

DAIRY PRODUCTION PROGRAMS  
REPORT ON DAIRY SCIENCE DEPARTMENT REVIEW--  
WHERE DO WE GO FROM HERE?

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Although University of Florida departments have been reviewed for various things in years past, it has only been recently that IFAS decided to initiate a comprehensive review program that would meet all needs for reviews of research, teaching and extension program areas and perhaps at the same time give better direction to future programs. Thus, in December of 1975 we were reviewed by our own administration and a comprehensive review team of five people from dairy science programs in other parts of the United States. These five were:

- Dr. R. W. Touchberry, Chairman of the Animal Science Department, University of Minnesota (Chairman of the Team)
- Dr. R. G. Cragle, Chairman of Dairy Science Department, Virginia Polytechnic Institute and State University
- Dr. J. H. Martin, Chairman of Dairy Science Department, South Dakota State University
- Dr. Frank Murrill, Extension Dairy Specialist, University of California
- Dr. C. R. Richards, Cooperative States Research Service, USDA

In preparation for this review, an extensive amount of information was compiled to show some of the history of program development in the department, current programs being emphasized, and, to the extent possible, a self-analysis by Dairy Science faculty to point out program needs as they saw them. This team, with a tremendous background of experience in programs at their own institutions and also at many other institutions with which they were acquainted, reviewed these efforts to try to point out areas of strength and areas that need improvement or development as we have a chance to make changes in the future.

These recommendations included an evaluation of departmental leadership, current areas of research and educational emphasis, and what program needs existed that are not new being covered. In that criticisms and other information brought forth by this review team are quite relevant to our relationships with industry programs through extension and educational meetings, and research done on industry problems, teaching emphases, etc., I thought it would be worthwhile to share these points with you. In doing this, however, it is important that I start with a brief review of what we are really trying to do currently.

Programs center around the faculty in that we expect faculty to give leadership to all programs. Additional support personnel may be available but it is faculty that are the leaders of all programs of this department. We have 13 faculty positions, including the Department Chairman, which have been gradually added to dairy programming since

1917 when Hamlin L. Brown was appointed as the first Extension Dairyman and 1929 when Dr. Becker joined the Animal Industry Department. Previous positions, although dealing with dairy in the beginning, were retained in the Animal Industries Department. The Dairy Science Department was separated from the Animal Industries Department in 1949. Current faculty and the year the position originated are:

<u>Active Faculty</u>	<u>Year Position Originated</u>
BACHMAN, K. C., Ph. D., Assistant Professor	1971
HARRIS, B., Jr., Ph. D., Professor	1955
HEAD, H. H., Ph. D., Associate Professor	1929
Environmental Physiologist	1941
MARSHALL, S. P., Ph. D., Professor	1947
MULL, L. E., Ph. D., Professor	1940
RICHTER, R. L., Ph. D., Assistant Professor	1957
SMITH, K. L., Ph. D., Associate Professor	1946
THATCHER, W. W., Ph. D., Associate Professor	1969
VAN HORN, H. H. (Jack), Ph. D., Professor and Chairman	1936
WEBB, D. W., Ph. D., Assistant Professor	1917
WILCOX, C. J., Ph. D., Professor	1931
WING, J. M., Ph. D., Professor	1951

Although faculty were added in 1969 and 1971, no net gains in Dairy Science faculty have occurred since 1966 when Dr. Browning came as Department Chairman after Dr. Fouts retired as Chairman but continued in the department until his full retirement in 1970. Later a faculty position occupied by Mr. Jake White at the West Florida Dairy Unit was transferred to Agronomy after closing of that unit.

Faculty are the basic units of our programs. We are blessed with aggressive, hard working faculty who want to feel they contribute to gains in agriculture and thus are not solely interested in how much money they make but rather in productivity and professional pride in being recognized as good scientists by other scientists. These faculty members have recognized that departmental programs have needed improvement and they have worked extremely hard over the last 10 years to improve output and to improve our teaching, research and extension programs to better serve Florida needs. In many cases, in fact, we have "stretched" to offer program assistance or to teach a needed class when it really kept that person from being able to develop his major program responsibility to its full potential.

