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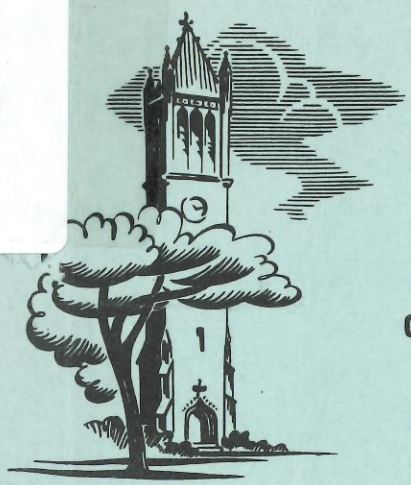

COMPETENCIES IN ANIMAL NUTRITION NEEDED BY FARMERS

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Division of Vocational Education
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The study is one of a series conducted by the Department of Education of Iowa State University of Science and Technology with the assistance of graduate students in agricultural education in cooperation with the Iowa Agriculture and Home Economics Experiment Station and the Vocational Agriculture Section, Division of Vocational Education, State Department of Public Instruction.

This study was conducted under the direction of Professor C. E. Bundy.

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Purpose of the Study

The purpose of this study was to investigate the status of animal nutrition competencies among farmers. The specific objectives of the study were: (1) to determine the animal nutrition competencies needed by farmers: (2) to determine the degree these animal nutrition competencies are needed and possessed as expressed by both a selected sample of outstanding farmers and a random sample group of farmers who were enrolled in adult farmer classes; (3) to determine the relationship of years of farming, size of farm, size of livestock production enterprise, and major type of farming program to the evaluation of the degree of competence in animal nutrition needed and possessed by a selected sample of outstanding livestock producers and a random sample of livestock producers; and (4) to plan for education needs of present and prospective farmers.

This study is a part of the overall Iowa Agricultural Experiment Station Research Project 1253, with the objectives of determining competencies needed by persons employed in farm and off-farm agricultural occupations. It is being conducted jointly by the Department of Education and Agricultural Experiment Station of Iowa State University of Science and Technology and the Agricultural Education Section, Division of Vocational Education, State Department of Public Instruction.

Method of Procedure

A panel of consultants consisting of three men from the animal science teaching staff at Iowa State University, three men employed by commercial feed manufacturing companies, three vocational agriculture instructors, and eight progressive livestock producers was utilized to develop a list of competencies in animal nutrition needed by farmers. A preliminary questionnaire consisting of 50 competencies was developed and pre-tested by a small group of farmers in central Iowa. Information obtained by the pre-test was analyzed and corrections made. A final list of 48 competencies was included in a questionnaire which was developed to obtain evaluation of the degree of competence farmers needed and possessed in the competencies and information about the individual farmers and farm businesses.

Questionnaires were mailed to 354 random sample farmers and 200 selected farmers. A total of 259 questionnaires were returned of which 243 were usable. The random sample farmers returned 118 usable questionnaires for a 33.3 percent response. The selected farmers returned 125 usuable questionnaires for a 62.5 percent response.

Five percent of the non-respondents of both groups were sent another letter and copy of the questionnaire to determine if the returns from the two groups were representative of the entire sample of each group. The findings from study of the returns from these non-respondents indicated that they were quite similar to the random sample and selected sample of farmers who had previously responded.

Findings

Twenty-five of the 48 competencies were understandings and 23 were abilities as in revealed in Table 1. Both selected and random sample farmers indicated degree of competence needed mean scores of 3.0 or higher (much competence needed) for the understandings of (1) how ration imbalance can affect nutrient utilization, and (2) purpose and use of antibiotics.

Other understandings with high degree needed mean scores for both selected and random sample farmers were the understandings of (1) the essential nutrients and their basic functions, (2) how disease and parasites affect an animal's performance in the utilization of the rations fed, (3) vitamin requirements relative to a specific ration, (4) the definition of feed additives; their usefulness and costs, and (5) effects of quality of feed and the level of intake on growth rate, feed efficiency, and carcass composition.

