Perceptions of Employers of Graduates of the Agricultural Systems Management Program Regarding Skills and Competencies Needed for Successful Employment

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By:

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The undersigned, appointed by the Dean of the Graduate School, have examined the thesis entitled:

PERCEPTIONS OF EMPLOYERS OF GRADUATES OF THE AGRICULTURAL SYSTEMS MANAGEMENT PROGRAM REGARDING SKILLS AND COMPETENCIES NEEDED FOR SUCCESSFUL EMPLOYMENT

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ABSTRACT

The need for the Agricultural Systems Management (ASM) program at the University of Missouri is based on agricultural industry demands for qualified personnel to supervise technological processes and the employees who perform associated tasks. Technological advancements in this area require continual monitoring of the subjects taught by ASM academic programs. Curriculum is evaluated with regard to usefulness to students as future employees. This study was modeled after a similar evaluation conducted at Purdue University (Ess, & Strickland, 2001).

Competencies associated with irrigation and surface water management defined the lower portion of the moderate score (2.51-3.50). Competencies evaluated as holding the highest level of mastery and importance by respondents included:"demonstration of professional ethical responsibilities,""development of solutions to problems by locating relevant information," "demonstration of effective computer skills," "application of skills associated with mathematics," "demonstration of a willingness to adapt to new concepts," "development of solutions to problems by analyzing possible alternatives" and "effective use of financial skills." Competencies denoted of moderately high importance by respondents but of lesser demonstrable effectiveness by MU ASM graduates included: "incorporation of safety into the workplace," "demonstration of effective written communication skills," "demonstration of proficiency in using electronics technology," and "effective demonstration of human resource skills."

CHAPTER I

INTRODUCTION

According to Burke and Wakeman (1992), agriculture in the United States is one of the most sophisticated and mechanized industries in the world. However, this production of food and fiber has not always been so sophisticated. Cooper (1997) stated that, "At the birth of the United States in 1776, over 90 percent of the American colonists were farmers yet many of General Washington's troops at Valley Forge died for lack of food and clothing" (p. 8). Burke and Wakeman (1992) noted that mechanization has proved instrumental in reducing the "hand labor, hard work, and time required to produce the food and fiber needed by the people in our society" (p. 626). What began as domestic subsistence farming when the country was founded has evolved so that today "there are generally food surpluses in America" (Cooper, p. 8). Cooper stated that an increase in the efficient production of agricultural output is a result of the major role played by mechanization. Personnel perform maintenance, innovation, design, and application of mechanized systems to several areas of agriculture, both in production as well as in agribusiness (Burke & Wakeman; Cooper). Cooper stated that multiple career choices in agriculture are impacted by mechanical systems technology.

According to Cooper (1997), production agriculture has become very mechanized in many developed countries around the world; however the requirement for a human presence is as necessary, though in smaller numbers, as it was when the food and fiber industry relied solely on human labor. Early machines such as the reaper replaced eight

laborers. Later, the self-propelled combine harvester performed as much work in one day as would have previously required 100 laborers to perform the same tasks (Canine, 1995; Cooper). Phipps and Osborne (1988) stated that "changes in agriculture have created a demand for more technically oriented type of … education" (p. 23). Burke and Wakeman (1992) classified human presence in the agricultural industry as entry-level occupations and technical-level occupations. Cooper classified human employment in agriculture as: laborer, semiskilled, skilled and professional. In each of these classification systems, the lower wage positions require more physical labor and less education than the higher-wage, better-skilled positions. According to Cooper, the largest portions of employment opportunities are available in marketing and sales and in scientific and engineering fields in agriculture. Cooper noted that employment in these fields require skills gained through formal schooling and experience. Burke and Wakeman stated "service people are necessary to keep the machines and equipment operating" (p. 626). Maintenance and operation of functioning systems must be duly noted as requiring many trained personnel. As a result, Phipps and Osborne proposed that agricultural workers "must receive technical-level training" (p. 23).

Peddle (2000) said, "Over the past thirty years there has been a growing realization that a productive, well-trained labor force is the key to success in an information-driven, increasingly global and competitive economy" (p.23). From where do agricultural companies and agencies draw the required employees? Martin, Milne-Home, Barrett, Spalding and Jones (2000) stated "There is little doubt that it is difficult for universities to prepare students in a way that meets all employers' needs" (p. 211) due to the "…sheer diversity of vocational aspirations" (p. 201.) Candy and Crebert (1991)

conceded that “it is difficult for any university or college to…prepare graduates for every possible career path” (p. 572). On-the-job training is often considered an alternative to hiring formally schooled employees and can, according to research by Bishop (1994), prove initially beneficial to the hiring entity based upon what type of prior training the new employee may have experienced. However, training facilitated by a specific firm “benefits other employers in the industry who hire workers who quit or are laid off” (Bishop, Productivity Effects of Prior Training section,para. 11). Negative effects can be particularly evident when examining firms that possess and develop industrially secretive products or those that require a high degree of specialized skill. Loss of employees into which the firm may have invested several years of training would negatively affect the firm. “The high rates of turnover in America, then, help explain why investments in on-the-job training are lower in this country” (Bishop, Turnover section, para. 5). Agricultural and other industrial firms have recognized this potentially detrimental effect of on-the-job training and have sought to locate employees already in possession of the basic skills necessary to perform tasks required of a specific job.“If employers need a set of skills, then they hire those who have them…” (Becker, 1957, cited by Miller and Rosenbaum, 1997). Research conducted notes that “Formal off-the-job training generates substantial long lasting externalities (benefits received by the worker's future employer: (sic.) and by consumers)” (Bishop, Productivity Effects of Prior Training section,para. 11).

Miller and Rosenbaum (1997) indicated that “many of the qualities employers want in their employees are reflected in school performance” (p. 500). Education of the labor force initiates with required public education and culminates at whatever level the

prospective student/employee desires. Peddle (2000) noted that "employee interest in education and training…has also grown as the range of skills necessary to participate in the new economy has expanded" (p.25). Four-year institutions have strived to adequately recruit and prepare a labor force to fill the requirements of employers by "offering components of work-based or work-integrated learning to better prepare their graduates for the demands of the rapidly changing workplace" (Trigwell and Reid, 1998; DEST, 2001 as cited by Crebert, Bates, Bell, Patrick, and Cragnolini, 2004, p. 49). Curriculum is the medium through which knowledge is transferred to students. Candy and Crebert (1991) proposed that universities introduce a range of learning styles into their curricula which exposed students to equivalent styles found in the workplace. Curriculum content must therefore be kept current if the program utilizing it is to remain effective. Peddle advised an "examination of evidence about the skills sets possessed by workers and about the skill sets needed by employers…" (p.24) in order to maintain the "focus…on the importance for universities to better prepare students for employment" (Martin, et al., 2000, p. 201).

Statement of the Problem

Following a university review performed in May of 2006, the University of Missouri (MU) Agricultural Systems Management (ASM) program , considered it necessary to evaluate the ASM curriculum to better serve its students and in so doing the agricultural industry. The MU ASM program must therefore determine which curricula are viewed as current, useful, and beneficial.

Purpose

The purpose of this study was to gather input from employers to assess the competencies and skills of ASM graduates from MU. Employer-derived input was then analyzed when grouped by demographic characteristics of the respondents.

Objectives

The objectives formulated to accomplish this purpose were:

1. Describe the demographic characteristics (length of time involved with agriculture, name of the company, job title, length of time with company, length of time in current position of company, level of formal education, institution attended for formal education, date of completion of formal education, number of University of Missouri Agricultural Systems Management students hired in the past five years, number of University of Missouri co-ops hired in the last five years) of Agricultural Systems Management employers.
2. Describe the mastery level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
3. Describe the importance level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
4. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by employers' level of education.

5. Compare the level of importance of skills required of Agricultural Systems Management graduates by employers' level of education.
6. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by business type of employer.
7. Compare the level of importance of skills required of Agricultural Systems Management graduates by business type of employers.
8. Describe the relationship between employer's tenure with the company and their perceived mastery level of skills held by University of Missouri Agricultural Systems Management graduates.
9. Describe the relationship between employer's tenure with the company and their perceived level of importance of skills held by University of Missouri Agricultural Systems Management graduates.

Definitions

Terms and abbreviations that are found in this study include the following:

ASM: Agricultural Systems Management

MU: University of Missouri

ASABE: American Society of Agricultural and Biological Engineers

Curriculum: Materials, principles, theories and processes used to frame instructional methods for imparting information in an educational setting.

Competencies: The ability to collect and analyze information, communicate, plan, organize, work with others, solve problems and use technology (Martin, et al., 2000, pgs. 208-209).

Employers: The immediate supervisors of… [ASM] graduates. (Robinson, 2006, p. 15).

Skills: Techniques and processes developed as a result of instruction.

Co-op: Cooperative educational endeavor between the MU ASM Program and cooperating businesses whereby MU ASM students are able to gain real-world employment experience while receiving college credit for their labor.

General skills: Non-technical skills associated more with character of the employee than with demonstration of knowledge in a specialized area.

Assumptions

For this study, the following assumptions were made:

1. Graduates were willing to provide information used to contact their supervisors.
2. Employers responded to the questions truthfully and without bias.
3. Employers objectively reported their perceptions of the importance of the listed skills and
   the competence level of their MU ASM graduate employees at using the skills.

Limitations

1. The study was limited to employers of Agricultural Systems Management graduates from the University of Missouri.

2. The population was employers of Agricultural Systems Management graduates from the University of Missouri therefore results can only be generalized to this population.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this chapter is to provide a review of the literature relevant to the purpose and objectives of this study. In addition, the theoretical basis for research is presented. This review is organized into the following sections: Purpose of the Study, History and Development of Agricultural Systems Management Programs, Employability Skills, Methods and Value of Curriculum Review.

Purpose of the Study

The purpose of this study was to gather input from employers to assess the competencies and skills of ASM graduates from the University of Missouri. Employer-derived input was then analyzed against demographic characteristics of the respondents.

History of Agricultural Systems Management Academic Programs

"Agriculture is America's number one employer … [with] nearly 22 percent of the workforce" (Cooper, 1997, p. 11-12). "After World War II, rising productivity, driven by the rapid adoption of mechanical and chemical technology, led to growing [agricultural] surpluses" (Dimitri, Effland, and Conklin, 2005, p. 9). According to Burke and Wakeman (1992), this incorporation of mechanization into agricultural production

and processing "offers good employment opportunities to those who want to design, build, install, service and repair" these technologies (p. 626). Though research and development is often associated with agricultural mechanization industry (that is, those companies that produce agricultural machinery), Cooper asserted that the role of the professional educator in directing students toward this transfer of knowledge cannot be overlooked. With the advent of the Morrill Act of 1862, The United States Government sought to provide a structure for universities where:

> The endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies,… to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life (About the Land-grant College, 2006, para. 20).

Incorporation of the frameworks and allocations provided for in this and subsequent legislation including the Hatch Act of 1887 (United States Congress, 1887), the Second Morrill Act of 1890 (United States Congress, 1890), and the Smith-Lever Act of 1914 (United States Congress, 1914) assisted in administration of collegiate educational programs pertaining to agriculture and mechanics. As the American population increased throughout the next century, so did the demand for reliable food production and processing. "Following World War II, technological developments [in agriculture] occurred at an extraordinarily rapid pace" (Dimitri, et al., 2005, p. 6).According to Dimitri,, farmers, intent not only on survival but also profitability of their farms,

embraced much of the new mechanical technology.More efficient and complex machinery was made available to the agricultural consumer which, according to Burke and Wakeman (1992), necessitated personnel skilled in design and service of such machinery. Universities that had once incorporated their mechanics and engineering curriculum into other areas of study suddenly discovered that a demand existed for specialized training regarding agricultural machinery technology.

According to *Request for Recognition of Agricultural Systems Management Curriculum, from the Division of Food Systems and Bioengineering Agricultural Systems Management Program at the University of Missouri-Columbia, 2006* the University of Missouri initiated offerings of mechanization in its agriculture curriculum for the fall semester of 1977. Student enrollment numbered 130 students, which, at the time, was greater than any other similar program in the country(*Request for Recognition*, 2006).

Though the percentage of the United States' population directly involved in production agriculture hasdecreased throughout the past century (United States Department of Agriculture, National Agricultural Statistics Service, "Farm Labor: Number of Farms and Workers by Decade, US" , 2002), "thus far, food production has generally kept pace with population growth" (Haub, 1995, Conclusions and Consequences section,para. 1). Many factors have contributed to the ability of one modern U.S. farmer to move from barely feeding his or her family in the early 20th century to providing for the nutritional needs of nearly130 persons based on modern population estimates (Iowa Farm Bureau Federation, 2006). Improved genetics, management of resources and development of chemical fertilizers and pesticides, were all essential in advancing the production rate of the farmer (Canine, 1995).

