

Major Advances in Extension Education Programs in Dairy Production

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ABSTRACT

The dairy industry has seen structural changes in the last 25 yr that have an impact on extension programming. The number of cows in the United States has decreased by 17%, whereas the number of dairy farms has decreased by 74%. The average milk production per cow has increased from 5,394 to 8,599 kg/lactation. Even though there are fewer farms, dairy farm managers are asking for more specific and targeted information. The extension resources available have also decreased during this period. Because of these changes, shifts have taken place in extension programming and staffing. A key change has been a shift to subject matter-targeted programs and workshops. Extension has also incorporated and expanded use of the Internet. Discussion groups, subject matter courses, and searchable databases are examples of Internet use. There will be continuing shifts in the demographics of the US dairy industry that will influence future extension efforts. It is also probable that fewer extension professionals will be available to provide programming due to changes in funding sources at national, state, and local levels. Future shifts in extension programming will be needed to provide the information needs of the industry with a smaller number of extension workers.

Key words: extension, Internet, program delivery

INTRODUCTION

Extension is one of the three missions of land-grant universities in the United States. The role of extension has been to provide research-based education and information to the production sector. The role of extension continues to shift and adapt due to changes in the clientele served, delivery methods available, and the number of individuals with extension responsibilities. Appleman and Norell previously outlined the trends that occurred in extension from 1956 through 1979.

This paper will cover changes and trends that have taken place in extension since 1980. The three focus areas of this paper will be 1) changes in clientele served by extension; 2) extension delivery methods; and 3) extension staffing patterns.

CLIENTELE SERVED BY EXTENSION

There continues to be a shift in both the structure of the dairy industry and productivity of the dairy cow. Figure 1 shows the shift in the number of US dairy farms since 1980. The total number of farms has decreased by 74% since 1980. The number of cows per farm has increased by 325% since 1980. The total number of dairy farms in the United States is projected to be about 16,000 by the year 2020. Average herd size will continue to increase as the number of dairy herds decreases. At some point, environmental considerations could alter herd size shift patterns.

Figure 2 shows the total number of dairy cows in the United States starting in 1980. Total number of cows has decreased by 17% during this period. Average milk production per cow has increased by 158% since 1980. The average annual increase in milk production was 135 kg/cow during the same period, and total US milk production has increased 133%.

How do these trends influence extension programming? One view is that less extension effort and resources are needed because there are fewer dairy farms. This viewpoint is overly simplistic to be used as a guide in determining the appropriate level of extension staffing and programs. A key factor that must also be considered is the expectations of clientele for extension information. An evaluation of clientele profiles is needed to answer this question. Primary factors to consider are the level and type of technical and management information required by the dairy producer. Today's dairy producers are asking for more in-depth, research-based information. These same individuals are requesting more targeted information and guidelines relative to their specific situation. Generalized information is of less value or interest to both current and future clientele.

There has also been an expansion of extension efforts to a broader based clientele. One example is the in-

