1. Descriptive statistics for dairy operations responding to the Kentucky Dairy Extension Survey¹

Item	Mean	Minimum	Maximum	SD	Respondents (n)
Primary operator age (yr)	50.89	22.00	82.00	12.86	208
Current cows (n, milking and dry)	82.97	10.00	1,200.00	101.76	213
Projected cows in 2013 ¹ (n, milking and dry)	102.07	20.00	1,065.00	114.38	161
Heifers on farm (n)	56.13	0.00	400.00	59.99	203
Heifers with custom heifer raiser (n)	64.53	2.00	500.00	118.72	19
Milking of cows (n of times/d)	2.03	2.00	3.00	0.18	213
Average milk production (kg/cow per day)	23.89	6.82	38.64	5.36	196
Average SCC (cells/mL)	304,824	75,000	750,000	123,580	182

¹The largest farm in the survey did not provide a projected number of cows for 2013.

was lower for surveyed Kentucky herds as compared with US DHIA herds (32.6 kg, Norman et al., 2009). Somatic cell counts were lower for US DHIA herds (262,000) than for surveyed Kentucky herds. Mean producer age was 50.9 ± 12.9 yr. Mean milk production (kg/cow per day) was 23.9 ± 5.4 . Mean SCC was $304,824 \pm 123,580$ cells/mL.

A series of questions were asked to gain a better understanding of off-farm educational meeting and seminar attendance (Table 2) by dairy producers. Only 28% of producers indicated they never attended meetings away from the farm, which is lower than the 40% reported by Maurer and Fast (2007). When asked about meeting attendance frequency, 25% of producers indicated they attended meetings annually, whereas 29% attended twice yearly, 13% quarterly, 3% monthly, 2% at least twice monthly, and 28% indicated they never attended meetings. When asked why they did not attend more meetings, lack of time was the most frequent response (62%), followed by meeting time (37%) and meeting location (33%). The best months to attend meetings were November through March, with January (61%) and February (67%) the most frequently selected. These preferences coincide with times of the year with few crop-related conflicts. The best times to attend meetings were between 1000 to 1400 h. This time-frame is likely between a.m. and p.m. milkings for many dairy producers who perform the milking themselves.

Respondents were categorized by region within the state to gain additional insight into regional differences. Table 3 demonstrates that producers in the East and Far West regions of Kentucky were less likely to attend meetings because meetings were not held in a convenient location ($P = 0.0029$). This result may demonstrate that attempts to hold regional meetings in central locations within the state, which are closer to the University of Kentucky, are inconvenient for these producers. Some meetings are held in county extension offices, which may contradict this observation. Producers in the Mid West region were more likely to indicate that meetings do not provide useful information for their operations ($P = 0.0029$).

The relative importance of dairy management topics in extension programming, as indicated by survey respondents are in Table 4. Surveyed producers were asked to assess what level of importance should be placed on a predetermined list of management topics. The topic with the highest mean response for importance was milk quality with a mean response of 4.35

Table 2. Summary of producer responses to questions related to off-farm educational meeting and seminar attendance

Topic	Response	
	n	%
Reasons for not attending meetings		
Not enough time	134	62
Held at wrong time of day	80	37
Not held at convenient location	71	33
Cover the same topics repeatedly	47	22
Held at wrong time of year	39	18
Not enough interest	25	12
Not useful to operation	22	10
Best months to attend meetings		
January	126	61
February	138	67
March	75	36
April	16	8
May	4	2
June	13	6
July	39	19
August	10	5
September	11	5
October	34	16
November	86	42
December	74	36
Best times to attend meetings		
0800 to 1000	11	5
1000 to 1200	113	55
1200 to 1400	111	54
1400 to 1600	23	11
1600 to 1800	1	1
1800 to 2000	46	23
2000 to 2200	50	25
Frequency of meeting attendance		
Never	63	28
Annually	57	25
Twice per year	66	29
Quarterly	29	13
Monthly	8	3
At least twice per month	4	2

± 1.05 , followed by animal well-being (4.05 ± 1.14), disease prevention and vaccinations (4.01 ± 1.06), cow comfort (3.97 ± 1.09), disease treatment (3.95 ± 1.10), and lameness and hoof health (3.95 ± 1.16), supporting Fulwider et al. (2008) who demonstrated producers were concerned with animal well-being, cow comfort, and lameness. VanLeeuwen and Keefe (2001) reported producers considered reproduction management, nutrition, and udder health as important extension and research topics. Management topics that were ranked as least important were crossbreeding (2.38 ± 1.37), operational benchmarking (2.32 ± 1.25), contract heifer-raising (2.17 ± 1.28), third-party certification programs (2.00 ± 1.30), and organic dairying (1.91 ± 1.38). Although these topics are often discussed within the dairy industry, they may only affect a small portion of the dairy population and producer familiarity with terminology may be limited.