Other abilities with high degree needed mean scores for both groups were the abilities to (1) calculate gains, feed efficiency and cost of production, (2) recognize poor performance and nutrient deficiencies, (3) determine when animals need a different ration, and (4) interpret information on a feed tag.

Competencies with largest differences between competence needed and possessed mean scores and respective differences for selected and random sample farmers were for the understandings of:(1) the general functions of enzymes and hormones (1.3 and 1.0), (2) nutrient interrelationships (1.2 and 1.0), (3) how ration imbalance can affect nutrient utilization (1.1 and 1.0), (4) the energy losses in digestion, especially in the different types of rations (1.0 and 1.0), (5) the economic possibilities of compensatory growth (1.0 and 1.0), (6) vitamin requirements relative to a specific ration (1.0 and 0.8), (7) mineral and trace mineral importance to metabolism and growth (0.9 and 0.7), the abilities to (8) incorporate concentrated sources of nutrients in premixes and supplements into a complete ration (0.9 and 1.0), (9) formulate a ration relative to basic nutritional requirements (0.9 and 0.8), and (10) recognize bacterial and mold problems in using effective feedstuffs (0.9 and 0.8).

Mean score differences of 0.6 or larger were found for 30 competencies for selected farmers and for 34 competencies for random sample farmers.

No competency had a mean score for competence possessed higher than for competence needed. One competency with equal scores was the ability to select and operate grinding and mixing equipment for random sample farmers. The selected farmers indicated higher degree of competence needed compared to degree of competence possessed for all of the specific competencies in this study.

Table 1. Competencies in animal nutrition needed and possessed by farmers

Competencies	Mean scores[a]							
	N[b]	R[c]	P[d]	R	N	R	P	R
Understanding of:								
1. The functions of the different organs of the digestive tract	2.4	48	1.8	43.5	2.5	43	1.9	38.5
2. The essential nutrients and their basic functions	3.0	17	2.3	24.5	2.9	13.5	2.1	27
3. The proximate analysis of a feedstuff (grains, etc.)	2.9	25.5	2.4	15	2.8	24.5	2.2	20
4. The substitution relationship between the different feedstuffs	2.7	40.5	2.3	24.5	2.6	39	2.0	33.5
5. The necessity for water in the utilization of nutrients (also the amount of water intake due to temperature of the water and the air)	2.6	43.5	2.2	29	2.6	39	2.1	27
6. The energy losses in digestion: especially in the different types of rations	2.5	46	1.5	47.5	2.4	46.5	1.4	47.5
7. How ration imbalance can affect nutrient utilization	3.1	8	2.0	39	3.0	5	2.0	33.5
8. How disease and parasites affect an animal's performance in the utilization of the rations fed	3.1	8	2.4	15	2.9	13.5	2.2	20
9. Animal growth - how fat, lean and bone is laid down relative to age, sex and weight	2.5	46	1.8	43.5	2.4	46.5	1.7	44
10. Effects of quality of feed and the level of intake on growth rate, feed efficiency, and carcass composition	2.9	25.5	2.1	33.5	2.9	13.5	2.1	27

[a]0 = no competence needed (or possessed), 1 = little competence needed (or possessed), 2 = some competence needed (or possessed), 3 = much competence needed (or possessed), 4 = very much competence needed (or possessed).

[b]Degree competency was needed.

[c]Rank of competency.

[d]Degree competency was possessed.

Table 1 continued.