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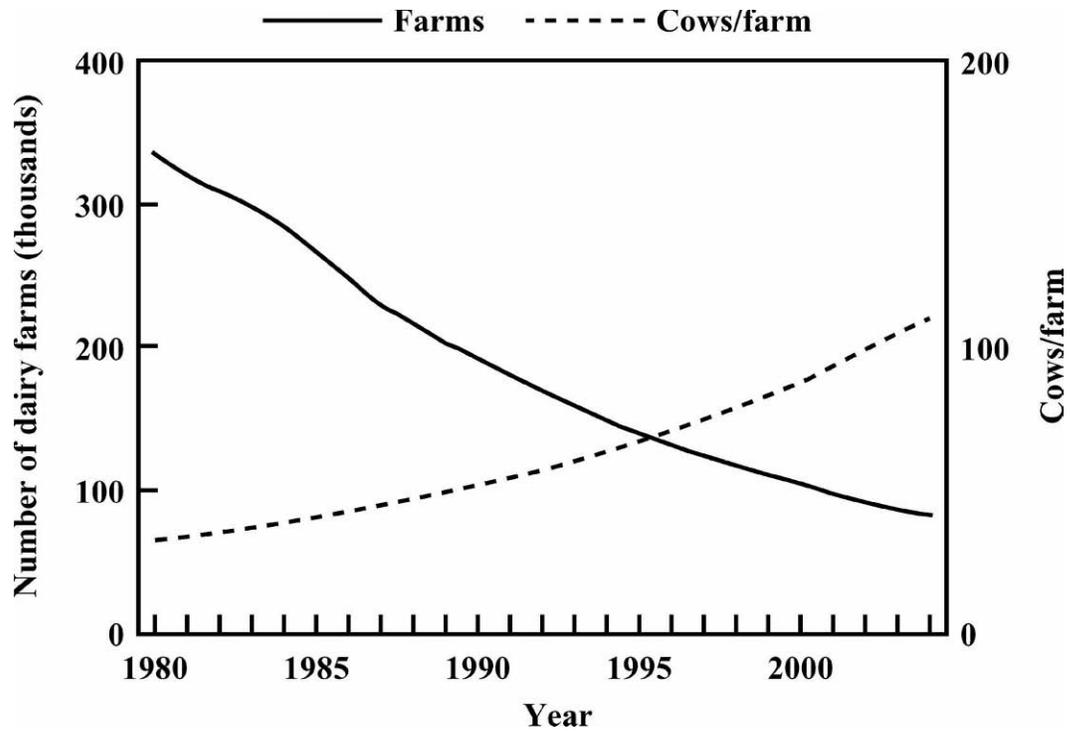


Figure 1. Number of dairy farms and average number of cows per farm in the United States, 1980 to 2004.

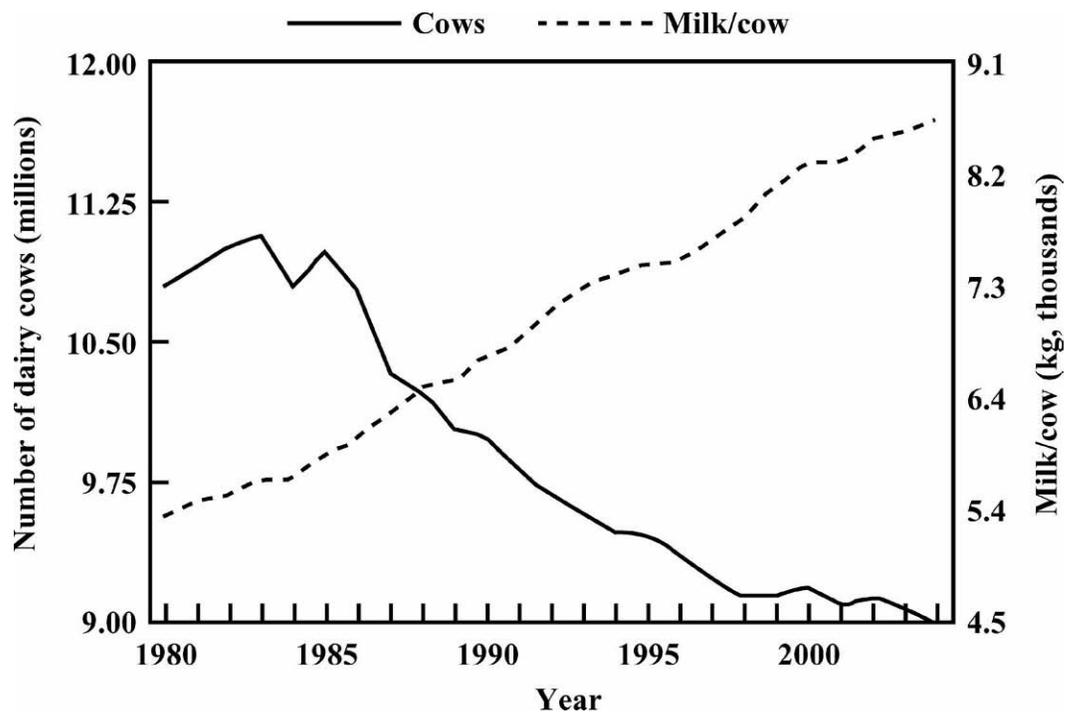


Figure 2. Total number of dairy cows and milk production per cow in the United States, 1980 to 2004.