Kentucky producers heavily use mixed production systems (confinement during inclement conditions with access to pasture in more moderate climatic conditions). The average herd size for each system is as follows: pasture-grazing 54 ± 9 , partial confinement 80 ± 11 , and total confinement 194 ± 17 . When management topics were categorized by production system (Table 5), transition cow feeding and management was more important ($P < 0.05$) to total confinement system producers (4.19 ± 0.23) than to pasture-grazing system producers (3.39 ± 0.13). Confinement-based dairy producers may experience more problems with transition cows or may be more familiar with the importance of transition cow management. Artificial insemination, expansion, synchronization protocols, and dairy production records were more important to producers managing total confinement systems than to those with partial confinement and pasture-grazing systems ($P < 0.05$). Dairy producers with confinement systems may be more likely to adopt new technologies and techniques than those with more traditional, low-input pasture-grazing systems. Forage and silage management was more important to partial confinement and total confinement system producers than to pasture-grazing system producers ($P < 0.05$). In contrast, grazing and pasture management was more important to pasture-grazing system producers than to partial confinement and total confinement system producers ($P < 0.05$).

Importance of management topics was categorized by production level (Table 6). Producers with high production levels considered transition cow feeding and management, cow comfort, and dairy production records more important than did producers with low or moderate production levels ($P < 0.05$). Producers with high production levels found forage and silage management, and ration troubleshooting and formulation

Table 3. Summary of survey respondent reasons for not attending off-farm educational meeting and seminar meetings, categorized by region within Kentucky (results reported in %)¹

Reason	Region of Kentucky					χ^2
	East (n = 22)	Far West (n = 33)	Mid West (n = 59)	North Central (n = 37)	South Central (n = 60)	
Meetings do not provide useful information for my operation	5	9	23	3	4	0.0029
Meetings are offered at the wrong time of day	43	25	34	32	41	0.5757
Meetings are offered at the wrong time of year	19	13	16	19	20	0.9055
Not enough interest	14	13	14	5	13	0.7432
Not enough time	62	75	59	51	67	0.3081
Meetings tend to cover the same topics repeatedly	29	16	25	24	20	0.7865
Meetings are not offered at a convenient location	43	56	18	24	31	0.0029

¹Regions within Kentucky defined by county as follows: East: Bath, Bracken, Clay, Fleming, Laurel, Lewis, Mason, Owen, Robertson, and Rockcastle; North Central: Anderson, Campbell, Fayette, Harrison, Henry, Lincoln, Madison, Mercer, Nicholas, Oldham, Shelby, Spencer, and Trimble; South Central: Adair, Breckinridge, Casey, Clinton, Green, Hardin, Larue, Marion, Nelson, Pulaski, Russell, Taylor, Washington, and Wayne; Mid West: Barren, Butler, Daviess, Edmonson, Hart, Logan, Metcalfe, Monroe, Ohio, and Warren; Far West: Caldwell, Calloway, Christian, Graves, Hickman, Todd, and Trigg.

for milking cows more important than did producers with low production herds ($P < 0.05$). Producers who attained a higher level of milk production placed a higher priority on these management topics that exert influence on milk production. Recognition of importance of these topics from an educational perspective and the pursuit of knowledge for making improvements in these areas may help producers achieve higher milk production levels. When categorized by herd size, the

importance of transition cow feeding and management increased as the herd increased (Table 7). Producers with larger herds (200 to 1,200 cows) did not find grazing and pasture management as important as did producers with smaller herds (1 to 49 cows), likely indicative of increased reliance on confinement housing by producers with larger herds. Labor and employee management was more important ($P < 0.05$) to managers of mid-sized herds (150 to 199 cows) than to manag-

Table 4. Overall importance of dairy management topics in extension programming as indicated by dairy operations responding to the Kentucky Dairy Extension Survey^{1,2}

