

# Agricultural Mechanization Knowledge and Skills Needed by Students of Agriculture

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## Introduction

Agriculture in the United States has been characterized by agronomic, biological-chemical, and mechanization technologies (Just, Schmitz, and Zilberman, 1979). In order to educate workers about agricultural mechanization technologies, Agricultural Engineering and Agricultural Mechanization education programs were developed. These programs emphasized the application of physical technology to agricultural production and processing (Esmay, 1986). This included aspects of marketing, management, service, and sales of agricultural technology (Buriak, 1989). Today, Agricultural Mechanization may be the only program that combines engineering sciences and technology, agriculture, and business.

Agricultural Mechanization programs have been viewed as classes for students returning to the farm and for those interested in teaching vocational agriculture (Meador, 1988). According to Buriak (1989), Agricultural Mechanization programs were perceived to be less than professional and needed by only a few students. Recent trends toward lower enrollment in Agricultural Mechanization programs may have resulted from this stereotypic image (Ballek, 1988; Buriak, 1989). The challenge for Agricultural Mechanization was to establish an identity and demonstrate positive outcomes of the program (Buriak, 1989).

One avenue to market Agricultural Mechanization programs is through the advising faculty. Faculty perceptions directly impact course enrollment. The researchers reasoned that an understanding of the purpose and role of agricultural mechanization in the agricultural industry would directly impact agricultural mechanization course enrollment.

Agricultural mechanization programs at the university level have been marked by declining enrollments and decreased support dollars during the last decade. Decreased emphasis on agricultural mechanization programs and recent program closings have occurred despite predictions that the agricultural mechanics service sector of the agricultural industry has been expanding. These trends may be related to advising faculty's perception of the image of topics taught in agricultural mechanization, relative to other academic programs. However, limited research has been conducted to ascertain the perceptions of college faculty con-

cerning the importance of topics taught in Agricultural Mechanization courses.

## Purpose

The central problem for this investigation was the lack of information that was needed to make informed decisions regarding changes in the Agricultural Mechanization curricula. More specifically, this study attempted to answer the following research questions:

1. What are the perceptions of the faculty, when grouped by administrative unit, concerning the agricultural mechanization knowledge and skills needed by their students?

2. Is there a difference in the importance of agricultural mechanization knowledge and skills as perceived by the faculty when grouped by administrative unit?

For statistical testing research question 2 was reformulated as a null hypothesis and stated as follows:

$H_0$ : There is no significant difference in the mean course importance ratings of agricultural mechanization courses when grouped by faculty administrative unit.

## Procedures

This study employed a descriptive research design as described by Ary, Jacobs, and Razavieh (1990). The independent variables were the selected demographic characteristics. The dependent variables were the importance and course format ratings for the agricultural mechanization knowledge and skill topic scales.

The target population for this study was composed of advising faculty in the University of Missouri-Columbia, College of Agriculture, Food and Natural Resources. A purposive sample of 142 faculty was selected. By virtue of their position as faculty, the sample possessed characteristics that reflected the target population.

A researcher designed survey instrument was used to collect information to answer the research questions. A one to five Likert-type scale was used to indicate the importance faculty placed on the 78 agricultural mechanization topic statements. Using the exact lower limits of the class intervals as described by Ferguson and Takane (1989), the Likert-type importance scale was modified using the following limits: 1.00 - 1.49 = no importance, 1.50 - 2.49 = below average importance, 2.50 - 3.49 = average importance, 3.50 - 4.49 = above average importance, and 4.50 - 5.00 = utmost importance.

The 78 topic statements were collapsed to reflect the 13 courses that the topic statements represented to facilitate data analysis. The 13 courses were as follows: (a) Electricity: Wiring and Equipment, (b) Agricultural Accident Pre-

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vention, (c) Agricultural/Industrial Structures, (d) Surface Water Management, (e) Mobile Hydraulics, (f) Irrigation and Drainage, (g) Construction Principles and Practices, (h) Internal Combustion Power, (i) Pesticide Application Equipment, (j) Agricultural Equipment and Machinery, (k) Mechanization Systems Management, (l) Welding Processes, and (m) Materials Handling and Conditioning. Mean importance ratings for each course were determined by computing the average of the six topic importance ratings provided by each respondent.

Means, standard deviations, and response frequencies were calculated for the faculty's perceptions of the importance of the agricultural mechanization topics needed by their students.

Data relative to null hypothesis one ( $H_01$ ) were analyzed using multivariate analysis of variance (MANOVA) followed by univariate analysis of variance (ANOVA). The MANOVA procedure was utilized to identify topics that were significantly different in importance as rated by faculty in each administrative unit. ANOVA was used, followed by the Least-Squares Means post hoc comparison, to identify administrative units that differed with regard to each topic. An a priori alpha level of .05 was used to test hypothesis one ( $H_01$ ).

## Results and Findings

The reliability of the importance scale was assessed using Cronbach's coefficient alpha. The importance scale produced an overall reliability coefficient of 0.992.

Null hypothesis one was rejected. Significant differences were found to exist in the mean course topic importance ratings of 11 courses when the respondents were grouped by administrative unit. No significant differences existed for the Surface Water Management and the Construction Principles and Practices courses.

The major findings of this study were as follows: (a) Five courses produced mean course topic importance ratings in the average importance category. Eight courses produced mean course topic importance ratings in the below average importance category. (b) The Welding Processes course produced the lowest mean course topic importance ratings, while the Pesticide Application Equipment course produced the highest mean course topic importance ratings. (c) The Irrigation and Drainage course and the Pesticide Application Equipment course were rated in the above average importance category by the Plant Science unit. (d) Relative to the other units there was uniformity within the Plant Science Unit, Animal Science Unit, and the Natural Resources Unit regarding the importance of the Agricultural Mechanization course topics. (e) There were no Agricultural Mechanization courses rated in the utmost importance category. (f) The Biochemistry unit rated all 13 courses in the below average importance category. (g) The Natural Resources unit rated nine courses in the below average importance category, three courses in the no importance category, and one course in the average importance category. (h) Significant differences were found in the unit mean course topic importance ratings for 11 of the 13 Agricultural Mechaniza-

tion courses. (i) The Biochemistry and Natural Resources units rated seven of the courses significantly different than the other units. These units produced lower mean course topic importance ratings.

## Conclusions

Advising faculty in the College of Agriculture, Food and Natural Resources at the University of Missouri-Columbia perceived agricultural mechanization course topics to be of limited importance for their students. This observation was supported by the fact that no course received ratings in the above average category or higher. This observation is similar to the findings of Ballek (1988) and Buriak (1989). This finding also supports Buriak's (1989) contention that Agricultural Mechanization faculty should promote the positive outcomes of the program and market the program among their colleagues. A positive image of the Agricultural Mechanization program is needed to assist college faculty as they make informed decisions concerning future program and curriculum changes.

Respondents from the Plant Science Unit reported that topics in the Irrigation and Drainage course and the Pesticide Application Equipment course were important to the students in their unit. This observation supports the importance of these topics to the agronomic sector of the agriculture industry.

Both the Biochemistry and Natural Resources units placed little or no value on the knowledge and skills taught in agricultural mechanization courses. The rationale for this observation may be that most students in Biochemistry continue their education in medical school or veterinary medicine school. Also, the Natural Resources Unit was recently combined into the College of Agriculture, Food and Natural Resources and may not be fully aware of the knowledge and skills taught in agricultural mechanization courses.

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