In as much as mechanization had developed into multiple areas of the production and processing sectors of agriculture; it became evident to faculty at MU that teaching students had evolved from specialized instruction in one particular mechanical areato management of mechanical systems (*Request for Recognition*, 2006). Also recognizable at the time was that several courses taught fell beneath the advancing tide of technological advancement. The MU ASM advisory committee recommended that MU ASM faculty develop a foundation in understanding of mechanical systems as well as management strategies and techniques. It was the belief of the advisory committee that students would then be better prepared for a broad range of mechanical challenges offered them by the workforce (*Request for Recognition*;L.G. Schumacher, personal communication, December 28, 2006). It was in acknowledgment of this insight, among other factors related to changing workforce opportunities as well as curriculum taught, that the faculty teaching Agricultural Mechanization within the Department of Agricultural Engineering at MU sought a more descriptive name for the Agricultural Mechanization program (*Request for Recognition*).In addition to seeking a new name for the program, a major shift also took place in the Department of Agricultural Engineering. The faculty decided to phase out the program that prepared agricultural engineers and began training biological engineers (L.G. Schumacher, personal communication, December 24, 2007). As of December 31, 1995 the engineering component of the program was renamed Biological Engineering and the applied engineering in agriculture component (formerly Agricultural Mechanization) was renamed Agricultural Systems Management (ASM) (*Request for Recognition*)

> During this time of restructuring, several "key" agricultural engineers (teaching faculty) retired. The College of Agriculture, Food and Natural Resources did not refill these positions with individuals who could teach these courses. As such it was impossible to teach all the courses that were needed. Initially six courses were dropped due to the mass exodus of teaching talent. This instructional gap was temporarily filled by agricultural engineering extension faculty who stepped forward to teach three of the six courses (L.G. Schumacher, personal communication, December 28, 2006).

Little more than ten years after the aforementioned changes were developed and implemented at the University of Missouri; the Agricultural Systems Management and Agricultural Engineering Extension program underwent a program review (reference citation). The resulting document:*Program Review Agricultural Systems Management and Agricultural Engineering Extension Programs in the Biological Engineering Division, University of Missouri- Columbia, May 17-19, 2006* reviewed the MU ASM and Biological Engineering Programs and was performed by an external evaluation committee comprised of two faculty members from the University of Missouri campus and two faculty members from Association of American Universities (AAU) universities who possessed teaching, research, and extension experience (Strickland, Taylor, Dauve, & Plain, 2006). It was determined from this evaluation that the support infrastructure for the MU ASM program had deteriorated due to key teaching and research faculty retirements resulting in failure of the program to achieve its purposes(Strickland et al.). Concerns focused on two broad areas: faculty and courses.

The number of MU ASM program faculty members actively teaching, performing research and providing academic guidance to students since its last review in February 2000had diminished by seven (Strickland et al, 2006*)*. According to the evaluators performing the review "...the ASM faculty does not have adequate time to teach, counsel, and develop the type of research program required to be successful at a research institution" (p. 11). The College of Agriculture, Food and Natural Resources responded to the deficiencies noted by the review team with approval of recruitment for one faculty member to fill a recently vacated teaching and advising position (L.G. Schumacher, personal communication, December 28, 2006). The review team also noted that the MU ASM program no longer included a graduate studies component(Strickland et al.). Inclusion of a graduate studies component in the MU ASM program could indicate, according to research by Lachs (1965) "a mark of progress and as such, [be] highly desirable" (p. 121). Delamont, Atkinson and Parry (2000) suggested that graduate "research is the key mechanism through which academic knowledge is produced and reproduced" (p. 2).Further research to determine whether shortages of qualified persons to fill MU ASM job opportunities and the inability to research or seek out new knowledge related to the profession as additional reasons to re-establish a graduate program should be initiated (L.G. Schumacher, personal communication, September 7, 2004).

When addressing concerns with MU ASM curriculum, the evaluators noted "there are some subject matter areas that are not being covered adequately that should probably be included in the curriculum, they are: electronics and controls, pneumatics, certain areas of precision agriculture, information management, facilities planning and

management, materials handling and processing, and environmental quality issues" (Strickland et al., 2006, p.11). These inadequacies of curriculum were suggested by the evaluators to have stemmed from the teaching staff shortages experienced by the program. The review committee indicated that curriculum revitalizations in the past might be inadequate based on advances in technology, job descriptions and skills sought by employers.(Strickland et al.). Recommendations by the evaluators included efforts by the MU ASM program to "…put together a new [curriculum] plan based on current limitations of the faculty..." (p. 11). The view expressed by several MU ASM faculty during faculty meetings in late 2006 was that such a curriculum plan should have as its base the recommendations and educational preferences of its graduates' current and potential employers (L.G. Schumacher, personal communication, December 28, 2006).

Employability Skills

Espinoza (1999) stated that "One purpose of higher education is to graduate students who will become productive citizens. An integral aspect of being a productive citizen is employment" (p. 1). According to Miller and Rosenbaum (1997) "Many employers have an explicit need for the academic skills taught in school" (p. 501). Even the most basic skills taught in schools across the country fulfill a basic need found in employment situations across the country (Miller & Rosenbaum; Peddle, 2000). Martin et al. (2000) upheld the premise that the development of job-related skills was "…an important purpose of higher education" (p.202).

Candy and Crebert, (1991) asserted that "On completion of university studies, the graduate usually possesses a generalized education (one where a little is known about a lot)" (p. 578). This generalized education forms the foundation for the skill sets to be developed by the graduate. Employability, however, is not simply about "making deposits in a bank of skills" (Morely, 2001, p. 133). It is, instead, maintaining and developing flexibility and "the ability to develop skills quickly and be able to apply them to new and unfamiliar situations, at the same time displaying a broad range of competencies" (Candy & Crebert, p. 579). They went on to say that graduates of a university should be able to at the very least "be equipped with skills and insights that allow them…to understand the culture of the workplace" (p. 584). Crebert et al. (2004) citing the Department of Education, Science and Training (DEST, 2001) agreed with developing a set of generalized skills, but found that "balancing curricula that prepare graduates to work in designated key areas…with the ideals of a broader, more holistic education has been one of the main challenges facing higher education" (p. 52). Darrah, (1994) as cited by Taylor (1998) illustrated the desired flexibility in skills acquired by the image of a "skilled worker who can move freely between different workplaces carrying his or her skills like so much luggage and transferring those skills effortlessly into new contexts" (p.149). Martin et al. (2000) suggested development of job-related skills as well as graduates "who were analytical and creative thinkers" (p.202). Morely also called for a set of "core skills" (p. 135) to be implemented in university curriculum in order to overcome the notion of a "skills gap" (p. 135) between what employers need and what universities are producing.

Peddle (2000), through his research pertaining to employer perceptions of workforce deficiencies and training needs, found an employer-perceived skills gap "between required skills and applicant skills" (p.29). The employers surveyed in this study expected this gap to widen in the future. Peddle went on to say that creating an interface between employers and those institutions of learning which train their employees would appear to provide a solution to the perceived skills gap. A 1998 article in *Change* magazine, aimed at understanding employers' perceptions of college graduates, proposed that "When involved with institutions, employers tend to have better perceptions of their graduates" (p. 50). Heldrich (2005), in a survey of New Jersey employers designed to determine the ability of higher education to prepare students for employment, determined that "Employers believe that higher education can be improved by making it more relevant to what happens in the workplace" (p.1). However "Colleges and universities are often puzzled about what is expected of them…. Employers complicate the matter by sending contradictory signals to schools and students about what they expect" (*Change*, 1998, p.1). When examining the skills gained by a graduate of a university "it is important to identify what factors are within the control of the university that contribute to the preparation of students for employment" (Martin et al., 2000, p. 200). Radcliffe, in his 2002 study examining convergences between work-based and campus-based learning, concluded that "The different understandings…of learning, training, competency and capability held by university and industry staff needs to be made explicit" (p. 8). What better way, then to bring the skills desires of employers into parallel with the skills taught by the university then by developing open lines of communication?

Crebert et al. (2004), used focus groups to gather perceptions of the role of the university held by graduates and employers. They found that "employers…wanted in principle to…develop closer links with higher education" (p. 55). From this study, the researchers "recommended to the university, as a result of the study, that in the process of integrating the generic skills and abilities in to the undergraduate curriculum, the input and views of employers and graduates be incorporated into program development" (p. 56).

Value of Curriculum Review

"Universities are regularly criticized for failing to prepare their students for the workplace" (Bennet, et al., 2000 as cited by Crebert, et al., 2004, p. 56). "Writing in the *Educational Record*, Verville (1995) as cited by Tanyel, Mitchell and McAlum (1999) criticized universities and their curricula for not keeping up with the …demands of the global marketplace" (p.34). Peddle (2000) alleged that "most firms…tend to point their fingers at educational institutions for failing to provide them with the employees they need" (p. 39). Martin, et al. (2000) proposed the necessity "that universities which tend to service specific areas should frequently assess the extent to which they are preparing graduates for work" (p. 210). This assessment could be provided from information presented by guest lecturers from outside institutions, industry-simulated research projects, and surveys and interviews of recent graduates to learn about their perspective on learning in the workplace. (Candy and Crebert, 1991). Additional input could come directly from employers in the form of contributions to curriculum design.

Candy and Crebert (1991) suggest that "There is much to be gained from mutual input into course design and from greater cooperation between industry and university" (p. 587). In conclusion of their study documenting the passage of employees from the university to workplace environment, Candy and Crebert found that "it is clear, then that in order to achieve a smooth passage between the two learning worlds of university and workplace there needs to be a reconciliation between the two objectives [higher education or study, and the workplace or a job] at which learning is directed" (p. 558). In other words the two worlds of learning and employment must be commonly joined in the pursuit of producing educated individuals adequately prepared for employment. The pursuit of the goal of cooperation in developing curriculum should emanate from both employers and the university.

Heldrich (1995) in his study of New Jersey employers' perceptions of the ability of higher education to prepare future employees found that 51 percent of the employees contributing to the study believed that "having colleges and universities solicit and implement ideas from business to improve the curriculum would also improve higher education" (p. 9-10). Miller and Rosenbaum's 1997 study examined what criteria employers use to hire employees. They found that many distrusted schools and teachers often due to a lack of direct contact with the educating entity. Seeking input for curriculum updates would be one way to regain this trust. This can be evidenced by some of the quotations of employers contributing to the project: "One employer explained, I think we've had good successes because we have been able to reach inside the schools and talk specifically to certain…teachers" (p. 512); Activities like this "convey expectations to teachers and be sure that the teachers make recommendations based on

relevant standards" (p. 512). Noted later in the study is the assumption that "schools are among our most democratic institutions, and school-employer relationships can open jobs to a wider range of young people" (p. 514).

Tailoring what is taught in schools to a wider range of employment opportunities will indeed succeed in realizing the goal of reaching a wider pool of employable persons. Peddle (2000) advocated "examination of evidence about the skills sets possessed by workers and about the skills sets needed by employers" (p. 24). Morley (2001) suggested employer acceptance of some of the responsibility for tailoring curricular materials to meet industry standards by stating that "corporate interests play a more powerful role in determining the purposes of higher education" (p. 131). Advocation of active employer input into the actual activities of education can be drawn from her statement indicating "the implication is that the education process should also extend to employers" (p. 137). Cameron (2000) as cited by Morley emphasized what others in industry proposed: The idea of "knowing how rather than simply knowing that" (p. 135). This movement is seen as progress toward curriculum development that begins by specifying "outcomes" or the "skills and competencies" that should be demonstrated by the student at the end of the course (p. 135). This type of curricular modification as a result of employer or industry input is desirable for the MU ASM program. Tanyel et al. (1999) pointed out that "the business environment changes faster than curricula at colleges and universities because of the cumbersome process often involved in curriculum revision, including political posturing by operating entities and conflicting educational philosophies among faculty" (p.33).