Topic	Response (%)			Total responses (n)	Mean response (± SD)
	Not important	Important	Very important		
Mastitis and milk quality	2.8	26.8	70.4	213	4.35 ± 1.05
Animal well-being	3.8	40.1	56.1	212	4.05 ± 1.14
Disease prevention and vaccinations	1.4	46.5	52.1	211	4.01 ± 1.06
Cow comfort	2.4	46.7	50.9	212	3.97 ± 1.09
Disease treatment	2.5	47.5	50.0	204	3.95 ± 1.10
Lameness and hoof health	4.3	44.0	51.7	209	3.95 ± 1.16
Feeding management	3.7	47.9	48.4	215	3.89 ± 1.14
Evaluation of alternative feeds	3.3	49.5	47.2	216	3.88 ± 1.12
Forage and silage management	4.4	48.3	47.3	207	3.86 ± 1.16
Commodity prices	7.1	44.3	48.6	210	3.83 ± 1.24
Reproductive management	4.3	50.9	44.8	210	3.81 ± 1.15
Ration troubleshooting and formulation: milking cows	8.1	46.7	45.2	210	3.74 ± 1.26
Selection of forage varieties	8.2	50.5	41.3	206	3.66 ± 1.25
Grazing and pasture management	11.4	45.7	42.9	210	3.63 ± 1.34
Manure management	7.7	53.6	38.7	209	3.62 ± 1.22
Transition cow feeding and management	7.4	55.4	37.2	204	3.60 ± 1.20
Milking equipment and systems	7.5	57.3	35.2	213	3.55 ± 1.19
AI	15.5	46.5	38.0	213	3.45 ± 1.40
Financial management	12.7	52.7	34.6	205	3.44 ± 1.31
Disease economics	7.9	63.0	29.1	203	3.42 ± 1.14
Genetic selection	10.1	60.4	29.5	207	3.39 ± 1.20
Whole farm business planning	13.0	55.8	31.2	208	3.37 ± 1.28
Transfer of farms to younger generation	19.0	45.4	35.6	205	3.33 ± 1.44
Ration troubleshooting and formulation: heifers	12.9	57.9	29.2	202	3.33 ± 1.26
Environmental issues	10.1	66.0	23.9	209	3.28 ± 1.13
Dairy production record	17.4	51.7	30.9	207	3.27 ± 1.37
Decision economics	14.4	63.7	21.9	201	3.15 ± 1.20
Price risk management	18.1	59.5	22.4	210	3.09 ± 1.27
Facility planning, construction, and renovation	18.9	59.7	21.4	206	3.05 ± 1.27
Dairy modernization	21.0	57.6	21.4	205	3.01 ± 1.31
Cutting-edge technologies for modern dairying	22.8	54.4	22.8	206	3.00 ± 1.35
Odor control	22.6	55.8	21.6	204	2.98 ± 1.33
Price risk management	23.3	58.9	17.8	197	2.89 ± 1.28
Standard operating procedures	24.3	59.6	16.1	193	2.83 ± 1.26
Dairy biosecurity	22.9	63.2	13.9	201	2.82 ± 1.20
Labor and employee management	33.2	48.5	18.3	202	2.70 ± 1.41
Community dairies (multiple producers working together)	34.6	46.4	19.0	205	2.69 ± 1.43
Synchronization protocols	33.2	50.5	16.3	202	2.66 ± 1.37
Expansion	32.2	52.7	15.1	205	2.66 ± 1.34
Transitioning out of the dairy business	40.7	44.2	15.1	199	2.49 ± 1.41
Crossbreeding	43.6	43.6	12.8	204	2.38 ± 1.37
Operational benchmarking	42.3	49.5	8.2	196	2.32 ± 1.25
Contract heifer raising	49.7	42.0	8.3	205	2.17 ± 1.28
Organic dairying	59.2	31.3	9.5	201	2.00 ± 1.33
Third-party certification programs	58.7	32.6	8.7	196	2.00 ± 1.30

¹Mean response calculated after assigning the following numeric values to producer response categories: not important: 1, important: 3, and very important: 5.

²Potential topics selected by state and county extension specialists.

ers of smaller herds (1 to 49 or 50 to 99 cows) with no other significant differences among herd size categories. Managers of mid-sized herds (150 to 199 cows) placed more importance ($P < 0.05$) on manure management and ration troubleshooting and formulation for milking

cows than did managers of the smallest herds (1 to 49 cows).

Producers were asked to identify the most effective information delivery method (Table 8). The most effective delivery methods were printed farm magazines