creased emphasis by a number of states (PA, NY, WI, WA, IL, and MI) to provide information, education, and in-depth training sessions for agri-service professionals. This clientele is an excellent multiplier group for dairy production extension efforts. Each of these individuals may work with 30 to 70 farms. Industry personnel have been very receptive to extension programming and training. The multiplier aspect of these extension efforts can be very significant in terms of transferring information to the farm level. Unfortunately, producers may not recognize extension as the original source of some of this information.

A second example of a shift in clientele is the increasing effort by extension personnel to provide information and training programs for Latino workers employed on dairy farms. This area of extension effort has developed in the last 5 to 10 yr and will continue to grow. The educational effort to reach these individuals works best in small, hands-on type workshops that emphasize both technical information and practical skills training. This audience is very interested in and receptive to these extension programming efforts. The employers of these individuals are also looking to extension services to provide these types of educational and training programs for their workers. Extension has developed materials and conferences to assist dairy farm owners better understand the Latino culture and how best to interact with these employees. Programs to assist individuals in learning Spanish have also been provided. There appears to be potential for expansion of programs in this area, because the jobs performed on dairy farms by these individuals require new skill sets. Initial programming focused on skills related to the milking routine and procedures. However, training programs in the areas of calf management, herd health, and feeding management have been added as these individuals take on a wider range of responsibilities on dairy farms.

EXTENSION STAFFING

The extension system continues to struggle with budget constraints that have affected both programming and staffing. Hutjens and Baltz have reported the changes in the number of extension personnel in 13 dairy states. This survey covered a 10-yr period from 1989 to 1999. A decrease in full-time employees (FTE) ranging from 5 to 34% occurred during this period. Decreases were reported at state, regional, and local levels. This trend of decreasing extension FTEs has continued since 1999 due to continuing budget cuts in many state and county governments. A major concern exists relative to future university FTEs designated to extension. A high percentage of the current university extension workers will be retiring in the next decade. It is

probable that a number of these FTEs will not be replaced or maintained with an extension responsibility. There is also a trend for current individuals with extension responsibilities to do more teaching and other departmental functions as total faculty size and FTEs decrease in many universities. Extension faculty will have joint extension–research appointments and will be expected to obtain competitive grants to support a research program. The success of the individual in conducting research and obtaining grants will be an important component of the tenure decision. These changes further decrease the actual FTEs devoted to extension in many departments. County-level extension programs and personnel are also under pressure because extension is not a mandated item in local budgets. These uncertainties relative to future program funding make it more difficult to attract and maintain the qualified young people to continue to provide the quality extension programs expected and demanded by our clientele. There may also be increased interest in having extension workers certified in recognition of their subject matter expertise. This can be done through programs administered by the American Registry of Professional Animal Scientists (ARPAS) or similar groups.

One approach to partially assist in maintaining the level of expertise needed to provide extension programming has been the development of multicounty, regional, or multistate extension efforts. At the university level, the Midwest group (IA, WI, MN, and IL) is an example. These extension specialists interact to provide programs or educational materials on a group basis. This interaction assists in covering various subject matter areas even though they may not all be present in a specific state. It is likely that this model will need to be expanded in the future in other states and regions of the United States. Such collaborative efforts decrease the need for each university to have a broad spectrum of subject matter expertise.

A second option is for individual states to develop specialization in dairy or livestock expertise area. One state could take the lead in dairy cattle while relying for other states for expertise in livestock species. Each state would still need some staff to help in coordination of extension programming in areas outside of its expertise base. This model will require some innovation, faculty flexibility, and administrative support. A major challenge will be shifting both people and monetary resources between states.