Although programs of the department will be described later, it may be important to some to evaluate these in relation to costs. Therefore, a summary of the 1975-76 budget is presented as background information.

Approximate 1975-76 Dairy Science Department Budget

Salaries (13 faculty, 35 other)	\$ 560,000
DRU expenses	140,000
Research and teaching OE	42,000
Graduate and Student Assistants	42,000
New equipment	28,000
Extension expenses	18,000
<u>Total Expenses</u>	<u>\$ 830,000</u>
Income (milk and cull animals)	<u>240,000</u>
<u>Net Cost of Dairy Science Programs</u>	<u>\$ 590,000</u>

In that approximately 67% of the faculty time is related to dairy production and 33% to dairy foods, the investment of Florida taxpayers in research, teaching and extension programs in dairy production is approximately \$400,000 annually and \$190,000 annually in dairy foods programs.

Contributions of Dairy Science to Florida Dairy Production

It is very difficult to evaluate the benefit consumers and producers of dairy products have obtained from past programs of faculty in Dairy Science. In fact, it is almost impossible even to list all of the areas where contributions were made.

Teaching

Without question one of the major contributions of a teaching program is in the people graduated who work with the industry involved to improve its production efficiency and profitability. The teaching programs in Dairy Science have been previously identified by our own faculty as being in need of improvement, particularly in regard to increasing student numbers to more nearly meet the job market demand and/or opportunity for Dairy Science graduates. This need was reinforced again by the Review Team.

Although interrelated, two separate teaching programs exist--undergraduate and graduate. Prior to 1965, an average of 6 undergraduate degrees were granted per year (for the 15-year period from 1950 through 1964). Although never as large as needed, student numbers were at a low point in the 1960's and graduate degree programs were almost nil until the late 60's. Therefore, great emphasis has been placed on improving quality of courses offered and a new degree in Dairy Management has been developed for the undergraduates. Graduate students have been recruited which also has benefited the research program. As far as assignments are concerned, 3.0 of the 13.0 faculty man-years are assigned to teaching (but most of our faculty have part-time teaching responsibility). Our teaching programs certainly haven't developed to where they need to be yet, but the following tables show that considerable progress is being made:

Table 1. B. S. Degrees in Dairy Science

	10	9
	4	4
	4	4
	2	3
	1	1
	1	1
	0	
1965*	66	67
	68	69
	70	71
	72	73
	74	75
	76	

\*Years are for academic year starting in Fall Quarter

Table 2. Undergraduate Students in Dairy Science (Fall Quarter)

	36	(Estimate)
	20	
	15	
	12	
	8	
	4	
1970	71	72
	73	74
	75	76

Table 3. Graduate Degrees (M. S. and Ph. D.) in Dairy Science

	9	(Expected)
	7	
	6	6
	6	6
	4	
	3	
	2	2
	2	
	1	1
1965*	66	67
	68	69
	70	71
	72	73
	74	75
	76	

\*Years are for calendar year

Table 4. Total Degrees Produced (B. S., M. S., or Ph. D.) in Dairy Science

	21	(Expected)
	16	
	15	
	10	10
	7	6
	4	4
	4	4
	3	
	2	2
	2	
1965	66	67
	68	69
	70	71
	72	73
	74	75
	76	

Table 5. Student Credit Hours Taught and Graduate Student Programs Directed by 3.0 Teaching Faculty in Dairy Science

	1970-71	71-72	72-73	73-74	74-75	75-76
Undergraduate courses	485	580	935	1110	1250	1700
Graduate courses	265	160	210	155	300	265
Total student credit hours	750	740	1145	1265	1550	1965
Graduate students advised by graduate faculty for thesis work in addition to class credits	10	20	22	21	23	25