The review of the MU ASM program has necessitated a speedy revision of the curriculum or risk essentially being made obsolete by industry changes. *Change* magazine in the article examining employer perceptions of college graduates (1998) proposed that "education needs to be more closely tied with the world of work" (p. 50). Competencies as a product of successful completion of relevant curriculum results in "higher levels of perceived employment preparation" (Martin et al., 2000, p. 208). Relevant curriculum should be developed by "understanding one's present market and relevant performance on key dimensions [which] should enhance departmental planning and program development" (Morgan and Shim, 1990, as cited by Martin et al., p. 200). Crebert et al. (2004) proposed that "it would be mutually beneficial if employers became more involved in programs of study" (p. 55). *Framework* (Alberta Education, 1996) as cited in Taylor (1998) recommended that "employers and educators should work together to identify the general employability, entrepreneurship and career-awareness skills and standards that students should develop" (p. 145).

"Competencies are important contributors to employees' ability to successfully perform in the workplace" (BHERT, 1991, 1992; Carmichael, 1992; 1993; Finn, 1991; Mayer, 1992; NBEET, 1992, as cited in Martin et al., 2000, p. 208). Meaning for skills and competencies learned during experience in continuing education would logically relate to employment. Candy and Crebert (1991) indicated that it is "in the workplace [where] one gets on with the business of applying what has been learnt" (p.571). Satisfaction based upon the competencies a graduate has acquired as a part of an educational experience should therefore be visible through performance in the workplace. Martin et al., seemed to validate this in their 2000 study to determine graduate

satisfaction with the university and perceived employability skills when they reported that "higher levels of satisfaction with the development of competencies were associated with higher levels of perceived employment preparation" (p.208). In Miller and Rosenbaum's 1997 study to determine what sources of information employers use when searching for and hiring employees they found that "many of the qualities employers want in their employees are reflected in school performance: academic skills, oral and written communications, dependable attendance, and good work habits" (p. 500). Succinctly stated: employers seek employees based upon knowledge expressed as competencies. As faculty of the ASM program at the University of Missouri, charged with redesigning the curriculum, it is paramount that the educational preferences of potential employers be determined and made of significance. For this reason it is necessary to determine the strengths and weaknesses exhibited by past MU ASM graduates as perceived by their employers, as well as potential emerging areas of technology in which graduates of the MU ASM program should become proficient

Summary

Mechanization in agriculture yields increases in efficiency of production with less labor input. Research, development, and service of agricultural machines necessitates training of qualified personnel. The MU ASM program has evolved over time to meet this need for training. Relevant training of graduates is a result of up-to-date curriculum. Changes to teaching materials should be developed by seeking input from potential employers in order to close the gap between school and the workplace. Employers have a

better understanding of the skills necessary for successful employment than do colleges and universities. Identification and implementation into the curriculum of skills that are important to employers will result in graduates that are equipped in areas relevant to employment. Successful employment results in more productive citizens.

CHAPTER III

RESEARCH DESIGN

Introduction

The purpose of this chapter is to present the methods and procedures used in this research. It includes an explanation of the research purpose and procedure, the type of research, and the respondent group. Data collection and analysis are also discussed.

Purpose of the Study

The purpose of this study was to gather input from employers to assess the competencies and skills of ASM graduates from the University of Missouri. Employer-derived input was then analyzed against demographic characteristics of the respondents.

Objectives

1. Describe the demographic characteristics (length of time involved with agriculture, name of the company, job title, length of time with company, length of time in current position of company, level of formal education, institution attended for formal education, date of completion of formal education, number of University of Missouri Agricultural Systems Management students hired in the

past five years, number of University of Missouri co-ops hired in the last five years) of Agricultural Systems Management employers.

2. Describe the mastery level of skills required of Agricultural Systems Management graduates as perceived by their employers.
3. Describe the importance level of skills required of Agricultural Systems Management graduates as perceived by their employers.
4. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by employers' level of education.
5. Compare the level of importance of skills required of Agricultural Systems Management graduates by employers' level of education.
6. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by business type of employer.
7. Compare the level of importance of skills required of Agricultural Systems Management graduates by business type of employers.
8. Describe the relationship between employer's tenure with the company and their perceived mastery level of skills held by University of Missouri Agricultural Systems Management graduates.
9. Describe the relationship between employer's tenure with the company and their perceived level of importance of skills held by University of Missouri Agricultural Systems Management graduates.

Research Design

This study was descriptive-correlational in nature. According to Ary, Jacobs and Razavieh (2002) descriptive-correlational research focuses on gathering material to describe subjects addressed by the objectives. This type of research does not attempt to interfere with or manipulate the materials under scrutiny. Once the data describing the research subjects has been gathered, it is then statistically analyzed in order to compare observations of different groups. Grouping of the data is based on comparisons that the research questions attempt to make.

Research identified what skills and competencies possessed by MU ASM graduates were deemed by employers as paramount in importance, which of these skills and competencies are important to their business, and what areas of new technology should be addressed by MU ASM faculty.

Research Subjects

Subjects for the study included the population of employers designated by graduates of the ASM Program of the University of Missouri in a 2006 survey of graduates of the program (n=92). Respondents to the 2006 survey of MU ASM graduates who were self employed were removed from the list of potential subjects. This action reduced the population for this study to 74. The researcher attempted to contact each of the remaining 74 subjects via telephone numbers or email addresses voluntarily provided by the 2006 survey of MU ASM graduates. Invalid or outdated contact information or

cessation of employment further reduced the number of potential research subjects to 59. Frame error was addressed by objective observation of the list of potential subjects and the removal of duplicate names of employers for the same MU ASM graduate. If several supervisors were listed within a given company, then those names were retained. The number of subjects in the population was reflected by those students who responded to the graduate survey. No sampling techniques were required due to the fact that a census was performed.

Instrumentation

The data collection questionaire was adapted from materials developed in a 2001 evaluation of curriculum by Dr. Daniel Essand Dr. Mack Strickland both of Purdue University (Ess & Strickland, 2001) and with input from the MU ASM advisory committee. The adapted version of the questionnaire (Appendix A) contained a list of 30 skills that participants were to evaluate based on graduates' level of mastery in one column and level of importance to the company in another column, both on a 5-point Likert-type Scale. These questions sought to determine participants' evaluation of the MU ASM program's proficiency in meeting the needs of potential employers by preparing students in areas such as: mathematics, language, communication, technology,et cetera. Four open-ended questions sought an overall assessment of MU ASM graduates. This assessment was accomplished by asking participants to generate lists of general skills useful in obtaining and maintaining a position with their company,

and those skills not currently demonstrated by MU ASM graduates but required to provide potential employees a more desirable repertoire of capabilities.

Demographic data about the population were gathered from a series of questions pertaining to tenure in agriculture and the workplace, levels and locations of further education, and number of MU ASM students hired by the company. These questions were included on the final page of the questionnaire.

The questionnaire was printed in bi-fold pamphlet form on light yellow paper stapled at the spine. The font was Times New Roman 11 for the skills/competencies ranking and Times New Roman 12 for the open ended and demographic questions.

Validity of the questionnaire was determined using a panel of three experts in research methods, ASM, agricultural education, and statistical analysis. The panel evaluated the questionnaire for face validity, content validity, instrumentation validity, and validity based on their insight on the subjects. The questionnaire framed by Dr. Daniel Essand Dr. Mack Strickland underwent multiple revisions in order to meet the requirements of the panel of experts. The greatest changes to the questionnaire were as a result of the panel members' insight of the subjects. Face-to-face meetings and email correspondence with members of the panel were used to provide feedback for revision of the questionnaire. In addition the questionnaire was presented to the ASM program advisory committee. This committee consists of ten professionals whose backgrounds reflect associations with agricultural-related industry. The data generated from discussions of each question determined technical clarity and applicability and guided adjustments to the questionnaire as a whole and with regard to each question individually. Adjustments took the form of grammatical inferences, question placement in the

questionnaire, and inclusion of skill areas that had been overlooked. Recommendations were evaluated and the questionnaire modified in order to comply with the guidance received.

Reliability of the questionnaire was accomplished via post-hoc reliability gathered from analysis of Cronbach's Alpha from existing data. Two matrices of 30 items each, corresponding with the 30 skills evaluated by the questionnaire were analyzed. The matrices corresponded with employers' perceptions of skills mastery and skills importance. Cronbach's Alpha for reliability of the instrument evaluating MU ASM employers' mastery of skills resulted in an alpha level of 0.89. Cronbach's Alpha for reliability of the instrument evaluating MU ASM employers' perception of importance of skills resulted in an alpha level of 0.71. Demographic data are not subject to reliability issues due to their static nature.

Data Collection

The data collection process was guided by Dillman's *The Tailored Design Method* (2000). Materials were distributed to 53 potential participants via the United States Postal System and 6 potential participants via e-mail.

The data collection process began with a pre notice contact letter (Appendix B) of introduction sent to all potential respondents (n = 59) from the researchers, which introduced the research problem to be addressed. This initial contact invited the recipient to participate in the survey and listed the proposed responsibilities of the participant. In addition this initial contact alerted the potential participant as to a time frame for data

collection materials to begin arriving in the mail. Emphasis was placed upon the importance of each subject's participation in order to obtain a clear answer to the questions posed. Information regarding means to contact the researcher was included in this material.

Within one week of the initial contact via the letter of introduction, the survey packet was sent to all 59 potential respondents. Each packet contained a cover letter (Appendix C) reminding the participant about the importance of the material that the questionnaire was to collect as well as an expression of appreciation for the participant's attention. Subjects were advised that participation was voluntary and were asked to indicate consent to contribute data to the project via a consent form printed on the inside front cover of the questionnaire. Affirmation of confidentiality for subjects was also included in this initial document. Most importantly the cover letter provided instructions for filling out the questionnaire, an estimate of the time required, and details on how to return the completed form to the researcher. A self addressed, postage paid envelope for use in providing the least amount of inconvenience necessary in returning the completed questionnaire was also included in the survey packet.

Within three weeks of the survey packet distribution, one survey packet was returned due to an insufficient address and one questionnaire was returned without being completed which reduced the number of potential respondents to 57 individuals. However, during this time 22 completed questionnaires were returned to the researcher which resulted in 38.59% initial response rate.

Approximately three weeks after the initial mailing of the survey packet, all respondents and potential respondents (n = 57) received a reminder postcard (Appendix

D) framed after Dillman's example in *The Tailored Design Method* (p. 180) designed to reaffirm the researcher's interest in their response whether they had returned a copy of the completed questionnaire or not. This postcard conveyed to the participant in a condensed form, the importance and value of completing the questionnaire as well as expressing appreciation to those who already had completed it. No further responses were gathered as a result of this mailing.

Approximately three weeks later, another survey packet containing a cover letter (Appendix E) framed after Dillman's example in *The Tailored Design Method* (p. 182) indicating in somewhat stronger language that the questionnaire had not been returned, a new questionnaire, and another self addressed, postage paid envelope was mailed to all non-respondents (n = 35).

Two incomplete questionnaires were then returned to the researcher by employers no longer employing MU ASM graduates. These responses reduced the total potential response group to 55 individuals,

Within two weeks of the final survey packet mailing, five completed questionnaires were returned to the researcher bringing the total number of completed questionnaires to 27 or 49.09%.

Non-response error was not an issue due to the fact that the study sought input from all members of the population. Caution should be taken to not generalize beyond the respondent group.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences SPSS© statistical software version 13.0 for Windows. Data were evaluated in nine groups in order to address each of the research objectives. Statistical measurements were used to describe the quantitative data gathered. Statistics is the science of collecting, organizing and interpreting numerical facts, which we call data." (Moore & McCabe, 2006, p. xxxi). "The goal of statistics is to gain understanding from the data." (p. xxxi). Statistical measurements used to describe the data for this study included: mean, standard deviation, frequency and range. Mean is a measure of center that provides an average value for the dataset(Moore & McCabe). Standard deviation is a measure of spread (Moore & McCabe). It measures the distance different observations are away from the mean. Frequency is a count of the number of individuals in a class (Moore & McCabe). Frequency was used in the analysis of this data as a tool to identify unusual numbers. Range was reported in this study as the smallest value followed by the largest value (R.M. Torres, personal communication, October 10, 2007). This technique was used to illustrate the precise area into which the data fell.

Objective one analyzed demographic characteristics of the population. Statistical comparisons among frequency and percent, mean and standard deviation, and range of the responses were made based on number of years of agricultural involvement, highest educational degree earned, employing business type, job position, tenure with the company, length of time in current position, whether formal education had been

completed, date of graduation, number of MU ASM graduates hired, and number of MU ASM co-ops hired.

Objective two described employer perceptions of mastery level for each of the 30 competencies listed in the questionnaire using mean and standard deviation. It was also described by a table listing frequency of responses for each of the 30 competencies.

Objective three described employer perceptions of level of importance for each of the 30 competencies listed in the questionnaire using mean and standard deviation. It was also described by a table listing frequency of responses for each of the 30 competencies.