Competencies	Mean scores[a]							
	N[b]	R[c]	P[d]	R	N	R	P	R
Understanding of:								
11. Factors affecting the value and palatability of feeds	2.8	34.5	2.1	33.5	2.8	24.5	2.0	33.5
12. Nutrient interrelationships. (Example: the need for readily available carbohydrates for amino acid synthesis from non-protein nitrogen.)	2.8	34.5	1.6	46	2.6	39	1.5	46
13. How feed preparation affects animal performance	2.8	34.5	2.3	24.5	2.8	24.5	2.4	9
14. Mineral and trace mineral importance to metabolism and growth	2.9	25.5	2.0	39	2.8	24.5	2.1	27
15. Age, sex, and weight relationship to energy and requirements of protein	2.7	40.5	2.1	33.5	2.7	33	2.1	27
16. Vitamin requirements relative to a specific ration	3.0	17	2.0	30	2.7	33	1.9	38.5
17. The purpose and use of antibiotics	3.1	8	2.4	15	3.0	5	2.3	15
18. The general functions of enzymes and hormones	2.8	34.5	1.5	47.5	2.6	39	1.6	45
19. The definition of feed additives; their usefulness, and costs. (Example: use of stilbestrol)	3.1	8	2.3	24.5	2.8	24.5	2.2	20
20. How environmental influences (housing, weather, etc.) affect nutrient requirements and animal performance.	2.9	25.5	2.4	15	2.8	24.5	2.4	9
21. Effect of energy and feed intake on reproductive performance. (The use of limited feeding to sows)	2.8	34.5	2.3	24.5	2.9	13.5	2.4	9
22. The value of urea in rations for ruminents	2.9	25.5	2.1	33.5	2.7	33	1.9	38.5
23. The economic possibilites in compensatory growth	2.7	40.5	2.1	33.5	2.6	46.5	1.4	47.5
24. Why efficiency in converting energy decreases as the animal approaches market weight and grade	2.7	40.5	1.7	45	2.4	39	2.1	27

Table 1 continued.

Competencies	Mean scores[a]							
	N[b]	R[c]	P[d]	R	N	R	P	R
Understanding of:								
25. The upper limits of certain feeds to include in a ration (example: molasses)	2.8	34.5	2.0	39	2.8	24.5	1.9	38.5
Overall mean score for understandings	2.8		2.1		2.7		2.0	
Ability to:								
26. Formulate a ration relative to basic nutritional requirements	3.1	8	2.2	29	3.0	5	2.2	20
27. Interpret tables listing nutrient content of various feedstuffs	2.9	25.5	2.4	15	2.9	13.5	2.3	15
28. Calculate total ration costs and specific nutrient costs per unit of ration	3.1	8	2.4	15	2.8	24.5	2.2	20
29. Calculate the percent of each nutrient in a ration	2.9	25.5	2.3	24.5	2.7	33	2.1	27
30. Calculate gains, feed efficiency and cost of product	3.1	8	2.5	7.5	2.9	13.5	2.3	15
31. Recognize poor performance and nutrient deficiencies	3.2	1.5	2.5	7.5	2.9	13.5	2.4	9
32. Interpret results of feeding experiments	3.0	17	2.4	15	2.7	33	2.3	15
33. Formulate a least cost and/or least time ration, and determine the need for one over the other	3.0	17	2.3	24.5	2.9	13.5	2.1	27
34. Recognize the handling properties of grains. (Example; particle size and weight of grain and effect on the distribution within a mix)	2.5	46	2.0	39	2.4	46.5	1.8	42.5
35. Recognize the importance of good management, disease, and parasite control, and their relation to nutrition	3.2	1.5	2.8	1.5	3.1	1.5	2.7	2.0
36. Interpret information on a feed tag	3.0	17	2.5	7.5	2.8	24.5	2.6	3.0

Table 1 continued.