Table 5. Importance of dairy management topics in extension programming categorized by production system as indicated by dairy operations responding to the Kentucky Dairy Extension Survey¹

Topic	Production system		
	Pasture-grazing (n = 98)	Partial confinement (n = 77)	Total confinement (n = 29)
Nutrition			
Evaluation of alternative feeds	3.92 ± 0.12	3.78 ± 0.13	3.96 ± 0.22
Feeding management	3.77 ± 0.12	3.87 ± 0.13	4.26 ± 0.22
Forage and silage management	3.55 ± 0.13 ^b	3.99 ± 0.13 ^a	4.26 ± 0.22 ^a
Grazing and pasture management	4.04 ± 0.13 ^a	3.22 ± 0.15 ^b	3.08 ± 0.25 ^b
Ration troubleshooting and formulation: heifers	3.39 ± 0.14	3.19 ± 0.15	3.46 ± 0.25
Ration troubleshooting and formulation: milking cows	3.62 ± 0.14	3.71 ± 0.14	4.19 ± 0.24
Selection of forage varieties	3.66 ± 0.14	3.73 ± 0.15	3.44 ± 0.25
Transition cow feeding and management	3.39 ± 0.13 ^b	3.67 ± 0.14 ^{ab}	4.19 ± 0.23 ^a
Health			
Dairy biosecurity	2.86 ± 0.13	2.64 ± 0.14	2.92 ± 0.25
Disease economics	3.40 ± 0.12	3.36 ± 0.13	3.72 ± 0.23
Disease prevention and vaccinations	4.03 ± 0.11	4.05 ± 0.12	3.92 ± 0.21
Disease treatment	4.04 ± 0.12	3.93 ± 0.13	3.88 ± 0.22
Lameness and hoof health	3.76 ± 0.12	4.04 ± 0.13	4.23 ± 0.23
Mastitis and milk quality	4.26 ± 0.11	4.39 ± 0.12	4.60 ± 0.21
Reproduction and genetics			
AI	3.20 ± 0.15 ^b	3.45 ± 0.16 ^b	4.19 ± 0.27 ^a
Crossbreeding	2.30 ± 0.15	2.31 ± 0.16	2.52 ± 0.28
Genetic selection	3.44 ± 0.13	3.24 ± 0.14	3.69 ± 0.24
Reproductive management	3.80 ± 0.12	3.75 ± 0.13	4.26 ± 0.22
Synchronization protocols	2.46 ± 0.15 ^b	2.54 ± 0.15 ^b	3.52 ± 0.25 ^a
Business management			
Commodity prices	3.82 ± 0.13	3.84 ± 0.15	3.77 ± 0.25
Community dairies (multiple producers working together)	2.59 ± 0.15	2.73 ± 0.16	2.48 ± 0.30
Dairy modernization	2.88 ± 0.14	2.86 ± 0.15	3.42 ± 0.26
Decision economics	3.12 ± 0.13	3.00 ± 0.14	3.50 ± 0.24
Expansion	2.53 ± 0.14 ^b	2.39 ± 0.15 ^b	3.24 ± 0.26 ^a
Financial management	3.37 ± 0.14	3.32 ± 0.15	3.67 ± 0.27
Labor and employee management	2.65 ± 0.15	2.51 ± 0.16	3.00 ± 0.29
Operational benchmarking	2.35 ± 0.14	2.17 ± 0.15	2.33 ± 0.25
Organic dairying	2.04 ± 0.14	1.90 ± 0.15	1.58 ± 0.26
Price risk management	2.98 ± 0.14	2.78 ± 0.15	2.74 ± 0.27
Standard operating procedures	3.00 ± 0.14	2.65 ± 0.15	2.75 ± 0.26
Third-party certification programs	1.95 ± 0.14	1.86 ± 0.15	2.04 ± 0.26
Transfer of farms to younger generation	3.34 ± 0.16	3.19 ± 0.17	3.42 ± 0.30
Transitioning out of the dairy business	2.62 ± 0.15 ^a	2.03 ± 0.16 ^b	2.83 ± 0.28 ^a
Whole farm business planning	3.36 ± 0.14 ^{ab}	3.11 ± 0.15 ^b	3.83 ± 0.26 ^a
General management			
Animal well-being	4.07 ± 0.12	4.04 ± 0.13	4.00 ± 0.22
Contract heifer raising	2.16 ± 0.13	1.99 ± 0.14	2.28 ± 0.25
Cow comfort	3.85 ± 0.11	3.99 ± 0.12	4.26 ± 0.21
Cutting-edge technologies for modern dairying	2.84 ± 0.14	2.89 ± 0.16	3.40 ± 0.27
Dairy production records	3.07 ± 0.14 ^b	3.08 ± 0.15 ^b	4.20 ± 0.26 ^a
Environmental issues	3.25 ± 0.12	3.11 ± 0.13	3.40 ± 0.22
Facility planning, construction, and renovation	2.86 ± 0.14	3.05 ± 0.15	3.40 ± 0.25
Manure management	3.52 ± 0.13	3.61 ± 0.14	3.72 ± 0.24
Milking equipment and systems	3.48 ± 0.12	3.42 ± 0.13	3.72 ± 0.23
Odor control	3.00 ± 0.14	2.86 ± 0.16	3.16 ± 0.27