Objective four compared employers' perception of theMU ASM graduates' mastery level of the 30 competencies listed in the questionnaire with the employers' level of education. Comparisons were made based on high school, Bachelor of Science, Master of Science, and Specialist/Doctorate degrees with overall mean and standard deviations of perceived abilities of MU ASM graduates to demonstrate the competencies listed.

Objective five compared employers' perceived level of importance of the 30 competencies listed in the questionnaire with their level of education. Comparisons were made based on high school, Bachelor of Science, Master of Science, and Specialist/Doctorate degrees with overall mean and standard deviations of perceived level of importance for the competencies listed correlating to each level of education.

Objective six compared employers' perception of the MUASM graduates' mastery level of the 30 competencies listed in the questionnaire with the type of industry in which the employer is involved. Comparisons were made among those employers involved in the school system,government services, agronomy, agricultural machinery industry, production agriculture, and those industries not otherwise easily classified or

miscellaneous and each category's overall mean and standard deviations of perceived abilities of MU ASM graduates to demonstrate the competencies listed.

Objective seven compared employers' perceived level of importance of the 30 competencies listed in the questionnaire with the type of industry in which the employer was involved. Comparisons were made among those employers involved in the school system,government services, agronomy, agricultural machinery industry, production agriculture, and those industries not otherwise easily classified or miscellaneous and each category's overall mean and standard deviations of perceived importance for the competencies listed.

Objective eight described the relationship between employers' tenure with the company and perceived MU ASM graduates' mastery level of competencies included in the questionnaire. A correlation was computed to describe the relationship between tenure of the employer and mastery of MU ASM graduates of the 30 competencies listed. Correlations were described by: r = 1 results in perfect correlation, r = 0.70 - 0.99 results in very high correlation, r = 0.50 – 0.69 results in substantial correlation, r = 0.30 – 0.49 results in moderate correlation, r = 0.10 – 0.29 results in low correlation, and r = 0.01 – 0.09 results in negligible correlation according to Davis (1971).

Objective nine described the relationship between employers' tenure with the company and perceived level of importance of competencies included in the questionnaire. A correlation was computed to describe the relationship between tenure of the employer and the perceived level of importance of the 30 competencies listed. Correlations were described by: r = 1 results in perfect correlation, r = 0.70 - 0.99 results in very high correlation, r = 0.50 – 0.69 results in substantial correlation, r = 0.30 – 0.49

results in moderate correlation, r = 0.10 – 0.29 results in low correlation, and r = 0.01 – 0.09 results in negligible correlation according to Davis (1971).

CHAPTER IV

FINDINGS

Introduction

The purpose of this chapter is to present the findings of this study. The study was conducted as a census of employers of MU ASM graduates. Statistical summarization of the data generated from the questionnaire is included. The information is organized by the objectives of the study and is presented in narrative and tabular form. Data analysis procedures described in Chapter III were used to generate the findings.

Purpose of the Study

The purpose of this study was to gather input from employers to assess the competencies and skills of ASM graduates from the University of Missouri. Employer-derived input was then analyzed against demographic characteristics of the respondents.

Objectives

1. Describe the demographic characteristics (length of time involved with agriculture, name of the company, job title, length of time with company, length of time in current position of company, level of formal education, institution

attended for formal education, date of completion of formal education, number of University of Missouri Agricultural Systems Management students hired in the past five years, number of University of Missouri co-ops hired in the last five years) of Agricultural Systems Management employers.

2. Describe the mastery level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
3. Describe the importance level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
4. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by employers' level of education.
5. Compare the level of importance of skills required of Agricultural Systems Management graduates by employers' level of education.
6. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by business type of employer.
7. Compare the level of importance of skills required of Agricultural Systems Management graduates by business type of employers.
8. Describe the relationship between employer's tenure with the company and their perceived mastery level of skills held by University of Missouri Agricultural Systems Management graduates.
9. Describe the relationship between employer's tenure with the company and their perceived level of importance of skills held by University of Missouri Agricultural Systems Management graduates.

Findings Related to Objective One

The purpose of Objective One was to describe the demographic characteristics of Agricultural Systems Management employers. Specifically, data about the length of time involved with agriculture, type of business, job title, length of time with company, length of time in current position of the company, whether the respondents pursued formal education, the level of formal education achieved, the number of MU ASM graduates hired in the past five years, and the number of MU ASM co-ops hired in the last five years were assessed.

Descriptions of mean, standard deviation, and range of the respondent's years involved in agriculture, tenure with their current employer, and tenure in their current job position are displayed in Table 1.

Table 1

Demographic Characteristics of Respondents Related to Their Employment and Experience in Agriculture

Characteristic	*M*	*SD*	Range
Years involvement in agriculture *(n = 23)*	23.09	17.78	0-62
Years of tenure with current employer *(n = 22)*	18.55	11.31	2-40
Years of tenure in current position *(n = 23)*	12.11	11.31	0.50-40

Six employers of MU ASM graduates indicated they had spent from 35 years to, in the words of one respondent, a "lifetime," involved with agriculture. Conversely, six employers indicated that they were in fields having no contact with the industry of agriculture. The mean years of involvement in agriculture for the employers was 23.09 with standard deviation 17.78 years. The largest concentration of respondent's values was at the minimum response on the range of number of years.

The respondents' mean tenure with the current employer was 18.55 years with standard deviation of 11.31 years. The mean for tenure in their current position was 12.11 years with a standard deviation of 11.31. The majority of respondents (53.00%) reported tenure in the same position of less than ten years, nearly 35% had less than four years in the same position, and 4.30% reported a tenure of six months or less.

Types of agricultural business represented among the respondents were categorized into six areas: school system, government services, agronomy, machinery industry, production agriculture, and those industries not otherwise easily classified, or miscellaneous. These data are displayed in Table 2.

Table 2.

Distribution of Respondents' Business Type (n = 24)

Business Type	*f*	%
Agricultural Machinery	6	25.00
Agronomy	4	16.67
Miscellaneous	4	16.67
School	4	16.67
Government Services	3	12.50
Production Agriculture	3	12.50

Twenty-five percent (n = 6) of the respondents were in businesses they described as dealing primarily with agricultural machinery. Nearly 17% of the respondents where in fields related to agronomy or school systems. Fewer than 13% of the respondents were involved in production agriculture and nearly 17% were categorized in a group called "miscellaneous," which was composed of business that did not fit any other category.

Respondents were asked to describe their primary job using one of the following categories: Manager, Owner/Chief Operating Officer, Superintendent, and Professional. These data are displayed in Table 3.

Table 3.

Respondents' Job Title (n = 24)

Title	*f*	%
Manager	12	50.00
Owner/CEO	5	20.83
Superintendent	4	16.67
Professional	3	12.50

Twelve respondents (50.00%) described themselves as managers. Nearly 21% of the respondents described themselves as Owners and Chief Operating Officers and nearly

17% described themselves as Superintendents. Three respondents described their position as Professionals.

The study determined from respondents whether they had completed formal education following high school. Description of respondents by this classification is best achieved by examination of the frequency of the population who have and have not completed formal education following high school as well as the values listed as a percentage of the whole population. These values represented are found in Table 4.

Table 4.

Description of Respondents by Post-High School Formal Education (n = 24)

Formal Education	*f*	%
Yes	21	87.50
No	3	12.50

The data indicated that 87.50% of the employers surveyed pursued formal education following high school. Conversely, the remaining 12.50% of respondents indicated they had not pursued formal education after high school. The respondents described their education by indicating their highest degree earned. As shown in Table 5, the highest degree for half of the employers of MU ASM graduates was a baccalaureate degree. The highest degree for one-fifth of the respondents was a masters degree. Two respondents had completed a doctoral degree and one had a specialist degree as his or her highest level of education. Fewer than 17% of the employers stated that their highest degree was a high school diploma.

Table 5.

Description of Employers by Highest Degree Earned (n = 24)

Degree	*f*	%
High School	4	16.67
Bachelors	12	50.00
Masters	5	20.83
Specialist	1	4.17
Doctorate	2	8.33

Number of MU ASM graduates hired in the last five years by respondents' employing companies is displayed in Table 6.

Table 6.

Description of Employers by Number of MU ASM Graduates Hired From 2001-2006 (n = 24)

Number	*f*	%
1	14	58.33
2	4	16.67
0	3	12.50
9	2	8.33
5	1	4.17

Fourteen respondents at 58.33% of the surveyed population indicated that they have hired one MU ASM graduate in the last five years. Four respondents out of 24 (16.67%) indicated that their company hired two MU ASM graduates in the last five years. One respondent, representing 4.17% of the population noted that five MU ASM graduates had been hired by his or her company. Two others respondents indicated that nine graduates had found employment with their company representing eight percent of

the total response. Three respondents reported hiring zero MU ASM graduates in the last five years. These data represent 12.50% of the total response.

The number of MU ASM co-ops hired by respondents' employing companies in the last five years is shown in Table 7.

Table 7.

Description of Employers by Number of MU ASM Co-ops Hired from 2001-2006 (n = 24)

Number	*N*	%
0	16	66.67
2	3	12.50
9	2	8.33
1	2	8.33
6	1	4.17

Two-thirds (66.67%) of the respondents had not hired students as a result of the MU ASM co-op program. Two companies, or 8.33% of the respondents, had hired one employee as a result of the program. Two employees had been hired by three companies who participated in the study and represented 12.50% of the respondents. One company hired six employees representing approximately four percent of the respondents and two companies, representing three percent of the total response, hired nine employees as a result of the co-op exchange program between the University of Missouri ASM program and the agricultural industry.

Findings Related to Objective Two

Subjects were asked to describe MU ASM graduates in their employ in terms of their mastery of 30 work-related competencies. These data, organized by the researcher from highest to lowest mean, are displayed in Table 8.

Table 8.

Distribution of Employers' Perceived Mastery Level of Competencies (n = 26)

Competency	*M*	*SD*
Demonstrate professional ethical responsibilities	4.42	0.64
Develop solutions to problems by locating relevant information	4.28	0.61
Demonstrate effective computer skills	4.24	0.72
Apply skills associated with mathematics	4.23	0.77
Demonstrates skills associated with project management	4.17	0.71
Develop solutions to problems by analyzing possible alternatives	4.17	0.82
Demonstrate a willingness to adapt to new concepts	4.15	0.93
Demonstrate effective oral communication skills	4.15	0.68
Effectively use financial skills	4.08	0.72
Demonstrate skills associated with 12 volt electricity	4.00	1.03
Demonstrate skills associated with machinery management	4.00	0.91
Incorporate safety into the workplace	3.96	0.72
Demonstrate knowledge required to construct agricultural structures	3.93	1.16
Demonstrate effective written communication skills	3.85	0.88
Effectively analyze performance data	3.82	1.05
Demonstrate proficiency in using electronics technology	3.79	1.08
Demonstrate skills associated with internal combustion engines	3.79	0.98
Apply skills associated with science	3.74	0.96
Demonstrate skills associated with120 volt electricity	3.72	1.07
Demonstrate skills associated with hydraulics	3.72	0.90
Effectively demonstrate human resource skills	3.71	0.75

Table 8 (Continued).

Distribution of Employers' Perceived Mastery Level of Competencies (n = 26

Competency	*M*	*SD*
Effectively use scientific technologies	3.70	0.98
Demonstrate skills associated with marketing of a product	3.70	0.92
Demonstrate skills associated with machine power distribution systems	3.59	1.00
Demonstrate skills associated with materials handling	3.53	1.12
Understand the global dimension of agriculture	3.50	0.99
Demonstrate skills associated with precision agriculture	3.31	1.18
Demonstrate skills associated with pesticides application	3.25	1.14
Demonstrate skills associated with surface water management	3.18	1.17
Demonstrate skills associated with irrigation	2.91	1.14

Note. Scale: 1.00–1.50 = Low Competence, 1.51 – 2.50 = Moderately Low Competence, 2.51 – 3.50 = Moderate Competence, 3.51 – 4.50 = Moderately High Competence, 4.51 – 5.00 = High Competence.