How big should our teaching program be? It appears there is employment demand for at least 15 undergraduates per year and recent experience has shown that less than half of our B. S. graduates really are available to accept employment directly. About half are already committed to further schooling, a job with the family operation, etc. Thus, we would have no fear of being able to place students if enrollment increased to yield 30 graduates yearly which would mean a dairy major student body of about 90 undergraduates. As far as M. S. and Ph. D. degrees are concerned, we think about 12 is appropriate for our faculty with potential for another 5 Master of Agriculture Degrees (no research program required as is for a M. S. Thesis). This would probably mean a graduate student body of about 30 students.

#### Extension and Research

So many improvements adopted by Florida dairymen over the past half century have been done through the assistance of extension and research faculty that a few of these major contributions are worth noting. A few of these are:

1. Dairy Herd Improvement Program--Cow evaluation through milk production records was initiated over 50 years ago and the program has continued to improve methods of cow evaluation and management assistance through major computer programs in use today. The leadership from dairymen associated with this program has given the fundamental approach to management for other dairymen that have not participated directly in the program.
2. Artificial Insemination--This major program for improving the genetic merit of dairy cattle was made possible only by having the information from Dairy Herd Improvement (DHI) records for accurate evaluation of daughters of individual sires and through research and extension programs on the physiology of breeding and semen handling.

3. Feeding and Management of Forages--Agronomists have made tremendous strides in improving varieties of forages that can be grown under Florida conditions and scientists in dairy feeding and management have contributed to methods of handling these forages to insure better quality, more efficient storage and feeding programs which would deliver proper amounts of nutrients to dairy cattle.
4. New Feedstuffs--The development of citrus pulp, sugarcane bagasse, cottonseed hulls, peanut hulls, wet and dried brewers grains, etc. have helped cheapen the cost of nutrients for feeding dairy cattle while at the same time making it possible to increase herd size through mechanized feeding because of the potential for complete rations.
5. Mineral Nutrition--Deficiencies of major and trace minerals in Florida soils necessitated early research to define specific needs for supplementation in fertilizing and feeding programs. Dr. R. B. Becker led the way in research that helped correct many of Florida's early mineral nutrition problems. The active animal industry we have today in Florida would never have developed had not these deficiencies been defined and corrected.
6. Genetic and Environmental Effects on Milk Yield and Composition--These effects have been measured and the data applied so dairy-men interpret cause and effect of production trends in their herds and know better how to manage their breeding and selection programs.
7. Forage Testing--An extension effort has developed cooperation between the Florida Department of Agriculture, County Extension and State Extension Specialists so that forage quality could be monitored through laboratory tests on forages which could be used in helping determine supplemental nutrients needed with forage systems.
8. Waste Management Systems--Recent years particularly have seen Environmental Protection Agency restrictions on waste disposal developed to the extent that new waste management systems had to be researched and recommendations developed for dairymen's use.
9. Complete Rations for Dairy Cattle--IFAS research has been among the leading work in the nation showing the feasibility of completely mixed rations (forages or fiber from byproduct sources included in the diet) for dairy cattle. Specifications for these complete rations have been defined and management procedures that have helped alleviate some of the problems with these kinds of diets have been developed. Some of the areas defined were

- a. Needs for maintenance of fat percent
  - b. The amount to feed for optimum milk production efficiency
  - c. Protein levels and quality needed for optimum performance
10. Calf and Heifer Feeding and Management--Weaning systems, starter formulations, housing systems, waste management systems, milk feeding systems, and milk replacers have been evaluated and the data used to develop current calf feeding management recommendations. Better growth from improved feeding and breeding for early calving of heifers have significantly reduced generation intervals and resulted in much greater production per day of life of our average dairy cows.
  11. Large Herd Management--Early emergence of larger herds in Florida than in much of the United States necessitated Dairy Science faculty to assist dairymen in developing feeding systems, milking management systems, use of computers for data management of reproduction and milk production information, mastitis control programs, and personnel management procedures for supervising large numbers of employees in these large dairies.
  12. Environmental Control for Cows in Hot Weather--Recent research has shown improvements in milk production and reproductive performance by providing shade in hot weather.