A similar trend is taking place in a number of individual states relative to regional or multicounty extension workers. In some cases, this is simply a matter of economics, and not being able to support as many county FTEs as were previously available. In some states (MO,

NY), the regionalization effort is supported by special appropriations from state governments. One advantage of multicounty or regional agents is that a more experienced or highly trained individual can be used. In some of these situations, an MS or PhD degree is the minimum educational requirement for employment. These individuals can bring a higher level of subject matter expertise to meet the higher level of information expected by our clientele. One disadvantage to this approach is the loss of contacts and linkages between the extension program and individual producers. Producers may feel more distant or less involved with extension as an initial source of contact or information. At the county level, the result may be decreased producer support for extension in tight budgetary situations. In some situations, major dairy counties do not have a dedicated dairy extension agent or program. An increasing number of state, regional, and local extension agents are expected to obtain grants to support some portion of their total program efforts. This activity further decreases the time that extension workers can devote to program activities.

An increasing demand on extension workers is the need for program accountability and defining the impact of programs. This is a situation in which the concept is correct but the actual details become problematic. It is easy to quantify the number of extension contacts, meetings, and written materials. However, these measures are not direct measures of impact. It has been very difficult to develop useful and logical methods of determining and reporting the impact of extension programs. Input from nonextension sources may be needed to assist in developing approaches to this evaluation and reporting requirement. Future funding of extension will most likely be linked to program impact type measures.

PROGRAM DELIVERY METHODS

The last 25 yr have seen a large number of changes in the program delivery methods used by extension workers. One reason for this has been the increased availability of technologies for use in developing programming efforts. A second reason has been the shift toward more specific or targeted activities to meet the needs of specific clientele. A paper by Hutjens and Baltz summarized survey results of shifts in extension program delivery methods. Key points included less individual county meetings, increased use of multicounty meetings, and more use of agribusiness personnel in delivering programs. Extension continues to offer many of the more traditional meetings and workshops. The program delivery areas listed below are examples of

some shifts in program delivery methods that have occurred in the last 20 yr.

Subject Matter-Specific Meetings

A major shift in extension programming has been developing specific, targeted meetings to meet the needs of our various clientele groups. These efforts can provide more specific, in-depth information on specific topics or management areas. Examples of these types of efforts include calf nutrition and management; transition cow management and nutrition; on-farm feeding management practices; herd internal growth; milking practices and milk quality; organic milk production; use and interpretation of Dairy Herd Improvement records; reproductive management programs; forage quality and forage use; silage management and fermentation; and ration formulation and management to decrease nutrient management.

Use of the Internet

The availability of the Internet has provided a number of opportunities for extension programs. Many universities and local extension offices have Web sites that can be accessed by the public. These sites provide a convenient and rapid way to provide current information to clientele. These sites also offer the opportunity for users to download or print copies of information to meet their specific needs. The links built into these sites provide users the opportunity to gain access to multiple sites that may contain information specific to their needs. One concern is that material on these sites has not usually undergone subject matter review. Thus, the end user does not have a method by which to assess the accuracy or quality of this information. There may be a need to refine the approach to determining the material that is made available by this approach.

A second use of the Internet has been the development of discussion groups or lists. This provides users the ability to post questions or answers to specific questions or situations. One example is Dairy-L, organized in 1990 by Mark Varner (MD) and Roger Cady (MO), which is a listserv-based system to which users must subscribe. The goal is to provide a method to facilitate communication among individuals interested in dairy cattle management. An individual sends a message to the listserv that then sends the message to all subscribers. Moderators monitor the system but do not alter the original messages sent by subscribers. At times, the moderators may limit additional discussion on a topic after a large number of responses to a specific question have been posted. As currently structured, this system does not permit the sending and receiving of attached

files. Current users are from academia, commercial companies, extension, consultants, and dairy producers. There are currently about 2,100 subscribers from 47 countries. The number of messages per year and the number of subscribers has decreased somewhat over the last 2 to 4 yr. Similar systems are in use for grazers, silage management, and bovine veterinarians.