Respondents rated their employees' competence in 11 of the 30 items assessed as moderately high .While none of the means were in the low or moderately low competence category, the respondents rated the competence of the MU ASM graduates in their employ as having moderate competence in five areas. The competency area rated of greatest importance included skills related to "demonstration of professional ethical responsibilities" (*M* = 4.42; *SD* = 0.64), followed by "development of solutions to problems by locating relevant information" (*M* = 4.28; *SD* = 0.61), "demonstration of effective computer skills" (*M* = 4.24; *SD* = 0.72), "application of skills associated with mathematics" (*M* = 4.23; *SD* = 0.77),"managing projects" (*M* = 4.17; *SD* = 0.71), "solving problems by analyzing possible alternatives" (*M* = 4.17; *SD* = 0.82), "adaptation to new concepts" (*M* = 4.15; *SD* = 0.93), "oral communications" (*M* = 4.15; *SD* = 0.68),

"finance" (*M* = 4.08; *SD* = 0.72),"working with 12-volt electricity" (*M* = 4.00; *SD* = 1.03), and "machinery management" (*M* = 4.00; *SD* = 0.91).. The lowest rating was for the competency area "demonstrate skills associated with irrigation (*M* = 2.91; *SD* = 1.14).

Findings Related to Objective Three

Participants in the study were asked to identify the level of importance for each of the competencies investigated. Data associated with this objective are shown in Table 9 and are arranged by the researcher from highest to lowest mean value.

Table 9.

Distribution of Employers' Perceived Importance of Competencies (n = 26)

Competency	*M*	*SD*
Demonstrate professional ethical responsibilities	4.73	0.60
Incorporate safety into the workplace	4.65	0.63
Demonstrate a willingness to adapt to new concepts	4.62	0.57
Develop solutions to problems by locating relevant information	4.56	0.58
Demonstrate effective oral communication skills	4.50	0.58
Develop solutions to problems by analyzing possible alternatives	4.38	0.71
Demonstrate effective computer skills	4.36	0.76
Demonstrate skills associated with machinery management	4.32	0.82
Effectively demonstrate human resource skills	4.29	0.69
Demonstrate effective written communication skills	4.23	0.91
Effectively use financial skills	4.13	0.95
Demonstrate proficiency in using electronics technology	4.05	1.08
Demonstrate skills associated with 12 volt electricity	4.05	1.00
Apply skills associated with mathematics	4.04	0.77
Demonstrates skills associated with project management	3.94	0.87
Demonstrate skills associated with marketing of a product	3.81	1.40

Table 9 (Continued).

Distribution of Employers' Perceived Importance of Competencies (n = 26)

Competency	*M*	*SD*
Apply skills associated with science	3.71	1.08
Effectively use scientific technologies	3.65	1.23
Effectively analyze performance data	3.64	0.85
Demonstrate skills associated with120 volt electricity	3.47	1.31
Demonstrate skills associated with hydraulics	3.47	1.35
Demonstrate skills associated with precision agriculture	3.43	1.28
Understand the global dimension of agriculture	3.37	1.34
Demonstrate skills associated with materials handling	3.28	1.45
Demonstrate skills associated with internal combustion engines	3.25	1.48
Demonstrate skills associated with pesticides application	3.23	1.48
Demonstrate skills associated with machine power distribution systems	3.21	1.40
Demonstrate knowledge required to construct agricultural structures	3.12	1.32
Demonstrate skills associated with surface water management	3.00	1.35
Demonstrate skills associated with irrigation	2.58	1.38

Note. Scale: 1.00 – 1.50 = Low Importance, 1.51 – 2.50 = Moderately Low Importance, 2.51 – 3.50 = Moderate Importance, 3.51 – 4.50 = Moderately High Importance, 4.51 – 5.00 = High Importance.

Four of the competencies were rated as having high importance (4.51 – 5.00). The most highly rated competency area was, "demonstration of professional ethical responsibilities" (*M* =4.73; *SD* = 060), followed by "incorporation of safety into the workplace" (*M* =4.65; *SD* = 0.63), "demonstration of a willingness to adapt to new concepts" (*M* =4.62; *SD* = 0.57), and "development of solutions to problems by locating relevant information" (*M* =4.56; *SD* = 0.58). Employers rated half of the competencies (15) as having moderately high importance. Included in this group were "demonstration of effective oral communication skills" (*M* = 4.50; *SD* = 0.58), "development of solutions

to problems by analyzing possible alternatives" (*M* =4.38; *SD* = 0.71), "demonstration of effective computer skills" (*M* =4.36; *SD* = 0.76), "demonstration of skills associated with machinery management" (*M* =4.32; *SD* = 0.82), "effective demonstration of human resource skills" (*M* =4.29; *SD* = 0.69), "demonstration of effective written communication skills" (*M* =4.23; *SD* = 0.91), "effective use of financial skills" (*M* =4.13; *SD* = 0.95), "demonstration of proficiency inskills associated with 12 volt electricity" (*M* =4.05; *SD* = 1.08), "demonstration of proficiency inskills using electronics technology" (*M* =4.05, *SD* = 1.00), and "application of skills associated with mathematics" (*M* =4.04; *SD* = 0.77). The lowest rated competencies included those associated with surface water management (*M* = 3.00; *SD* = 1.35), and irrigation (*M* = 2.58; *SD* = 1.38).

Findings Related to Objective Four

The fourth objective of this study was to compare the perceived mastery level of skills possessed by MU ASM graduates to employers' highest level of education. A mean score for perceived mastery level of skills was derived by summation of the 30 questions pertaining to educational content areas for each respondent based on degree level. All employers, regardless of their highest level of education, evaluated the competence of their employees who were MU ASM graduates as moderate. More specifically, employers who identified their highest degree as a high school diploma evaluated competence of these employees highest (*M* = 3.42; *SD* = 0.35) followed by those employees with a baccalaureate degree (*M* = 2.96; *SD* = 0.99). Employers with a masters

degree rated the competence of these employees lowest (*M* = 2.83; *SD* = 0.43). These data are displayed in Table 10.

Table 10.

Description of Employers' Total Perceived Mastery of Competencies by Highest Level of Education (n = 24)

			Perceived Abilities	
Highest Degree	*F*	*%*	*M*	*SD*
High School	4	15.40	3.42	0.35
Bachelors	12	46.20	2.96	0.99
Specialist/Doctors	3	12.50	2.91	0.34
Masters	5	19.20	2.83	0.43

Note. Scale: 1.00–1.50 = Low Competence, 1.51 – 2.50 = Moderately Low Competence, 2.51 – 3.50 = Moderate Competence, 3.51 – 4.50 = Moderately High Competence, 4.51 – 5.00 = High Competence.

Findings Related to Objective Five

The fifth objective was to compare the level of importance of skills required of MU ASM graduates with employers' level of education. As shown in Table 11, all employers, regardless of their highest level of education, rated the skills included in this investigation as moderately important. In comparison to their counterparts with other levels of education, employers identified as high school graduates evaluated the overall importance of these skills highest (*M* = 3.44; *SD* = 0.28). The next highest rating was from employers with specialists/doctoral degrees (*M* = 3.31; *SD* = 0.22), followed by the rating by those employers with a masters degree (*M* = 2.99; *SD* = 0.64). Respondents

with bachelors degree evaluated importance of skills included in this study lowest (*M* = 2.97; *SD* = 0.89).

Table 11.

Description of Employers' Total Perceived Importance of Competencies by Highest Level of Education (n = 24)

			Perceived Abilities	
Highest Degree	*f*	%	*M*	*SD*
High School	4	15.40	3.44	0.28
Specialist/Doctors	3	12.50	3.31	0.22
Masters	5	19.20	2.99	0.64
Bachelors	12	46.20	2.97	0.89

Note. Scale: 1.00 – 1.50 = Low Importance, 1.51 – 2.50 = Moderately Low Importance, 2.51 – 3.50 = Moderate Importance, 3.51 – 4.50 = Moderately High Importance, 4.51 – 5.00 = High Importance.

Findings Related to Objective Six

Data pertaining to the sixth objective were used to compare perceived overall mastery level by MU ASM graduates of the competencies investigated to the type of business in which each respondent worked. As shown in Table 12, all business types represented in the survey, except production agriculture, perceived varying degrees of moderate mastery level of competencies. Respondents who worked in production agriculture perceived the MU ASM graduates in their employ to have an overall moderately high (*M* = 4.05; *SD* = 0.32) level of competency mastery. The next highest rating was from respondents whose business type was classified as miscellaneous (*M* =

3.12; *SD* = 1.18), followed by respondents employed by agricultural machinery oriented businesses (*M* = 3.03; *SD* = 0.45). Respondents who worked in government services-type businesses rated the overall competence of the MU ASM graduates lowest (*M* = 2.51; *SD* = 0.27).

Table 12.

Description of Employers' Total Perceived Mastery of Competencies by Business Type (n = 24)

		Perceived Abilities	
Business Type	*F*	*M*	*SD*
Production Agriculture	3	4.05	0.32
Miscellaneous	4	3.12	1.18
Agricultural Machinery	6	3.03	0.45
School	4	2.74	0.94
Agronomy	4	2.69	0.25
Government Services	3	2.51	0.27

Note. Scale: 1.00–1.50 = Low Competence, 1.51 – 2.50 = Moderately Low Competence, 2.51 – 3.50 = Moderate Competence, 3.51 – 4.50 = Moderately High Competence, 4.51 – 5.00 = High Competence.

Findings Related to Objective Seven

The seventh objective of the study compared the respondents' type of business with their rankings of the level of importance of the competencies investigated. These data are shown in Table 13. With the exception of production agriculture, subjects perceived varying levels of moderate importance of competencies. Respondents who

worked in production agriculture rated the greatest overall importance of competencies (*M* = 3.97; *SD* = 0.37). Respondents employed by the agricultural machinery industry perceived the next highest importance of competencies (*M* = 3.28; *SD* = 0.40) followed by respondents involved with agronomy-type businesses (*M* = 3.10; *SD* = 0.30). Respondents employed by government services-type businesses rated the lowest overall importance of competencies (*M* = 2.51; *SD* = 0.53).

Table 13.

Description of Employers' Total Perceived Importance of Competencies by Business Type (n = 24)

		Perceived Importance	
Type of Business	*F*	*M*	*SD*
Production Agriculture	3	3.97	0.37
Agricultural Machinery	6	3.28	0.40
Agronomy	4	3.10	0.30
Miscellaneous	4	2.90	0.92
School	4	2.77	1.00
Government Services	3	2.51	0.53

Note. Scale: 1.00 – 1.50 = Low Importance, 1.51 – 2.50 = Moderately Low Importance, 2.51 – 3.50 = Moderate Importance, 3.51 – 4.50 = Moderately High Importance, 4.51 – 5.00 = High Importance.

Findings Related to Objective Eight

The eighth objective of the study sought to describe the relationship between employer's tenure with the company and their rating of the mastery level of the

competencies held by MU ASM graduates. Table 14 includes results of a correlation computed to describe the relationship between tenure of an employer in his or her current business and his or her rated mastery of competencies by MU ASM graduates.

Table 14.

Correlation of Perceived Mastery of Competencies and Importance of Competencies with Employers' Tenure with Current Business

ASM Competency	*r*
Mastery	0.09
Importance	0.33

A Pearson Product Moment Correlation was used to determine the relationship between the length of time (tenure) a respondent had been involved with his or her business and how the respondent rated their perception of mastery level of competencies. The result was a value of 0.09. The value computed from analysis of the data indicated, according toDavis (1971), there was a negligible relationship between the length of time a respondent to this study had been involved with his or her business and his or her perceived mastery level of competencies.

Findings Related to Objective Nine

Objective nine addressed the potential for a description of the relationship between employer's tenure with the company and his or her perceived importance level of competencies held by potential new employees. A correlation analysis was computed

to describe the relationship between tenure of an employer in his or her current business and his or her rated importance of competencies. The correlation value is included in Table 14.

Results generated froma Pearson Product Moment Correlation test yielded a value of 0.33. According to Davis (1971) this value indicated a moderate relationship between the length of time a respondent had been involved in his or her current business and how the respondent rated the importance of competencies.

CHAPTER V

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

Introduction

There are three purposes of this chapter. First, a summary of the study is provided. Second, conclusions, resulting from the findings of the study are presented. Finally, suggestions for action and further research are provided.

Purpose of the Study

The purpose of this study was to gather input from employers to assess the competencies and skills of ASM graduates from the University of Missouri. Employer-derived input was then analyzed against demographic characteristics of the respondents.

Objectives

1. Describe the demographic characteristics (length of time involved with agriculture, name of the company, job title, length of time with company, length of time in current position of company, level of formal education, institution attended for formal education, date of completion of formal education, number of University of Missouri Agricultural Systems Management students hired in the

past five years, number of University of Missouri co-ops hired in the last five years) of Agricultural Systems Management employers.