^{a,b}LSM within rows with different superscripts differ ($P < 0.05$).

¹Mean response calculated after assigning the following numeric values to producer response categories: not important: 1, important: 3, and very important: 5.

(81.0%), agricultural newspapers (77.4%), printed newsletters from county agriculture agents (75.7%), printed newsletters from university extension (65.0%), and local or regional meetings (55.8%). The least effective delivery methods were university websites (11.9%),

indirectly through allied industry consultants (11.5%), webinars (2.7%), podcasts (0.4%), and blogs (0.4%). Clearly, respondents preferred printed delivery methods over electronic delivery methods. Although electronic delivery methods are heavily used among the general

Table 6. Importance of dairy management topics in extension programming categorized by herd production level as indicated by dairy operations responding to the Kentucky Dairy Extension Survey¹

Topic	Herd production level ²		
	Low (n = 62)	Mid (n = 68)	High (n = 66)
Nutrition			
Evaluation of alternative feeds	3.81 ± 0.15	4.09 ± 0.14	3.76 ± 0.14
Feeding management	3.60 ± 0.15 ^b	4.09 ± 0.14 ^a	4.02 ± 0.14 ^{ab}
Forage and silage management	3.53 ± 0.15 ^b	3.98 ± 0.14 ^{ab}	4.06 ± 0.14 ^a
Grazing and pasture management	3.89 ± 0.18 ^a	3.62 ± 0.17 ^{ab}	3.27 ± 0.17 ^b
Ration troubleshooting and formulation: heifers	3.16 ± 0.18	3.22 ± 0.16	3.60 ± 0.16
Ration troubleshooting and formulation: milking cows	3.42 ± 0.17 ^b	3.82 ± 0.15 ^{ab}	4.00 ± 0.16 ^a
Selection of forage varieties	3.69 ± 0.18	3.70 ± 0.16	3.61 ± 0.16
Transition cow feeding and management	3.16 ± 0.16 ^b	3.58 ± 0.14 ^b	4.15 ± 0.15 ^a
Health			
Dairy biosecurity	2.92 ± 0.17	2.88 ± 0.15	2.55 ± 0.16
Disease economics	3.35 ± 0.16	3.47 ± 0.14	3.51 ± 0.15
Disease prevention and vaccinations	3.98 ± 0.14	4.18 ± 0.13	4.02 ± 0.13
Disease treatment	3.88 ± 0.15	4.13 ± 0.13	3.97 ± 0.14
Lameness and hoof health	3.74 ± 0.16	4.00 ± 0.14	4.10 ± 0.15
Mastitis and milk quality	4.26 ± 0.13	4.38 ± 0.13	4.54 ± 0.13
Reproduction and genetics			
AI	3.29 ± 0.18	3.30 ± 0.17	3.84 ± 0.17
Crossbreeding	2.74 ± 0.19	2.14 ± 0.17	2.25 ± 0.18
Genetic selection	3.30 ± 0.17	3.43 ± 0.15	3.43 ± 0.16
Reproductive management	3.78 ± 0.16	3.85 ± 0.14	3.90 ± 0.15
Synchronization protocols	2.44 ± 0.19	2.66 ± 0.17	2.93 ± 0.18
Business management			
Commodity prices	3.64 ± 0.16	3.94 ± 0.15	3.92 ± 0.16
Community dairies (multiple producers working together)	2.70 ± 0.19	2.58 ± 0.17	2.61 ± 0.19
Dairy modernization	2.96 ± 0.18	2.91 ± 0.16	3.07 ± 0.18
Decision economics	3.04 ± 0.16	3.18 ± 0.15	3.29 ± 0.16
Expansion	2.77 ± 0.18	2.52 ± 0.16	2.55 ± 0.18
Financial management	3.42 ± 0.18	3.33 ± 0.16	3.53 ± 0.17
Labor and employee management	2.46 ± 0.20	2.75 ± 0.18	2.68 ± 0.19
Operational benchmarking	2.47 ± 0.18	2.09 ± 0.15	2.39 ± 0.17
Organic dairying	2.32 ± 0.18	1.77 ± 0.16	1.84 ± 0.17
Price risk management	3.08 ± 0.18	2.75 ± 0.16	2.82 ± 0.17
Standard operating procedures	2.78 ± 0.19	2.78 ± 0.16	2.96 ± 0.17
Third-party certification programs	2.16 ± 0.18	1.67 ± 0.16	2.07 ± 0.17
Transfer of farms to younger generation	3.42 ± 0.20	3.16 ± 0.18	3.35 ± 0.20
Transitioning out of the dairy business	2.53 ± 0.20	2.32 ± 0.18	2.47 ± 0.19
Whole farm business planning	3.34 ± 0.18	3.24 ± 0.16	3.38 ± 0.18
General management			
Animal well-being	3.98 ± 0.15	3.97 ± 0.14	4.28 ± 0.14
Contract heifer raising	2.12 ± 0.17	2.06 ± 0.15	2.12 ± 0.16
Cow comfort	3.77 ± 0.14 ^b	3.82 ± 0.13 ^b	4.32 ± 0.13 ^a
Cutting-edge technologies for modern dairying	3.12 ± 0.19	2.88 ± 0.17	2.90 ± 0.17
Dairy production records (example: DHI)	3.00 ± 0.18 ^b	3.00 ± 0.16 ^b	3.81 ± 0.17 ^a
Environmental issues	3.22 ± 0.15	3.15 ± 0.14	3.33 ± 0.14
Facility planning, construction, and renovation	3.00 ± 0.18	3.00 ± 0.16	3.13 ± 0.16
Manure management	3.49 ± 0.16	3.64 ± 0.15	3.67 ± 0.16
Milking equipment and systems	3.43 ± 0.16	3.58 ± 0.14	3.50 ± 0.15
Odor control	3.04 ± 0.19	2.94 ± 0.17	2.97 ± 0.18

^{a,b}LSM within rows with different superscripts differ ($P < 0.05$).

¹Mean response calculated after assigning the following numeric values to producer response categories: not important: 1, important: 3, and very important: 5.

²Production levels categorized as low (<22.7 kg/cow per day), mid (22.7 to 26.4 kg/cow per day), and high (≥26.4 kg/cow per day).

population and dairy producers in other parts of the country, producers in the Kentucky dairy industry are not transitioning to these methods as rapidly. Additionally, dairy producers may simply not be as familiar with newer delivery methods or even be aware that they are an option for receiving information. Because producers

may be accustomed to printed materials through years of exposure to this method, they may be somewhat resistant to unfamiliar or less comfortable methods. These results may partially be explained by Internet accessibility. Maurer and Fast (2007) reported that only 37.8% of producers regarded Internet resources as effective.

Table 7. Importance of dairy management topics in extension programming categorized by herd size as indicated by dairy operations responding to the Kentucky Dairy Extension Survey¹