Current programs have as much or more potential for helping industry bring about future improvements as those did in the past. For example, average milk production per cow in Florida is now at 10,000 pounds annually, but we have the technology to move that to 15,000 pounds if we can really implement what we know how to do. So that's a management need--the major thrust of extension educational programs in dairy production. Today's research will be necessary to move the potential on to 20,000 pounds per cow for the future and to find new, cheaper feedstuffs and more efficient ways of doing the job.

If future production gains can be achieved, Florida probably can produce its fluid milk needs with about the same number of cows we now have but otherwise some increase in cow numbers will be needed. Per capita consumption of milk nutrients (other than fat) remains very stable and the increase in population expected in Florida is going to add steadily to the milk product sales possible in the Florida markets. Therefore, past gains that have brought farm value of milk and dairy beef to over \$250 million in 1975 will continue at a growth rate at least equal to Florida's population growth if producers can continue to increase their production efficiency. Current programs in extension and research will help producers improve this efficiency. The following outline summarizes these programs and indicate current faculty giving leadership to them.

1. Extension Education (Barney Harris, Jr. and D. W. Webb)

- a. Dairy herd management in the broad sense, including cow management, financial management, replacement management, milking practices, use of records, etc.
- b. Coordination of Dairy Herd Improvement program
- c. Give leadership to nutrition, reproduction and genetics education through short courses, literature development, etc.
- d. Coordination of interdisciplinary programs for the dairy commodity area that involve specialists from other disciplines, such as herd health, pasture and field crop production, cost of labor studies, waste management, parasite control, buildings, facilities and storage
- e. Dairy personnel management, including organization and structure
- f. Coordination of forage testing and evaluation program
- g. Leadership of State 4-H Dairy Program through coordination of dairy shows, judging contests, training of State 4-H Dairy Cattle Judging Team, conducting 4-H dairy workshops, and judging 4-H dairy shows

2. Genetics Research (C. J. Wilcox)

- a. Genetics of milk yield and composition
- b. Genetics-physiology interrelationships
- c. Sire acturial tables
- d. Maternal effects

3. Reproduction Research (W. W. Thatcher)

- a. Ovulation control
- b. Stress effects on reproduction
- c. Reproductive management
- d. Embryo development and mortality
- e. Temporary infertility
- f. Postpartum reproductive function



4. Physiology of Lactation Research (H. H. Head)
  - a. Maintenance of lactation
  - b. Initiation of lactation
    1. Adrenal function
    2. Artificial induction
  - c. Characterization of spontaneous rancidity (worked on cooperatively with Dr. K. C. Bachman in Dairy Foods)
  
5. Nutrition and Management Research (J. M. Wing, S. P. Marshall, H. H. Van Horn and Barney Harris, Jr.)
  - a. Use of by-product fibers
  - b. Protein nutrition for lactation
  - c. Waste management
  - d. Complete rations for heifers
  - e. Calf feeding and management
  - f. Labor management for large herds

Obviously, improvements will be made in the future. Programmed reproduction is now in sight. This might include practical synchronization of ovulation for timed insemination without heat detection; reduction of heat stress effects on fertility; and reduction in days open by stimulating early estrus. Induced lactation with hormone injections is possible for bringing cows that won't breed into lactation. Another factor in reproduction that may be seen in the future is the opportunity for dairymen to inseminate with fertilized ova rather than semen if they wish to.

Better quality cows are already being bred, but 20 years from now the average cow will be as good as our best 5% are now if dairymen choose to raise replacements they have bred or buy replacements from the better AI sires and of known identity. We will see more use of computers to keep track of identity of animals even if sold. Research programs will make possible much greater utilization of currently wasted nutrients, for example, sawdust, waste papers, animal waste, etc., which will help keep feed costs economical.