The University of Illinois has taken the lead in developing courses that can be taken via the Internet. These classes use a combination of Internet communications and CD-ROM based materials. Since 1998, the University of Illinois has offered 15 dairy classes via the Internet. Over 400 adults and students have been enrolled. Students participating were from 8 universities and 55% of the students were out of state. International students represented 11% of the total participants. Courses offered included dairy nutrition, dairy production, reproduction, milk quality and mastitis, advanced dairy nutrition, and advanced dairy cattle management. There have been >4,500 CD-ROM disks sold at a cost of \$25 to \$45 each as part of this effort. A certificate program is also offered as part of this program. Even though this program has been well received, it is not logical for every institution to provide this type of program delivery method. There could be some real opportunities for multiple universities to join in moving this concept ahead.

A number of other Internet approaches have been used. An Internet-based site with reviewed articles that could be sorted and retrieved was established (GA). The time and resources needed to maintain this site led to termination of the effort. There are also a number of states (GA, FL, and WI) that have benchmark data available online, including both financial and production data. This provides quick access to data that can be useful to dairy producers and professionals in evaluating dairy operations. A number of commercial firms are beginning to offer data that can be used for benchmarking purposes.

Video and Satellite Conferences

Distance education programs have been offered by a number of institutions (PA, WI, and MN). Initially, videotapes were produced and made available for use in local meetings. Even though this approach provided excellent information, many of these were not very successful. One problem was that the originators of the material were generally not available to the participants to respond to specific questions. Secondly, the local organizer needed training in how to integrate this information into an overall program. In addition, there was a high commitment of both time and funds to put together high quality videotapes and programs. The

availability of Internet based resources also increased dramatically in recent years. Because of these factors, the production and use of videotapes as a program delivery method has decreased significantly.

A second approach was the use of satellite-based educational programs. These programs permit the specialists to interact with the participants. The same program can be offered at a number of sites simultaneously. The amount of preparation time by extension specialists to organize these programs can be high. A variety of materials need to be prepared and made available at each site to the participants. Site coordinators need to be trained to effectively offer the program at each site. The program needs to be varied so that short presentations combined with on-site activities are used. This may require the provision of a number of teaching aids at each site. Example teaching aids for a dairy nutrition program could include worksheets, notebooks, feed and forage samples, and particle-size screens. It appears important to change topics and speakers every 15 to 20 min to maintain attention and interest in the program. A critical success factor was the ability to interact among the site coordinators, participants, and program speakers. It appears that the use of this approach to extension education has decreased significantly in the last few years. This may be due to cost factors, the time required, or the availability of alternative educational approaches using the Internet.

National Dairy Database

The National Dairy Database project was started in the early 1980s. The objective was to provide dairy information in CD-ROM format for users. A key aspect of this project was the use of a peer-review system for selecting information for incorporation onto the CD. Extension information and publications were solicited from universities. The submitted articles were then divided into subject matter categories and peer-reviewed for potential inclusion on the CD. One objective of the peer-review system was to ensure that the information on the CD was current and accurate. A second objective was to minimize duplication of subject matter material. As an example, 20 publications related to dry cow nutrition might have been submitted for review. However, after peer review, <10 may have actually been used on the CD due to duplication of similar information in many of the submitted articles. The first version was developed under the leadership of the University of Illinois. Versions 2 and 3 were developed and distributed by the University of Wisconsin Center for Dairy Profitability. Currently, version 4 is available from the Agricultural Databases for Decision Support Center. This version has >1,500 articles on the CD-ROM. The

purchase of the CD-ROM also provides the user a 1-yr online subscription. Other databases are available for beef, sheep, and goats from the same source. A primary challenge in keeping this system current is obtaining new articles and information for consideration by the peer-review group. The current structure includes 24 different domain areas. A leader is responsible for each area and has 3 to 15 members to assist in reviewing documents and computer software for inclusion on the CD.