Topic	Herd size				
	1 to 49 (n = 80)	50 to 99 (n = 84)	100 to 149 (n = 25)	150 to 199 (n = 12)	200 to 1,200 (n = 12)
Nutrition					
Evaluation of alternative feeds	3.62 ± 0.13	3.99 ± 0.13	4.28 ± 0.22	4.27 ± 0.34	3.73 ± 0.34
Feeding management	3.71 ± 0.13	3.91 ± 0.13	3.96 ± 0.23	4.45 ± 0.34	4.27 ± 0.34
Forage and silage management	3.66 ± 0.14	3.92 ± 0.13	3.88 ± 0.23	3.91 ± 0.35	4.27 ± 0.35
Grazing and pasture management	3.99 ± 0.15 ^a	3.59 ± 0.15 ^{ab}	3.08 ± 0.26 ^b	3.55 ± 0.39 ^{ab}	2.60 ± 0.41 ^b
Ration troubleshooting and formulation: heifers	3.27 ± 0.16	3.32 ± 0.15	3.26 ± 0.27	3.91 ± 0.38	3.20 ± 0.40
Ration troubleshooting and formulation: milking cows	3.49 ± 0.15 ^b	3.74 ± 0.14 ^{ab}	3.96 ± 0.25 ^{ab}	4.64 ± 0.38 ^a	3.91 ± 0.38 ^{ab}
Selection of forage varieties	3.47 ± 0.15	3.81 ± 0.14	3.50 ± 0.26	3.91 ± 0.38	3.80 ± 0.40
Transition cow feeding and management	3.24 ± 0.14 ^b	3.81 ± 0.13 ^{ab}	3.58 ± 0.24 ^{ab}	4.20 ± 0.37 ^a	4.27 ± 0.35 ^{ab}
Health					
Dairy biosecurity	2.88 ± 0.15	2.60 ± 0.14	2.83 ± 0.25	3.55 ± 0.36	3.00 ± 0.40
Disease economics	3.35 ± 0.14	3.45 ± 0.13	3.43 ± 0.24	4.09 ± 0.35	3.22 ± 0.38
Disease prevention and vaccinations	3.86 ± 0.12	4.08 ± 0.12	4.20 ± 0.21	4.64 ± 0.31	3.67 ± 0.34
Disease treatment	3.86 ± 0.13	4.01 ± 0.13	4.13 ± 0.23	4.27 ± 0.33	3.67 ± 0.36
Lameness and hoof health	3.65 ± 0.13	4.00 ± 0.13	4.20 ± 0.23	4.64 ± 0.34	4.20 ± 0.36
Mastitis and milk quality	4.30 ± 0.12	4.36 ± 0.12	4.33 ± 0.21	4.82 ± 0.31	4.40 ± 0.33
Reproduction and genetics					
AI	3.34 ± 0.17	3.28 ± 0.16	3.96 ± 0.28	3.36 ± 0.42	3.91 ± 0.42
Crossbreeding	2.19 ± 0.16	2.18 ± 0.16	3.00 ± 0.28	2.82 ± 0.41	3.00 ± 0.43
Genetic selection	3.35 ± 0.14	3.23 ± 0.13	3.75 ± 0.24	4.27 ± 0.36	3.18 ± 0.36
Reproductive management	3.77 ± 0.14	3.84 ± 0.13	3.88 ± 0.23	4.09 ± 0.35	3.80 ± 0.36
Synchronization protocols	2.53 ± 0.17	2.62 ± 0.16	2.60 ± 0.27	3.00 ± 0.43	3.40 ± 0.43
Business management					
Commodity prices	3.85 ± 0.15	3.79 ± 0.14	3.80 ± 0.25	4.64 ± 0.37	3.40 ± 0.39
Community dairies (multiple producers working together)	2.83 ± 0.17	2.55 ± 0.17	2.50 ± 0.29	3.00 ± 0.43	2.78 ± 0.48
Dairy modernization	2.73 ± 0.16	2.90 ± 0.15	3.43 ± 0.27	3.36 ± 0.39	3.73 ± 0.39
Decision economics	2.94 ± 0.14	3.18 ± 0.14	3.19 ± 0.26	3.55 ± 0.36	3.60 ± 0.38
Expansion	2.43 ± 0.16	2.51 ± 0.15	2.83 ± 0.27	3.36 ± 0.40	3.18 ± 0.40
Financial management	3.50 ± 0.16	3.29 ± 0.15	3.35 ± 0.27	4.09 ± 0.39	3.40 ± 0.41
Labor and employee management	2.56 ± 0.17 ^b	2.45 ± 0.16 ^b	3.00 ± 0.30 ^{ab}	4.09 ± 0.42 ^a	3.00 ± 0.44 ^{ab}
Operational benchmarking	2.33 ± 0.15	2.22 ± 0.15	2.27 ± 0.27	3.00 ± 0.38	2.20 ± 0.40
Organic dairying	2.16 ± 0.16	1.88 ± 0.15	1.82 ± 0.28	2.20 ± 0.42	1.60 ± 0.42
Price risk management	2.91 ± 0.16	2.76 ± 0.15	3.00 ± 0.28	3.36 ± 0.39	2.78 ± 0.43
Standard operating procedures	3.03 ± 0.16	2.63 ± 0.15	2.90 ± 0.28	3.36 ± 0.38	2.40 ± 0.40
Third-party certification programs	2.14 ± 0.16	1.70 ± 0.15	2.05 ± 0.28	2.45 ± 0.39	2.40 ± 0.41
Transfer of farms to younger generation	3.32 ± 0.18	3.19 ± 0.17	4.04 ± 0.30	3.00 ± 0.44	3.00 ± 0.44
Transitioning out of the dairy business	2.31 ± 0.17	2.47 ± 0.16	2.52 ± 0.31	2.45 ± 0.43	3.00 ± 0.45
Whole farm business planning	3.37 ± 0.15	3.13 ± 0.15	3.52 ± 0.27	4.09 ± 0.39	3.60 ± 0.41
General management					
Animal well-being	4.11 ± 0.13	4.06 ± 0.13	3.83 ± 0.23	4.27 ± 0.34	4.00 ± 0.36
Contract heifer raising	2.00 ± 0.16	2.13 ± 0.14	2.39 ± 0.27	2.27 ± 0.39	2.40 ± 0.40
Cow comfort	3.93 ± 0.13	3.94 ± 0.12	3.96 ± 0.22	4.45 ± 0.33	4.40 ± 0.34
Cutting-edge technologies for modern dairying	2.77 ± 0.16	2.95 ± 0.15	3.08 ± 0.27	3.40 ± 0.43	3.60 ± 0.43
Dairy production records	3.12 ± 0.16	3.18 ± 0.15	3.78 ± 0.28	2.64 ± 0.41	4.09 ± 0.41
Environmental issues	3.17 ± 0.13	3.26 ± 0.13	3.00 ± 0.23	3.73 ± 0.34	3.55 ± 0.34
Facility planning, construction, and renovation	2.86 ± 0.15	3.03 ± 0.14	3.17 ± 0.27	3.73 ± 0.38	3.40 ± 0.40
Manure management	3.31 ± 0.14 ^b	3.74 ± 0.13 ^{ab}	3.70 ± 0.25 ^{ab}	4.45 ± 0.36 ^a	3.40 ± 0.38 ^{ab}
Milking equipment and systems	3.41 ± 0.14	3.56 ± 0.13	3.67 ± 0.24	3.91 ± 0.36	3.36 ± 0.36
Odor control	2.91 ± 0.16	3.00 ± 0.15	2.91 ± 0.29	3.55 ± 0.41	2.80 ± 0.43