2. Describe the mastery level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
3. Describe the importance level of these skills needed by Agricultural Systems Management graduates as perceived by their employers.
4. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by employers' level of education.
5. Compare the level of importance of skills required of Agricultural Systems Management graduates by employers' level of education.
6. Compare the perceived mastery level of skills possessed by Agricultural Systems Management graduates by business type of employer.
7. Compare the level of importance of skills required of Agricultural Systems Management graduates by business type of employers.
8. Describe the relationship between employer's tenure with the company and their perceived mastery level of skills held by University of Missouri Agricultural Systems Management graduates.
9. Describe the relationship between employer's tenure with the company and their perceived level of importance of skills held by University of Missouri Agricultural Systems Management graduates.

Limitations

1. The study was limited to employers of Agricultural Systems Management graduates from the University of Missouri from 1995 – 2006.
2. The population was employers of Agricultural Systems Management graduates from the University of Missouri therefore results can only be generalized to this population.

Research Design

This study was descriptive-correlational in nature. According to Ary, Jacobs and Razavieh (2002) descriptive-correlational research focuses on gathering material to describe subjects addressed by the research questions. This type of research does not attempt to interfere with or manipulate the materials under scrutiny. Once the data describing the research subjects has been gathered, it is then statistically analyzed in order to compare observations of different groups. Grouping of the data is based on comparisons that the research questions attempt to make.

Research identified what skills and competencies possessed by MUASM graduates were deemed by employers as paramount in importance, which of these skills and competencies are important to their business, and what areas of new technology should be addressed by MU ASM faculty.

Research Subjects

Subjects for the study included the population of employers designated by 92 graduates of the MU ASM Program who responded to a 2006 survey of graduates of the program. Removal of self-employed MU ASM Graduates resulted in reduction of the potential subjects to 74. E-mail or telephone contact was attempted for each of the remaining 74 respondents to the 2006 survey of MU ASM graduates in order to gather contact information about their current employer. 15 respondents to the 2006 MU ASM Graduate survey could not be reached due to invalid or outdated contact information, which further reduced the potential subject group to 59 individuals. Frame error was addressed by objective observation of the list of potential subjects and the removal of duplicate names of employers for the same MU ASM graduate. If several supervisors were listed within a given company, then those names were retained. The number of subjects in the population was reflected by those students who responded to the graduate survey. No sampling techniques were required due to the fact that a census was performed.

Instrumentation

The questionnaire was adapted from materials developed in a 2001 evaluation of curriculum by Dr. Daniel Essand Dr. Mack Strickland both of Purdue University (Ess & Strickland, 2001) and with input from the MU ASM advisory committee. The adapted version of the questionnaire (Appendix A) contained a list of 30 skills that participants

were to evaluate based on graduates' level of mastery in one column and level of importance to the company in another column, both on a 5-point Likert-type Scale. These questions sought to determine participants' evaluation of the MU ASM program's proficiency in meeting the needs of potential employers by preparing students in areas such as: mathematics, language, communication, technology, et cetera. Four open-ended questions sought an overall assessment of MU ASM graduates. This assessment was accomplished by asking participants to generate lists of general skills useful in obtaining and maintaining a position with their company. Participants were also asked to identify skills not currently demonstrated by MU ASM graduates but required to provide potential employees a more desirable repertoire of capabilities.

Demographic data about the population were gathered from a series of questions pertaining to tenure in agriculture and the workplace, levels and locations of further education, and number of MU ASM students hired by the company. These questions were included on the final page of the questionnaire.

The questionnaire was printed in bi-fold pamphlet form on light yellow paper stapled at the spine. The font was Times New Roman 11 for the skills/competencies ranking and Times New Roman 12 for the open ended and demographic questions.

Validity of the questionnaire was determined using a panel of three experts in research methods, ASM, agricultural education, and statistical analysis. The panel evaluated the questionnaire for face validity, content validity, and validity based on their insight on the subjects. The questionnaire framed by Dr. Daniel Essand Dr. Mack Strickland underwent multiple revisions in order to meet the requirements of the panel of experts. The greatest changes to the questionnaire were a result of the panel members'

insight of the subjects. Face-to-face meetings and email correspondence with members of the panel were used to provide feedback for revision of the questionnaire. In addition, the questionnaire was presented to the ASM program advisory committee. This committee consisted of ten professionals whose backgrounds reflect associations with agricultural-related industry. The data generated from discussions of each question determined technical clarity and applicability and guided adjustments to the questionnaire as a whole. Adjustments took the form of grammatical inferences, question placement in the questionnaire, and inclusion of skill areas that had been overlooked. Recommendations were evaluated and the questionnaire modified in order to comply with the guidance received.

Reliability of the questionnaire was accomplished via post-hoc reliability gathered from analysis of Cronbach's Alpha from existing data. Two matrices of 30 items each, corresponding with the 30 skills evaluated by the questionnaire were analyzed. The matrices corresponded with employers' perceptions of skills mastery and skills importance. Cronbach's Alpha for reliability of the instrument evaluating MU ASM employers' mastery of skills was 0.89. Cronbach's Alpha for reliability of the instrument evaluating MU ASM employers' perception of importance of skills was 0.71. Demographic data are not subject to reliability issues because of their static nature.

Data Collection

The data collection process was guided by Dillman's *The Tailored Design Method* (2000). Materials were distributed to 53 potential participants via the United States Postal System and 6 potential participants via e-mail.

The data collection process began with a pre notice letter (Appendix B) of introduction sent to all potential respondents (n = 59) from the researchers, which introduced the research problem to be addressed. This initial contact invited the recipient to participate in the survey and listed the proposed responsibilities of the participant. In addition this initial contact alerted the potential participant as to a time frame for data collection materials to begin arriving in the mail. Emphasis was placed upon the importance of each subject's participation in order to obtain a clear answer to the questions posed. Information regarding means to contact the researcher was included in this material.

Within one week of the initial contact via the letter of introduction, the survey packet was sent to all 59 potential respondents. Each packet contained a cover letter (Appendix C) reminding the participant of the importance of the material that the questionnaire was to collect as well as an expression of appreciation for the participant's attention. Subjects were advised that participation was voluntary and were asked to indicate consent to contribute data to the project via a consent form printed on the inside front cover of the questionnaire. Affirmation of confidentiality for subjects was also included in this initial document. Most importantly the cover letter provided instructions for filling out the questionnaire, an estimate of the time required, and details on how to

return the completed form to the researcher. A self addressed, postage paid envelope for use in providing the least amount of inconvenience necessary in returning the completed questionnaire was also included in the survey packet.

Within three weeks of the survey packet distribution, one survey packet was returned due to an insufficient address and one questionnaire was returned without being completed which reduced the number of potential respondents to 57 individuals. However, during this time 22 completed questionnaires were returned to the researcher which resulted in 38.59% initial response rate.

Approximately three weeks after the initial mailing of the survey packet, all respondents and potential respondents (n = 57) received a reminder postcard (Appendix D) framed after Dillman's example in *The Tailored Design Method* (p. 180) designed to reaffirm the researcher's interest in their response whether they had returned a copy of the completed questionnaire or not. This postcard conveyed to the participant in a condensed form, the importance and value of completing the questionnaire as well as expressing appreciation to those who already had completed the questionnaire. No further responses were gathered as a result of this mailing.

Approximately three weeks later, another survey packet containing a cover letter (Appendix E) framed after Dillman's example in *The Tailored Design Method* (p. 182) indicating in somewhat stronger language that the questionnaire had not been returned, a new questionnaire, and another self addressed, postage paid envelope was mailed to all non-respondents (n = 35).

Two incomplete questionnaires were then returned to the researcher by employers no longer employing MU ASM graduates. These responses reduced the total potential response group to 55 individuals,

Within two weeks of the final survey packet mailing, five completed questionnaires were returned to the researcher bringing the total number of completed questionnaires to 27 or 49.09%.

Non-response error was not an issue due to the fact that the study sought input from all members of the population. Caution should be taken to not generalize beyond the respondent group

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences SPSS© statistical software version 13.0 for Windows. Data were evaluated in nine groups in order to address each of the research objectives. Statistical measurements were used to describe the quantitative data gathered. Statistics is the science of collecting, organizing and interpreting numerical facts, which we call data." (Moore & McCabe, 2006, p. xxxi). "The goal of statistics is to gain understanding from the data." (p. xxxi). Statistical measurements used to describe the data for this study included: mean, standard deviation, frequency and range. According to Moore and McCabe, mean is a measure of center that provides an average value for the dataset. Standard deviation is a measure of spread (Moore & McCabe). It measures the distance different observations are away from the mean. Frequency is a count of the number of individuals in a class (Moore & McCabe).

Frequency was used in the analysis of this data as a tool to identify unusual numbers. Range was reported in this study as the smallest value followed by the largest value (R.M. Torres, personal communication, October 10, 2007). This technique was used to illustrate the precise area into which the data fell.

Objective one analyzed demographic characteristics of the population. Statistical comparisons among frequency and percent, mean and standard deviation, and range of the responses were made based on number of years of agricultural involvement, highest educational degree earned, employing business type, job position, tenure with the company, length of time in current position, whether formal education had been completed, date of graduation, number of MU ASM graduates hired, and number of MU ASM co-ops hired.

Objective two described employer perceptions of their MU ASM graduate employees' mastery of each of the 30 competencies listed in the questionnaire using means and standard deviations.

Objective three described employer perceptions of level of importance for each of the 30 competencies listed in the questionnaire using mean and standard deviation. It was also described by a table listing frequency of responses for each of the 30 competencies.

Objective four compared employers' perception of the MUASM graduates' mastery level of the 30 competencies listed in the questionnaire with the employers' level of education. Comparisons were made based on high school, Bachelor of Science, Master of Science, and Specialist/Doctorate degrees with overall mean and standard deviations of perceived abilities of MU ASM graduates to demonstrate the competencies listed.

Objective five compared employers' perceived level of importance of the 30 competencies listed in the questionnaire with their level of education. Comparisons were made based on high school, Bachelor of Science, Master of Science, and Specialist/Doctorate degrees with overall mean and standard deviations of perceived level of importance for the competencies listed correlating to each level of education.

Objective six compared employers' perception of the MUASM graduates' mastery level of the 30 competencies listed in the questionnaire with the type of industry in which the employer is involved. Comparisons were made among those employers involved in the school system,government services, agronomy, agricultural machinery industry, production agriculture, and those industries not otherwise easily classified or miscellaneous and each category's overall mean and standard deviations of perceived abilities of MU ASM graduates to demonstrate the competencies listed.

Objective seven compared employers' perceived level of importance of the 30 competencies listed in the questionnaire with the type of industry in which the employer was involved. Comparisons were made among those employers involved in the school system,government services, agronomy, agricultural machinery industry, production agriculture, and those industries not otherwise easily classified or miscellaneous and each category's overall mean and standard deviations of perceived importance for the competencies listed.

Objective eight described the relationship between employers' tenure with the company and perceived MU ASM graduates' mastery level of competencies included in the questionnaire. A Pearson Product Moment correlation analysis was computed to

describe the relationship between tenure of the employer and mastery of MU ASM graduates of the 30 competencies listed.

Objective nine described the relationship between employers' tenure with the company and perceived level of importance of competencies included in the questionnaire. A Pearson Product Moment correlation analysis was computed to describe the relationship between tenure of the employer and the perceived level of importance of the 30 competencies listed.

Summary of Findings

Objective One-Demographic Characteristics of MU ASM Graduate Employers

Respondents reported involvement in agriculture ranging from 0 years to lifetime (estimated at 62 years based on college graduation date of the respondent). The mean length of time involved in agriculture was 23 years with a standard deviation of 17.79 years.

Tenure with the company ranged from two to 40 years. Mean number of years with the same company for the entire group of respondents was 18.55 years and standard deviation was 11.31 years.

Length of time spent in the current job position for each respondent was reported. The overall mean for time spent by respondents in their current position was 12.11 years with standard deviation 11.31 years.

Agricultural machinery represented the largest portion of responding businesses with 25.00% of the total. Agronomy, school, and miscellaneous categories represented the smallest portion of respondents with four employers per group. These participants resulted in 16.67% of the total responses to be allocated for each category.

Job titles for each respondent were divided into four categories. Managers represented the largest portion of respondents with 45.83%. Owner/CEO was the designation listed by five of the respondents and superintendent followed closely behind with four respondents reporting as their job title. These values represented 20.83% and 16.67% of the total response respectively. Professionals accounted for four respondents (16.67%).

Respondents were asked whether they had attempted formal education following high school. Of the 24 responses, 21 (87.50%) reported having attempted some formal education following high school, three (12.50%) reported not attempting formal education following high school.