Searchable Conference Database

A new effort was initiated by ADSA in 2005 to provide a searchable database of conference proceedings. This subscription-based service provides access to conference proceedings. The program is just getting started but at least 14 conferences will have their proceedings available in this database (<http://spac.adsa.org>).

On-Farm Demonstration Projects

Extension has traditionally used on-farm demonstrations as one of the approaches to providing information to its clientele. A number of states (MD, NY) have used multiple herd demonstration projects. These projects may focus on specific subject matter (nutrition, mastitis, calf management, nutrient management) topics. Generally, these are multiple herd projects and may involve more than 1 yr of actual on-farm work. A second class of projects has evaluated the impact of various methods of providing management advice and information to specific farms. A large amount of time and effort is required to properly conduct these projects. Evaluations have indicated that dairy producers have implemented a number of the recommendations or management practices suggested by the project personnel. However, it appears that the effectiveness of many of these recommendations decline after the project ends and less individual farm input is provided by the extension system. There appears to be less use of this technique due to lack of funding sources and availability of extension personnel to commit the time needed to conduct these demonstrations.

On-farm research may increase in the future as more extension specialists have research appointments. This will provide an opportunity to conduct controlled studies on larger dairy farms, and permit the use of large numbers of cows to achieve statistical significance and assist on controlling variation. Research areas could include nutrition, reproduction, animal behavior, cow comfort, and management alternatives. University herds do not have adequate animals or facilities to conduct this type of research. These trials will need to be

carefully designed and analyzed to permit the results to be published in peer-reviewed journals. External funding will be needed to support these activities. However, this is another factor that reduces the time available to extension specialists for programming efforts.

Dairy Advisory Teams

Workers at the University of Minnesota initiated the use of Dairy Diagnostic Teams to assist dairy producers in the early 1990s. The goal of this approach was to assist dairy farm managers in assessing their current situation and then develop alterations in management practices. Extension specialists provided the initial leadership to assist producers in selecting and organizing the specific advisory team for their farm. The dairy farm manager was responsible for selecting the actual team members (5 to 8 per farm). Team members were typically those individuals involved in providing products or services to the farm. Examples of team members include nutritionists, lenders, veterinarians, milk processors, extension educators, or other producers. A SWOT (strengths, weaknesses, opportunities, and threats) analysis was conducted by the team and used as a base for developing recommendations to assist the farm in attaining its goals. An evaluation of the 3-yr project indicated that producers were supportive of this approach and felt that it was beneficial to them. The actual changes implemented varied considerably for a variety of reasons. The role of extension was to assist in getting this process organized and started. However, to be successful, ownership and leadership had to shift to the dairy farm manager. On how many Dairy Advisory Teams can an extension worker actually participate? This can be a real problem in some areas with a large number of dairy farms interested in this approach and the limited time availability of extension educators.

Hands-On Workshops

It has been interesting to watch the growth of targeted subject matter, hands-on workshops in the last 5 to 10 yr. These typically involve a small number of participants (10 to 20). The goal is to provide a blend of subject matter information, group discussion, and hands-on activities. Examples of topics include foot health, calf management, and TMR management. These may be repeated a number of times within the same county or state to reach a larger number of producers. Agri-service support and help with teaching has been an integral component of many of these programs. In many cases, the participant is provided with a set of materials and tools to take home for use on a routine basis. The cost of these tools can be covered from a

mix of registration fees and agri-service contributions. Informal feedback from participants indicates a high level of satisfaction and learning from this approach. This is not a new or unexpected finding. Dairy producers have always reacted favorably to these types of meetings or activities in previous years. The challenge for extension is how to offer these types of activities in times of decreased funding and personnel.

Focus Groups

Focus groups are formed to permit individuals to share experiences, questions, and discussion on specific topic areas. This could relate to a specific management practice or to compare results or approaches on different farms. One example is the focus groups organized by Ontario DHI to compare and evaluate milk production records and other data from small groups of producers. These groups are generally small and consist of producers who are familiar with and respect each other. This provides a base for good, interactive discussions.