^{a,b}LSM within rows with different superscripts differ ($P < 0.05$).

¹Mean response calculated after assigning the following numeric values to producer response categories: not important: 1, important: 3, and very important: 5.

Table 8. Effectiveness of information delivery methods as indicated by dairy operations responding to the Kentucky Dairy Extension Survey

Information delivery method	Producers indicating method is effective (%)
Printed farm magazines	81.0
Agricultural newspapers	77.4
Printed newsletters from county agriculture agent	75.7
Printed newsletters from university extension team	65.0
Local or regional meetings	55.8
Printed extension fact sheets	50.0
Individual farm visits	46.9
On-farm demonstrations	43.4
Television programs	34.5
Electronic newsletters from university extension team	27.0
Radio programs	17.7
Video-tapes and DVD	11.9
University website	11.9
Indirectly through allied industry consultants	11.5
Webinars	2.7
Podcasts	0.4
Blogs	0.4
Other	0.4

tive (32.5%) or very effective (5.3%). When categorized by herd size (Table 9), producers with herds with 200 to 1,200 cows found it more effective to have on-farm demonstrations than did producers with smaller herds, whereas producers with herds with 1 to 49 cows found it more effective to use printed farm magazines than did producers with larger herds ($P < 0.05$). Surprisingly, no significant differences in use of Internet resources among age categories were found. This could be because many younger dairy operators in Kentucky are members of

the Amish or Mennonite communities (David S. Roberts, Kentucky Dairy Development Council, Hampton, KY, personal communication). A large number of small Amish dairy farms exist in Kentucky (Cross, 2007).

Survey respondents were asked to identify the usefulness of a list of potential programs to evaluate the worth of future programs (ranked as not useful, useful, or very useful). As Table 10 demonstrates, producers indicated instruction on interpretation of rations and communicating with nutritionists was the most useful

Table 9. Effectiveness of information delivery methods categorized by herd size as indicated by dairy operations responding to the Kentucky Dairy Extension Survey¹

Method	Herd size					χ^2
	1 to 49	50 to 99	100 to 149	150 to 199	200 to 1,200	
Agriculture newspapers	77	75	92	58	83	0.213
Blogs	1	0	0	0	0	0.797
Electronic newsletters from University of Kentucky Dairy Extension Team	28	27	17	17	58	0.094
Individual farm visits	35	49	46	42	75	0.092
Indirectly through allied industry and consultants	9	10	21	8	17	0.495
Local or regional meetings	53	55	58	33	83	0.172
On-farm demonstrations	33	45	54	33	83	0.011
Podcasts	0	0	0	0	0	
Printed extension fact sheets	49	43	63	42	58	0.483
Printed farm magazines	91	72	75	75	75	0.041
Printed newsletters from county agriculture agent	76	77	83	67	58	0.501
Printed newsletters from University of Kentucky Dairy Extension Team	72	55	63	58	75	0.220
Radio programs	13	23	21	8	8	0.332
Television programs	33	36	38	33	17	0.744
University of Kentucky website	13	8	13	0	25	0.315
Video-tapes and DVD	10	13	4	0	8	0.516
Webinars	3	4	0	0	8	0.634

¹Percent of farmers selecting method.

Table 10. Usefulness of potential dairy programming areas as indicated by dairy operations responding to the Kentucky Dairy Extension Survey¹