Better trained managers for dairies will be one of the major changes coming and this will influence the quality of labor under him and his ability to motivate other employees. Use of milk component pricing, economic formulas and a tremendous increase in use of computers to handle the large amount of data that can be helpful in dairy management will be tremendously expanded. But one of the major roles of extension will be to help develop what we now know how to do but have not been able to implement by 1976.

Recommendations of Review Team

The Dairy Science Department Review Team complimented the faculty in general on their productivity but several important recommendations were made. These recommendations included:

1. Teaching programs need further growth, particularly undergraduate. Past growth has been extensive but the number of graduates is still below needs.
2. Expand the Master of Agriculture program in Dairy Foods to get students trained and available for industry demands. Since only Food Science majors are being trained at the undergraduate level and Dairy Foods faculty are still within Dairy Science, the major opportunity for students specifically trained in dairy manufacturing lies at the Master's level. Many students graduating in curricula where jobs are not plentiful frequently desire training in foods fields and can be recruited into Master of Agriculture programs. The advantage of this kind of program is that it would not require assistantships and research laboratories for the students since it is a course-work-only degree.
3. Complete the plan for development of former dairy processing plant into research laboratories and faculty offices on campus. The split of four faculty with offices at the Dairy Research Unit keeps communication from being as extensive as needed within the department and adds to the expense of departmental operation because of extra travel to and from the Dairy Research Unit. Although some travel will still be needed the addition of faculty offices and laboratories on campus should greatly enhance the interaction of faculty.
4. Nutrition program lacks the "in depth" approach of other areas. Nutrition laboratory space and facilities are inadequate. This has been accentuated with the growth of the undergraduate teaching program which has necessitated that Dr. S. P. Marshall move from a high percent of his time spent in research to almost entirely advising undergraduates and teaching undergraduate courses. H. H. Van Horn also has only a small amount of time

for nutrition research and Dr. J. M. Wing has been on foreign appointments much of the last few years. Since Dr. Wing is returning from these appointments this will add additional time that can go into nutrition research if it can be developed.

5. There is a need for additional research to provide economic and adequate amounts of fiber for dairy cattle.
6. Needed: a new Extension position for dairy herd management and an Area Extension Specialist for West Florida. Extension Specialists particularly have been "stretched extremely thin" to provide the programs needed for production.
7. Needed: More interaction in programs in farm management which show need for more time devoted to dairy programs by an agricultural economist.
8. DHI offers opportunity for closer relationship with industry and for expanding educational programs and service programs to industry at the same time. A state-wide manager of DHI is needed.
9. Develop a successful gifts and grants program of \$175,000.00 to \$225,000.00 per year.

#### Where Do We Go from Here?

The Dairy Science Faculty are in general agreement with the recommendations of the review team. Past emphases placed on teaching, which have helped bring about recent growth, will continue. We are recruiting to fill a vacant position in the department now (vacancy left with the retirement of Mr. W. A. Krienke) which will give some assistance to teaching.

We are dedicated to do the best we can with the resources given us. As Department Chairman, however, I need to find out what dairymen, in general, expect from our department and how we can work together to solve additional dairy production problems. We are going to try to attract additional grant funds from government and commercial sources to help. For example, an interim faculty member in nutrition and management research may be a help in correcting our deficiency in that area if we can attract enough funds to hire one for two or three years.

Dairymen may need to consider funding some projects relating to production problems themselves in order to stimulate a progressive problem solving program. For example, Virginia dairymen, with fewer cows and far less farm income from dairy than we have in Florida, are

putting more than \$120,000.00 annually into research, teaching and extension programs. They feel they are getting results, too. They have one of the most active dairy programs in the nation and the average production and profitability per cow have made more rapid advances in recent years than any other state in the nation. Florida dairymen may not want this same program, but I would like to learn from Florida's dairy production leadership what more they do want from us and give what leadership I can to help us get this job done.