Targeted Conferences

The use of multistate, subject matter-targeted conferences has also increased in recent years. These have been done in many states and have been successful in bringing both speakers and participants together over broad geographical areas. Many of these are 1- to 3-d conferences that require participants to pay travel, conference, and hotel costs. A key advantage is that subject matter expertise can be obtained from a variety of sources. The “experts” in a specific area can be made available to the participants. A disadvantage, for some dairy producers, is the time and cost involved in participating in this type of meeting. The Western Dairy Conference and the Western Canadian Dairy Conference are examples of targeted conferences that have nationally recognized programs.

The above program delivery methods are just examples of some shifts which have taken place in extension programming. All of these methods have advantages and disadvantages. Each of these approaches has or is serving an educational need for a specific group of dairy producers.

FUTURE DIRECTIONS

Many factors will influence the future direction and role of extension. A primary factor will be the ability of universities to refill extension-oriented, faculty-level positions. These positions will most likely be joint extension–research appointments with significant research program expectations. Similar personnel chal-

lenges will exist at the regional or county level in most states. It appears certain that there will be fewer FTEs devoted to extension activities in the future.

A second factor that will influence the direction and role of extension are the projected continuing changes in dairy herd numbers and sizes. A number of groups have made projections on changes in the dairy industry that will occur over the next 10 to 15 yr. Some of the projections that will have a direct effect on future extension planning include the following.

1. The total number of milk cows is predicted to decrease from 8,975,000 in 2004 to 8,360,000 by 2015.
2. The average milk production per cow is projected to increase from 8,777 kg/cow in 2004 to 10,546 kg in 2015.
3. Total US milk production is predicted to increase to 88.5 billion kg in 2015 from 78.8 billion kg in 2004.
4. The number of US dairy herds is projected to decrease to 14,000–16,000 by 2020 from 70,410 in 2003.
5. The percentage of dairy farms with >500 cows is predicted to be 22.8% of total herds vs. these same herds representing 2.5% of total herds in 2000.
6. Herds >500 cows are predicted to produce 82 to 84% of the total milk produced in 2020 vs. the 36% of the total milk supply supplied by these herds in 2000.
7. Changes in the percentage of the total milk produced in different areas of the United States will occur. The western United States will continue to grow in terms of total milk production. The Midwest, Northeast, and Florida are expected to remain stable in terms of milk production. The remaining states are expected to decrease in milk production.

The role and program delivery methods for extension will continue to change over the next decade based on the above shifts in the structure of the dairy industry. It also appears that there will be a continuing decrease in extension FTEs to develop programs and work with clientele. At the same time, the clientele is asking for more specialized information and more workshop-type extension programming. The clientele base continues to expand beyond the dairy farm owner and manager. Commercial companies are doing more “extension” type work as part of their total service package offered to customers. For extension to remain a viable and primary source of information, a significant amount of program evaluation and refocusing will be required. The continuing decrease in federal, state, and local extension funding presents another challenge. One option is that funding sources for extension programming will

need to shift to a customer or a fee-based system if the system is to remain viable and effective for clients in the future. This change in funding patterns has already taken place in many other countries. Extension may need to use the focus-group concept to assist in examining plans and alternatives for future program efforts and directions.