Program	Response percent				Total responses (n)	Mean response (± SD)
	Not useful	Moderately useful	Very useful			
Instruction on interpretation of rations and communicating with nutritionists	15.5	43.2	41.3		206	3.51 ± 1.42
Dairy business management skills training program	16.2	52.0	31.8		204	3.31 ± 1.35
Dairy modernization planning, training, and consulting	26.2	47.6	26.2		206	3.00 ± 1.45
On-farm troubleshooting and opportunity identification	26.2	51.0	22.8		206	2.93 ± 1.40
Instruction on calculation and interpretation of financial records	29.8	55.1	15.1		205	2.71 ± 1.31
Spreadsheets to examine economic implications of various management decisions	36.3	44.1	19.6		204	2.67 ± 1.46
Case studies describing dairy extension success stories	29.7	58.9	11.4		202	2.63 ± 1.23
Organized tours of dairies in other states	40.5	42.9	16.6		205	2.52 ± 1.44
Introductory computer skills instruction	42.9	38.9	18.2		203	2.51 ± 1.49
Employee management training program for dairy owners	50.7	34.2	15.1		205	2.29 ± 1.46
Investment analysis training	47.5	42.7	9.8		204	2.25 ± 1.32
PC/Dart training	53.4	32.8	13.8		189	2.21 ± 1.44
Online training and webinars (any topic)	53.2	38.4	8.4		203	2.10 ± 1.29
Milker training schools offered in Spanish	69.0	21.2	9.8		203	1.82 ± 1.33
Milker training schools offered in English	67.0	27.6	5.4		203	1.77 ± 1.18

¹Mean response calculated after assigning the following numeric values to producer response categories: not useful: 1, moderately useful: 3, and very useful: 5.

idea, with a mean response of 3.51 ± 1.42 . Other highly ranked answers included a dairy business management skills training program (3.31 ± 1.35), dairy modernization planning and training and consulting (3.00 ± 1.45), on-farm troubleshooting and opportunity identification (2.93 ± 1.40), and instruction on calculation and interpretation of financial records (2.71 ± 1.31).

CONCLUSIONS

This study provides valuable insight for Kentucky extension professionals and industry consultants and can serve as a reference for future extension programming ideas, topics, information delivery methods, and marketing. Providing meetings with topics producers are interested in encourages attendance. Kentucky extension professionals should prioritize programming efforts to focus on topics of interest to producers, including mastitis and milk quality, animal well-being, disease prevention and vaccinations, and cow comfort. Meetings should be held in convenient locations. Dairy meeting topics may be regionalized within the state because many dairies are similar within a region. In order for the producers to receive the information they need, Kentucky extension professionals have new insight into preferred delivery methods. Kentucky extension professionals should be cautious in transitioning too quickly to Internet resources and continue to use more traditional means of communication. Additionally, these results may provide insight to extension professionals in other states within the Southeast.

REFERENCES

Chase, L. E., L. O. Ely, and M. F. Hutjens. 2006. Major advances in extension education programs in dairy production. *J. Dairy Sci.* 89:1147–1154.

Cross, J. A. 2007. The expanding role of the Amish in America's dairy industry. *Focus on Geography* 50:7–16.

Fultz, S. W., and D. M. Schwartz. 2001. Our evolving audience and their needs: The agent's perspective. *J. Dairy Sci.* 84(E-Suppl):E191–E193.

Fulwider, W. K., T. Grandin, B. E. Rollin, T. E. Engle, N. L. Dalsted, and W. D. Lamm. 2008. Survey of dairy management practices on one hundred thirteen North Central and Northeastern United States dairies. *J. Dairy Sci.* 91:1686–1692.

Hutjens, M. F., T. P. Lyons, and K. A. Jacques. 2004. Meeting the educational needs of dairy clientele in 2020. Pages 205–210 in *Proc. Nutritional Biotechnology in the Feed and Food Industries*; Proc. 20th Alltech Symposium. Nottingham University Press, Nottingham, UK.

LaDue, E., B. Gloy, and C. Cuykendall. 2003. Future structure of the dairy industry: Historical trends, projections and issues. *Res. Bull.* 2003–01. Dept. of Applied Econ. and Manag., Cornell Univ., Ithaca, NY.

Likert, R. 1932. A technique for the measurement of attitudes. *Arch. Psychol.* 140:1–55.

Maurer, R. C., and A. J. Fast. 2007. Kentucky dairy producers survey results. Accessed June 15, 2008. http://www.rs.uky.edu/regulatory/milk/survey/E_Dairy_Producer_Comprehensive_Final_Report.pdf.

- Norman, H. D., R. H. Miller, and F. A. Ross Jr. 2009. Somatic cell counts of milk from Dairy Herd Improvement herds during 2008. USDA AIPL Research Report SCC10 (2-09), Animal Improvement Programs Laboratory, ARS-USDA, Beltsville, MD. Accessed October 26, 2010. <http://www.aipl.arsusda.gov/publish/dhi/dhi09/sccrpt.htm>.
- Ostrom, M., D. Jackson-Smith, and S. Moon. 2000. Wisconsin dairy farmer views on university research and extension programs. PATS Research Summary No. 2. Program on Agricultural Technology Studies, University of Wisconsin-Madison.
- USDA. 2009. Dairy 2007, Part V: Changes in Dairy Cattle Health and Management Practices in the United States, 1996-2007. #519.0709. USDA:APHIS:VS, CEAH. Fort Collins, CO.
- USDA-NASS. 2009. Farm computer usage and ownership. National Agricultural Statistics Board, US Department of Agriculture. Washington, DC. Accessed May 6, 2010. <http://usda.mannlib.cornell.edu/usda/current/FarmComp/FarmComp-08-14-2009.pdf>.
- USDA-NASS (National Agricultural Statistics Service). 2010. Milk production. Monthly reports. Accessed October 25, 2010. <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1103>.
- VanLeeuwen, J. A., and G. P. Keefe. 2001. A survey of demographics and information demands of dairy producers. *Can. Vet. J.* 42:57-59.