Responses to the question of highest degree earned were grouped by degree into those who had received high school, bachelors, masters, specialists, or doctoral degrees. The majority of respondents indicated a baccalaureate degree as that of their highest degree earned. Masters degree recipients were represented in similar frequency as high school degree recipients. Specialists, and doctoral degrees made up the fewest responses.

The study identified how many MU ASM graduates had been hired by respondents in the last five years. This number ranged from zero to nine. The largest number of respondents (58.30%) reported hiring one MU ASM graduate as an employee in the last five years. Four respondents (16.67%) reported hiring two MU ASM

graduates, one respondent (4.17%) reported hiring five graduates, and two respondents representing 8.33% of the total response group reported hiring nine MU ASM graduates apiece in the last five years. Average hires per respondent were 1.88 during the last five years.

The study asked how many MU ASM co-op students had been hired by the respondents over the past five years. The range of co-op hires by respondents ranged from zero to nine. The greatest number of respondents (16) hired zero MU ASM co-op students. This represented the majority of the responding group with 66.67%. Two respondents (8.33%) reported hiring one employee each as a result of the co-op program with the MU ASM program. One respondent reported hiring six employees and two respondents reported hiring nine employees as a result of the co-op program. These values equal 4.17% and 8.33% of the total responses respectively.

Objective Two-Description of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers

According to their employers, MU ASM graduates demonstrated no less than moderate mastery of all competencies ranked by respondents. These graduates demonstratedmoderately high levels of competence, as perceived by respondents, in eleven skill areas. Competencies associated with irrigation were rated lowest and several competency areas were in the lower end of the moderate category.

Objective Three-Description of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates

Respondents rated each of the included competencies at least moderate in importance. Competencies associated with irrigation were described by employers of MU ASM graduates as less necessary than other competencies listed. Respondents rated fourteen competencies at moderately high importance. Of those fourteen competencies, all except project management, were rated both of moderately high mastery (3.51 – 4.50) by MU ASM graduates and of moderately high importance (3.51 – 4.50) to respondents to the survey. Four competency areas were rated of high importance to employers but were not rated of equally high mastery by MU ASM graduates

Objective Four-Comparison of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers with Employers' Level of Education

Respondents to the research questionnaire were grouped into four categories based on indicated highest education level. The resulting degree categories were: high school, bachelors, masters, and specialists/doctoral degrees. Respondents' perception of competency mastery by MU ASM graduates ranged from 3.42 to 2.83 (moderate mastery). MU ASM graduates demonstrated highest levels of competence mastery when perceived by respondents who completed no more than a high school education. MU ASM graduates who were supervised by employers holding masters degrees demonstrated the least amount of skills mastery.

Objective Five-Comparison of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates with Employers' Level of Education

Respondents to the research questionnaire were grouped into four categories based on respondents' indicated highest level of education. The resulting degree categories were: high school, bachelors, masters, and specialists/doctoral degrees. Respondents' perceptions of competency importance were more tightly clustered than were the perceptions of competence mastery. The range of mean perceived importance of competencies was from 3.44 to 2.97. Employers of MU ASM program graduates who have formal education of no more than a high school degree perceived the highest levels of competence importance. MU ASM employers who achieved formal education of no more than a baccalaureate degree perceived the least amount of skills importance.

Objective Six-Comparison of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers with Employers' Business Type

Categorization of businesses that employ MU ASM graduates used intuitive grouping. MU ASM graduates' mastery level of competencies as perceived by their employers were divided into categories of low (0.00-1.50), moderately low (1.51-2.50), moderate (2.51-3.50), moderately high (3.51-4.50), and high (4.51-5.00) for each business type. MU ASM graduates employed by government services-type businesses were perceived by their employers to demonstrate the least mean mastery of competencies of the categories. MU ASM graduates employed in production agriculture

were perceived by their employers to perform the greatest mastery of skills when compared to other business categories. The largest group of respondents was associated with agricultural machinery businesses. MU ASM graduates in this field were perceived to demonstrate moderate mastery of competencies listed in the research questionnaire.

Objective Seven-Comparison of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates with Employers' Type of Business

Categorization of businesses represented by respondents used intuitive grouping. MU ASM Employer-perceived importance levels of competencies included in the research questionnaire were divided into categories of low importance (0.00-1.50), moderately low importance (1.51-2.50), moderate importance (2.51-3.50), moderately high importance (3.51-4.50), and high importance (4.51-5.00) for each business type. Supervisors of MU ASM graduates employed in fields associated with government services indicated perception of the least overall importance of competencies for future employees. Conversely, supervisors of MU ASM graduates employed in the field of production agriculture perceived the highest level of importance associated with skills listed in the research questionnaire. Respondents from businesses associated with agricultural machinery were largest in number for this survey. For this category of respondents, mean perceptions of importance of the skills listed in the research questionnaire were exceeded only by respondents involved in production agriculture.

Objective Eight-Describe the Relationship Between Employers' Tenure with Their Company and Perceived Mastery Level of Competencies Held by MU ASM Graduates

Objective Eight determined whether difference in perception of mastery level of competencies held by MU ASM graduates employed by survey respondents occurred as a result of the number of years a respondent had been employed by their company. A Pearson Product Moment correlation test to identify a correlation was performed comparing the number of years each employer had been employed with their company against the mean perceived score evaluating mastery of the competencies listed in the research questionnaire as demonstrated by MU ASM graduates. The test revealed a correlation of 0.09 between the explanatory variable (number of years with current company) and the response variable (mean perceived mastery of competencies).

Objective Nine-Describe the Relationship Between Employers' Tenure with Their Company and Perceived Importance of Competencies Held by MU ASM Graduates

Data gathered pertaining to the ninth objective describedthe relationship between the perceptions of importance of competencies listed in the research questionnaire compared to the number of years a respondent had been employed with their current company.A Pearson Product Moment correlation test to determine the strength of a correlation was performed on the data in order to provide a statistical comparison of the explanatory variable (number of years with current company) with the response variable (mean perceived importance of competencies). The test revealed a correlation of 0.33 between the perceived importance of competencies and the length of time a respondent had been employed with their current company.

Conclusions, Implications, and Recommendations

Objective One-Demographic Characteristics of MU ASM Graduate Employers

Conclusions.

The subjects who participated in this study are individuals with seasoned experience in careers related to agriculture and who have spent the majority of their tenure in this field employed by the same company. Employers of MU ASM graduates have held their current position with their company for nearly two-thirds of their mean tenure.

Employers of MU ASM graduates are primarily associated with the agricultural machinery industry. Employers associated with the remaining business type categories, though fewer in number than the agricultural machinery category, are among themselves equally represented.

MU ASM graduates can expect to be supervised by managers of the departments or divisions in which they are employed. A large majority of supervisors (87.50%) have post-high school formal education. Of these respondents, most will present views from the position of employers holding baccalaureate degrees.

Respondents to the questionnaire maintain consistency in hiring MU ASM graduates though not necessarily as a result of the MU ASM co-op program. Data gathered indicates that the MU ASM co-op program is not being used by 66.67% of respondents.

Implications.

Few recent entrants into agricultural businesses are in direct supervision of MU ASM graduates. This is evidenced by the substantially large mean tenure in agriculture (M = 23 years), the current company (M = 18.55 years) and the current job position (M = 12.11 years) of respondents. Curriculum changes based on perspectives of the response group reflect considerable experience in the field of agriculture, with the current company and in the currently held position within the respondents' companies. The agricultural machinery industry dominates the field of businesses that hire MU ASM graduate with 25.00% of the respondents. The remaining businesses are not as well represented by responses to this survey. Curriculum review based on this survey may be biased toward the beliefs of the agricultural machinery industry. Employers occupying positions as the CEO or owner of the company (20.83%) and at the professional level (12.50%) were not as well represented as respondents in managerial (50.00%) positions. Respondents who have not attempted post-high school education (12.50%) are dramatically under represented in this study. Under representation is also the case for respondents who have achieved post-graduate degrees. Respondents to the questionnaire have maintained consistency in hiring MU ASM graduates though not necessarily as a result of the MU ASM co-op program. Data gathered indicates that the MU ASM coop program has not been utilized to its fullest potential. The fact that the majority of respondents (66.67%) hired zero employees as a result of the coop program is in diametric opposition to the fact that 12.50% of the respondents hired between six and nine employees as a result of this program.

Recommendations.

Replication of the study should be conducted with additional demographic questions in order to account for more variance associated with the response group. If replication of the study yields similar demographic characteristics, then MU ASM curriculum should continue to focus on the needs of respondents employed by the machinery industry as this employs the largest number of MU ASM graduates.

Objective Two-Description of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers

Conclusions.

MU ASM Graduates demonstrate no less than moderate mastery of all competencies andmoderately high levels of competence in eleven competency areas. MU ASM graduates demonstrate greater mastery in competency areas that are less skill-specific and focus more on broad categories ofcharacter and leadership. Competency areas such as "demonstrates professional ethical responsibilities" and "develops solutions to problems by locating relevant information" are demonstrated with greater mastery than skills-specific competencies such as "demonstrates skills associated with pesticide application" or "demonstrates skills associated with irrigation". MU ASM graduates demonstrate the greatest mastery of skills associated with: demonstration of professional ethical responsibilities, development of solutions to problems by locating relevant information, demonstration of effective computer skills, and application of skills in mathematics. MU ASM graduates are most lacking in skill areas including:

demonstration of skills associated with precision agriculture, demonstration of skills associated with pesticides application, demonstration of skills associated with surface water management, and demonstration of skills associated with irrigation.

Implications.

MU ASM graduates are not well prepared to meet the challenges of employment in terms of mastery of specific ASM technical skills. However, in the workplace MU ASM graduates appear to effectively demonstrate more general skills that have been acquired inadvertently through the degree program.

Recommendations.

Continued emphasis should be placed on enhancement of MU ASM graduates mastery of all skills. More emphasis should be placed on those skill areas where less mastery has been perceived by employers.Response ratingsevaluating mastery of communication skills, both oral and written, provide evidence that written skills are lacking whereas oral skills are only to a lesser extent. It should be the focus of the curriculum review committee to design curriculum to assist in development of written skills. Prior changes to curricular requirements resulted in sales, marketing and communications courses that have assisted in the development of oral communications skills. Many of the deficient areas were of a technical skill orientation. MU ASM skill areas that are already well demonstrated by MU ASM graduates should not be neglected lest the level of proficiency diminish. The team whose purpose is to review the MU ASM curriculum should also incorporate current technological advancements when revising curriculum.

Objective Three-Description of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates

Conclusions.

Employers of MU ASM graduates are seeking individuals competent in skill areas involving such things as demonstration of professional ethical responsibilities, safety, and willingness to adapt to new concepts. Employers of MU ASM graduates seek employees who possess knowledge in specific technological skills areas involving electronics and computers. Employers are also interested in individuals who are proficient in both written and oral communication skills. Employers of MU ASM graduates are less concerned with other subject-specific skills such as those associated with power distribution systems, construction of structures, surface water management, and irrigation. Courses and concepts that appear to be most necessary to MU ASM employers in the agricultural industry as well as those being adeptly demonstrated by graduates of the MU ASM program include: computer skills, adaptation to new concepts, development of solutions to problems by analyzing possible alternatives, use of financial skills, demonstration of professional ethical responsibilities, machinery management, and development of solutions to problems by locating relevant information. Each of these competencies were consistently perceived to possess a rating of 4 (moderately high) or above when evaluating importance to respondents as well as a rating of 4 (moderately high) or above when perceiving the level of mastery demonstrated by MU ASM graduates.

Implications.

Competencies associated with human resources was designated by respondents as necessary to their businesses but somewhat lacking in demonstrable skills by MU ASM graduates. Demonstration of safety in the workplace was a glaring discrepancy between what is observed of MU ASM graduates and what is expected of respondents' employees. Personal safety and safety of others is an industry-wide concern to the respondents. The agricultural industry continues to rank in the top six most dangerous occupations nationally according to The National Academy of Sciences(2007). Skill areas associated with irrigation and surface water management were the least valued and least mastered ASM skills. Technological advancements in the agricultural industry have necessitated an increased understanding of electronics in the workplace. Demonstration of professional ethical responsibilities is of paramount concern to employers and MU ASM instructors.

Recommendations.