REFERENCES

- Appleman, R. D., and R. J. Norell. 1981. Trends in dairy production extension. *J. Dairy Sci.* 64:921–932.
- Black, A. W. 2000. Extension theory and practice: A review. *Aust. J. Exp. Agric.* 40:493–502.
- Cassel, E. K., L. R. Vough, M. A. Varner, R. C. Eickelberger, J. E. Manspeaker, L. E. Stewart, L. W. Douglas, and R. R. Peters. 1994. A demonstration project of interdisciplinary dairy herd extension advising funded by industry and users. 3. Impact on management practices. *J. Dairy Sci.* 77:2461–2476.
- Gherty, J. 1995. Serving the customers! Education's challenge for the future. *J. Dairy Sci.* 78:1399–1406.
- Heinrichs, A. J., N. E. Kiernan, and V. A. Ishler. 1996. Keys to developing an effective dairy satellite extension program. *J. Dairy Sci.* 79:1981–1987.
- Hobbs, B. B. 2004. Latino outreach programs: Why they need to be different. *J. Extension* 42(4). Online. Available: <http://www.joe.org>
- Hutjens, M. F. 2004. Meeting the educational needs of dairy clientele in 2020. Pages 205–210 in *Nutritional Biotechnology in the Feed and Food Industries*; Proc. 20th Alltech Symposium. Nottingham University Press, Nottingham, UK.
- Hutjens, M. F., and J. H. Baltz. 2000. Keeping extension programs current in order to meet the needs of a dynamic dairy industry. *J. Dairy Sci.* 83:1412–1417.
- LaDue, E., B. Gloy, and C. Cuykendall. 2004. Which farms will produce the nation's milk in 2020? *Hoard's Dairyman* 149:49.
- Lippert, R. M., O. Plsank, J. Camberato, and J. Chastain. 21998. Regional extension in-service training via the Internet. *J. Extension* 36(1). Online. Available: <http://www.joe.org>
- Peters, R. R., E. K. Cassel, M. A. Varner, L. W. Douglas, L. R. Vough, J. E. Manspeaker, L. E. Stewart, J. W. Wysong, and R. C. Eickelberger. 1994. A demonstration project of interdisciplinary dairy herd extension advising funded by industry and users. 2. Impact on herd performance. *J. Dairy Sci.* 77:2450–2460.
- Peters, R. R., E. K. Cassell, M. A. Varner, R. C. Eickelberger, L. R. Vough, J. E. Manspeaker, L. E. Stewart, and J. W. Wysong. 1994. A demonstration project of interdisciplinary dairy herd extension advising funded by industry and users. 1. Implementation and evaluation. *J. Dairy Sci.* 77:2438–2449.
- Peters, R. R., K. A. DeMarco, J. E. Manspeaker, E. K. Cassel, R. L. King, M. A. Varner, L. W. Douglas, and M. J. Paape. 1986. Use of videotape and phone teleconference in statewide extension program on milk quality and mastitis control. *J. Dairy Sci.* 69:1178–1185.
- Risdon, P. 1994. Transferring technology through the Internet channel. *J. Extension* 32(1). Online. Available: <http://www.joe.org>
- Roseler, D. K., L. E. Chase, and E. W. McLaughlin. 1994. Information dissemination in dairy nutrition. *J. Extension* 32(1). Online. Available: <http://www.joe.org>
- Schmitt, M. A., B. R. Durgan, and S. M. Iverson. 2000. Impact assessment and participation profiles of extension's education programs for agricultural chemical/seed retailers and crop advisors. *J. Extension* 38(6). Online. Available: <http://www.joe.org>
- Twidwell, E. K., and B. C. Venuto. 2004. Teaching a forage crops course to extension agents via distance education. *J. Extension* 42(4). Online. Available: <http://www.joe.org>
- Varner, M. A., and R. A. Cady. 1993. Dairy-L: An electronic information exchange network for professionals advising dairy producers. *J. Dairy Sci.* 76:2325–2331.
- Varner, M. A., J. E. Manspeaker, E. Russek-Cohen, E. K. Cassel, J. L. Majeskie, and R. A. Erdman. 1989. Impact of intensive integrated reproductive management education programs upon dairy producers in Maryland. *J. Dairy Sci.* 72:1620–1626.
- Weinard, D., and B. J. Conlin. 2003. Impacts of dairy diagnostic teams on herd performance. *J. Dairy Sci.* 86:1849–1857.
- ZoBell, D. R., C. K. Chapman, C. Bagley, K. Heaton, and D. Whittier. 2004. Intermountain beef 3910 workshop—Collaborating with industry in extension education. *J. Extension* 42(4). Online. Available: <http://www.joe.org>