Competencies	Mean scores[a]							
	N[b]	R[c]	P[d]	R	N	R	P	R
Ability to:								
37. Calculate the amount of feed additives (antibiotics, etc., based on legal levels) to add to a ration	3.1	8	2.3	24.5	2.8	24.5	2.0	33.5
38. Incorporate concentrated sources of nutrients in premixes and supplements into a complete ration	3.0	17	2.1	33.5	2.9	13.5	1.9	38.5
39. Determine when animals need a different ration	3.1	8	2.6	3.5	2.9	13.5	2.3	15
40. Comprehend the stress of the environmental habitat	2.9	25.5	2.4	15	2.7	33	2.1	27
41. Recognize bacterial and mold problems in using effective feedstuffs	2.8	34.5	1.9	42	2.5	43	1.8	42.5
42. Interpret a feed analysis report and know where one can be obtained	2.8	34.5	2.2	29	2.7	33	1.9	38.5
43. Evaluate the best methods of using the feeds available to you	3.0	1.7	2.5	7.5	3.1	1.5	2.4	9
44. Predict when meat animals have reached their most desirable carcass potential	3.1	8	2.5	7.5	3.0	5	2.4	9
45. To select and operate grinding and mixing equipment	2.6	43.4	2.5	77.5	2.5	43	2.5	4.5
46. Keep an accurate record of the amounts and costs of feeds fed to the species of the animals you raise	2.9	25.5	2.4	15	2.9	13.5	2.4	9
47. Obtain or raise animals that will utilize feeds most efficiently	3.1	8	2.6	3.5	3.0	5	2.5	4.5
48. Recognize that the theory "if a little bit is good, much more is better," can be expensive in the production of meat, milk, and eggs	2.9	25.5	2.8	1.5	2.9	13.5	2.8	1
Overall mean score for abilities	3.0		2.4		2.8		2.3	
Total overall mean score	2.9		2.2		2.8		2.1	

Eight competencies were rated the same for degree of competence needed by both the selected and random sample farmers. The random sample farmers indicated a higher degree of competence possessed when compared to the selected farmers for six competencies. Nine competencies were rated the same for degree of competence possessed by both groups.

Degree needed mean scores for individual competencies ranged from a low of 2.4 for both selected and random sample farmers to 3.2 for selected farmers and 3.1 for random sample farmers. Degree possessed mean scores for individual competencies ranged from a low of 1.4 for random sample farmers to 2.8 for both groups of farmers. The mean score difference between total overall mean scores for degree of competence needed and possessed was the same (0.7) for both selected and random sample farmers.

Comparisons among farmers classified by various characteristics resulted in the following groups having largest differences between overall mean scores for degree of competence needed and possessed: (1) operators of large acreages, (2) farmers with the least farming experience, (3) farmers enrolled in adult farmer classes, (4) farmers with no vocational agriculture training, (5) general (crop and livestock income equal) farmers, (6) farmers with four years of vocational agriculture training, and (7) farmers with the least education.

Mean scores for competence needed and possessed for selected and random farmers stratified by animal units produced are shown in Table 2. The 500 or more animal units group had the highest overall degree of competence needed mean score for understandings (3.0). The 0 to 199 and 200 to 499 animal units groups had identical mean scores of 2.7 as is revealed in Table 2.

The 0 to 199 animal units group and the low competence possessed overall mean score of 1.8 for understandings, whereas the 500 or more units group was high with 2.2. The 200 to 499 units group had a score 2.1. The above findings were observed for the selected farmers.

Also for the selected farmers, the highest overall degree of competence needed mean score for abilities was 3.2 for the group that produced 500 or more animal units. The 0 to 199 units group had the lowest score (2.8), whereas the 200 to 499 units group had a score of 2.9.

The 500 or more units group had the highest overall competence possessed mean score of 2.5 for abilities. The 200 to 499 units group ranked second with 2.4, and the 0 to 199 units group was low with a score of 2.2.

For the random sample group, the highest degree of competence needed overall mean score for understandings was 2.9 for the 500 or more units group. Other overall competence needed mean scores for understandings were close with 2.8 and 2.7 respectively for the groups producing 200 to 499 and 9 to 199 animal units.

The 200 to 499 units group had the highest overall degree of competence possessed mean score (2.2) for understandings. The lowest score of 1.9 was found for the 0 to 199 units group and a score of 2.0 was found for the 500 or more group. The groups having the widest difference between overall competence needed and possessed mean scores for understandings was the one

Table 2. Selected competencies in animal nutrition needed and possessed by random and selected farmers by animal units produced

Competencies	Mean scores					
	0 to 199 units		200 to 499 units		500 or more units	
	Needed	Possessed	Needed	Possessed	Needed	Possessed
Selected Farmers	N = 40		N = 40		N = 45	
Understandings[a]						
2	2.9	2.2	2.8	2.2	3.2	2.4
7	2.7	1.8	3.1	2.1	3.4	2.2
8	2.9	2.1	3.1	2.6	3.2	2.5
10	2.9	2.0	2.7	2.1	3.0	2.2
16	2.9	1.8	2.9	2.2	3.2	2.1
17	2.9	2.2	3.1	2.6	3.1	2.5
19	2.0	1.7	3.0	2.5	3.1	2.6
Overall mean score	2.7	1.8	2.7	2.1	3.0	2.2
Ability to						
26	2.9	2.0	3.0	2.3	3.4	2.4
35	3.1	2.5	3.2	2.9	3.3	3.0
43	2.9	2.3	3.0	2.7	3.2	2.6
44	2.9	2.0	3.1	2.7	3.3	2.8
47	3.0	2.4	3.0	2.8	3.3	2.6
Overall mean score	2.8	2.2	2.9	2.4	3.2	2.5
Total overall mean score	2.8	2.0	2.8	2.3	3.1	2.4
Random Farmers	N = 82		N = 28		N = 8	
Understandings						
2	2.8	2.0	3.0	2.4	3.0	1.9
7	3.0	1.9	3.1	2.0	3.3	2.1
8	2.9	2.2	3.0	2.4	3.3	2.0
10	2.9	2.1	3.0	2.3	2.9	2.0
16	2.7	1.9	2.8	2.0	3.3	2.3
17	3.0	2.2	3.1	2.5	3.3	2.4
19	2.8	2.1	3.0	2.6	3.1	2.4
Overall mean score	2.7	1.9	2.8	2.2	2.9	2.0
Ability to						
26	3.0	2.2	3.0	2.4	2.8	2.0
35	3.1	2.7	3.2	2.8	3.1	3.0
43	3.1	2.3	3.1	2.5	3.6	3.1
44	2.9	2.3	3.3	2.6	3.3	3.0
47	2.9	2.4	3.2	2.7	3.1	2.7
Overall mean score	2.8	2.2	2.9	2.4	2.9	2.4
Total overall mean score	2.7	2.1	2.8	2.3	2.9	2.2

[a]Competencies are numbered the same as those in Table 1.

producing 500 or more units (0.9). The 0 to 199 units group had the next widest difference (0.8) and the 200 to 499 units group had the smallest (0.6).

The 500 to more animal units group had a larger degree of competence possessed mean score compared to the degree of competence needed mean score for the ability to recognize that the theory "if a little bit is good, much more is better," can be expensive in the production of meat, milk and eggs.

Significant correlations were found between animal units produced and acreage of farms operated for both selected and random sample farmers.

Animal units produced by selected farmers was significantly correlated with degree of competence needed scores for ability to determine when animals need a different ration, ability to recognize poor performance and nutrient deficiencies, and the ability to predict when meat animals have reached their most desirable carcass potential.

Years of school completed by random sample farmers was significantly correlated with degree of competence needed scores for ability to determine when animals need a different ration and the ability to recognize poor performance and nutrient deficiencies.

Correlations between degree of competence needed and possessed scores for the same competency were all found to be significant for the selected farmers. Sixty-six percent of the competence needed and possessed scores for the same competency were correlated significantly for the random sample farmers.

Implications

At least 48 competencies in animal nutrition were considered necessary. These competencies have importance in planning educational programs for present and prospective producers of livestock and livestock products. They should form the basis for animal nutrition instruction in (1) vocational agriculture classes for high school youth, young farmers and adults, (2) in the cooperative agriculture extension programs, (3) in area vocational-technical schools, (4) in junior colleges offering instruction in agriculture, and (5) in the College of Agriculture resident instructional programs.

With the rapid developments in technology related to animal nutrition it is imperative that increased effort be extended to provide in-service instruction to present farmers. Only a small percentage of operators and workers are now being served. Instruction in animal nutrition at the pre-service level is available to nearly 50 percent of potential livestock producers. Present instructional programs should be evaluated and new programs should be organized in terms of the findings of this study. These programs can greatly improve the efficiency of the livestock producers and assure adequate quantity and quality of livestock products available to the consumers of this nation.