The MU ASM curriculum review committee should emphasize mastery enhancement of all skills.Associations with other students as well as with members of the community could assist in overcoming theperceived human resource skills deficit. University or community-wide interaction by MU ASM students might further enhance their human resource skills. Curriculum planners must implement components of safety in the workplace in the MU ASM program competency-based courses. In addition, adaptation or renovation of the current course(s) devoted entirely to safety in agriculture should be considered in order to overcome this deficit. The MU ASM curriculum designers should consider the addition of an electronics course to the already useful and, according to review by survey respondents, necessary agricultural electricity course. Curriculum emphasizing continued development ofcomputer skills, adaptation to new

concepts, development of solutions to problems by analyzing possible alternatives, use of financial skills, demonstration of professional ethical responsibilities, machinery management, and development of solutions to problems by locating relevant information should continue to be offered by the program.Subject matter dealing with professional ethical responsibilities should continue to be integrated into courses offered by the program. Graduates of the MU ASM program should devote less time to developing skills associated with irrigation and surface water management than skills sought by the majority of employers.

Objective Four-Comparison of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers with Employers' Level of Education

Conclusions.

MU ASM graduates are most likely to achieve higher mastery of skills ratings from employers who have achieved a high school diploma as their highest formal education. Although the majority of MU ASM graduates are supervised by employers who have achieved a bachelor's degree as their highest formal education, they will receive moderate ratings for mastery of skills. Of the degree choices indicated by employers of MU ASM graduates, those with bachelors degrees rate lower levels of mastery by their employees than those with high school diplomas and higher than those with post graduate degrees. MU ASM graduates who are supervised by respondents with masters degrees are rated as demonstrating the least amount of skills mastery.

Implications.

MU ASM graduates demonstrate moderate mastery of skills regardless of the highest degree held by their employers. Mean employer perception of mastery diminishes when the employer completes post-high school formal education. The demographic variable associated with employers' highest level of education is not useful in explaining variance in responses.

Recommendations.

Perceptions of mastery level of MU ASM graduates should not be segregated based on employers' highest level of education. Replication of the study with additional demographic variables should be performed in order to generate additional data.

Objective Five-Comparison of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates with Employers' Level of Education

Conclusions

Employers of MU ASM graduates rate all included competencies of moderate importance. The response groups, divided according to highest degree earned, find more consensus in rating importance than mastery level of skills.

Employers who culminated their formal education with a high school diploma assign the greatest importance to the skills presented. Employers with specialists or doctoral degrees believe importance of the included skills to be less than respondents with no more than a high school diploma but of greater importance than employers with masters and bachelors degrees. At least half of the MU ASM graduates employed are

supervised by employers whose highest educational level is a bachelors degree. MU ASM graduates employed by this group will find the least amount of importance placed on the included skills.

Implications.

Employers of MU ASM graduates highest level of formal education may not explain the variance for this objective. Employers whose formal education culminated with a baccalaureate degree are, in general, satisfied with training of MU ASM graduates. This is evidenced by the fact that the rated importance level of skills is nearly the same as the perceived mastery level demonstrated by MU ASM graduates. Employers whose formal education culminated with a specialist or doctoral degree are least satisfied with the training received by MU ASM graduates in their employ since their mean perception of skills mastery is considerably less than the mean perception of skills importance.

Recommendations.

Curriculum designers should not use level of education to segregate importance of skills data. The results were of little value Replication of the study using additional demographic variables should be performed in order to provide additional data.

Objective Six-Comparison of Mastery Level of Competencies by MU ASM Graduates as Perceived by Their Employers with Employers' Business Type

Conclusions.

MU ASM graduates employed in production agriculture demonstrate the greatest amount of mastery of the included skills when compared to the other business categories

of agriculture. MU ASM graduates employed in miscellaneous areas exhibit mastery of skills superseded only by graduates employed in production agriculture. The agriculture machinery industry employs the majority of MU ASM graduates. These employees demonstrate greater mastery level than MU ASM graduates employed by the school system, agronomy, and government services.

Implications.

The MU ASM program produces graduates who demonstrate no less than mean moderate mastery of skills in all business areas. The MU ASM program is especially successful in preparing its graduates for careers in production agriculture. The program is also successful, though to a lesser extent, in preparing graduates for employment in agricultural machinery and miscellaneous business categories.

Recommendations.

The MU ASM curriculum review committee should incorporate subject material useful for graduates who seek employment in business categories ofagricultural machinery, the school system, and agronomy government services. Considerable attention should be paid to the views expressed by employers involved in the agricultural machinery industry due to the fact that this group employs the majority of MU ASM graduates. The study should be replicated specifically to all businesses representing specific areas of agriculture in order to provide more data related to business.

Objective Seven-Comparison of Importance Level Assigned to Competencies as Perceived by Employers of MU ASM Graduates with Employers' Type of Business

Conclusions.

Employers who work in government services hold the least amount of importance of the total response in the skills included in the research questionnaire. Conversely, employers involved in production agriculture find the skills included to be of the greatest importance. Employers who occupy positions in the largest reporting business group, agricultural machinery, follow closely behind those employed in production agriculture in rating the overall importance of the included skills. Employers of MU ASM graduates who work in fields of agronomy and the school system place a lesser value on the importance of the included skills than all other business types except responses from individuals in government services.

Implications.

The MU ASM program is exceeding the expectations of respondents working in production agriculture and miscellaneous business categories. This is illustrated by the fact that mean perceived mastery of skills for these business groups are greater than the mean perceived importance of the same skills. The MU ASM program is not preparing its graduates for jobs in government services-type industries. However, this group also finds the least amount of mean importance for the skills listed in the questionnaire.

Recommendations.

A Delphi study should be initiated to determine what skills are most important to each business group. Production agriculture should continue to be emphasized in the MU

ASM curriculum. In addition, skills needed by businesses involved with agronomy, the school system and agricultural machinery should be re-emphasized by curriculum designers.

Objective Eight-Describe the Relationship Between Employers' Tenure with Their Company and Perceived Mastery Level of Competencies Held by MU ASM Graduates

Conclusions.

Employers' perception of skills mastery exhibited by MU ASM graduates shows a negligible correlation to the number of years that an employer has spent with his or her company.

Implications.

Perception of skills mastery by MU ASM graduates is not influenced by an employer's tenure with the company.

Recommendations.

Curriculum review should not take respondents' tenure with their company into consideration when reviewing perceptions of skill mastery. No replication of this portion of the study is necessary due to the fact that there is negligible correlation between the variables.

Objective Nine-Describe the Relationship Between Employers' Tenure with Their Company and Perceived Importance of Competencies Held by MU ASM Graduates

Conclusions.

Employers' perceptions of skills importance is moderately related to the number of years that an employer of MU ASM graduates has been with his or her company.

Implications.

Some seasoned employers provide a better perspective about the importance of competencies sought by companies when seeking employees. The majority of respondents' perceptions of importance are not influenced by their tenure with their company.

Recommendations.

When reviewing curriculum, emphasis should not be placed on respondents' perceptions of importance as influenced by tenure with their company.

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APPENDIX A:

UNIVERSITYOF MISSOURI

AGRICULTURAL SYSTEMS MANAGEMENT

PROGRAM EVALUATION

University of Missouri

Agricultural Systems Management

Program Evaluation

Dear Survey Participant,

The following pages represent a questionnaire designed to collect information about the Agricultural Systems Management (ASM) program at the University of Missouri. You have been selected to participate in this study because you are an employer of ASM Program graduate(s). Completion of this questionnaire should take 20 minutes of less of your time. With exception of a note expressing thanks, you will receive no further materials from the researchers once they receive the returned questionnaire.

The intent of the questionnaire is to gather information in order to update the classes taught by the ASM Program in order to better meet the needs of potential employers such as yourself.

Participants often have concerns about their privacy in answering surveys. Here is how your confidentiality is protected in this survey.

(1) To protect your confidentiality, all responses will be separated from your mailing address or any other identifying information and will be associated only by a random numerical code. (2) All data will be kept in a secure location in the researcher's office. (3) No one other than the researchers will know your individual responses to any of the questions, results will be reported only in the aggregate.

All data will be destroyed three years after completion of the study. The findings will be reported to the research advisory committee and the Agricultural Systems Management Program and may be used in journal articles or other publications. Please know that you may withdraw at any time. Should you withdraw, your information will be eliminated from the study. If you wish to know the findings, a summary of the results will be forwarded to you. You may request a copy of the summary of the final reports by indicating your interest at the bottom of this page.

There is no financial remuneration for participating in this study.

There are no foreseeable risks associated with completion of this questionnaire.

Should you have any questions about subject participants rights, you may contact the University of Missouri Instructional Review Board regulating human subjects research at Campus Institutional Review Board, 483 McReynolds, University of Missouri, Columbia, MO 65211, phone 573 882-9585, fax 573 884-0663

If you have any questions about any aspect of this study or your involvement, please contact Shannon Snyder at 1-800-995-8503 or email scsy92@missouri.edu before indicating your consent to participate.

Consent. If you agree please check the box next to "I have read the consent form and agree to participate in the research study" below and then move to the next page to start taking the survey.

- ❑ I have read the consent form and agree to participate in the research study.
- ❑ I do not agree.
- ❑ I would like to receive a copy of the summary of the final reports.

Instructions

Important skills that we believe graduates of the Agricultural Systems Management (ASM) program should possess are included in this questionnaire. We are seeking your input regarding the mastery of those skills possessed by the graduates of our program who are currently in your employ. Please consider the most recent MU ASM graduate you work with as you respond to this questionnaire.

We request that you provide us information about the listed skills regarding our graduates *and* your organization. In doing so, you will circle two response choices for each item.

Should you experience discomfort as a result of answering any of the survey questions, feel free to simply leave the question blank and proceed to the next item.

- In the left column, please indicate the graduate's level of mastery in performing each listed skill using the following scale:

  1 = Low mastery
  2 = Moderately low mastery
  3 = Moderate mastery
  4 = Moderately high mastery
  5 = High mastery

- In the right column, please indicate the importance of each listed skill as it pertains to your organization using the following scale:

  1 = Low importance
  2 = Moderately low importance
  3 = Moderate importance
  4 = Moderately high importance
  5 = High importance

Sample Question:

In the sample below, the respondent believes the MU ASM graduate has high mastery of the skill and the skill is of moderate importance to the organization.

Skills Do our graduates:	Level of Mastery of the Skill Low	Mod. Low	Moderate	Mid. High	High	NA	Importance of the Skill to Your Organization Low	Mod. Low	Moderate	Mid. High	High	NA
#. demonstrate skills associated with irrigation?	1	2	3	4	(5)	NA	1	2	(3)	4	5	NA

Please begin on the next page →

Assessment of Skills

For each item, provide a response for "Level of Mastery of the Skill" and "Importance of the Skill to Your Organization."

Skills Do our graduates:	Level of Mastery of the Skill Low		Mod. Low		Moderate		Mid. High		High		Importance of the Skill to Your Organization Low		Mod. Low		Moderate		Mid. High		High	
1. apply skills associated with mathematics?	1	2	3	4	5	NA	1	2	3	4	5	NA
2. apply skills associated with science? (i.e. chemical formulations, biological applications, force and motion, fluid movement, etc.)	1	2	3	4	5	NA	1	2	3	4	5	NA
3. effectively use scientific technologies? (i.e. biofuels technology, electronics technology, plant and soil nutrition and application technology, etc.)	1	2	3	4	5	NA	1	2	3	4	5	NA
4. incorporate safety in the workplace?	1	2	3	4	5	NA	1	2	3	4	5	NA
5. demonstrate effective computer skills?	1	2	3	4	5	NA	1	2	3	4	5	NA
6. develop solutions to problems by locating relevant information?	1	2	3	4	5	NA	1	2	3	4	5	NA
7. develop solutions to problems by analyzing possible alternatives?	1	2	3	4	5	NA	1	2	3	4	5	NA
8. effectively use financial management skills?	1	2	3	4	5	NA	1	2	3	4	5	NA
9. demonstrate skills associated with marketing of a product?	1	2	3	4	5	NA	1	2	3	4	5	NA
10. understand the global dimensions of agriculture?	1	2	3	4	5	NA	1	2	3	4	5	NA
11. demonstrate effective written communication skills?	1	2	3	4	5	NA	1	2	3	4	5	NA
12. demonstrate effective oral communication skills?	1	2	3	4	5	NA	1	2	3	4	5	NA
13. effectively demonstrate human resource skills?	1	2	3	4	5	NA	1	2	3	4	5	NA
14. demonstrate professional ethical responsibilities?	1	2	3	4	5	NA	1	2	3	4	5	NA
15. demonstrate a willingness to adapt new concepts?	1	2	3	4	5	NA	1	2	3	4	5	NA

Please continue ➡

Skills Do our graduates:	Level of Mastery of the Skill Low		Mod. Low		Moderate		Mid. High		High		Importance of the Skill to Your Organization Low		Mod. Low		Moderate		Mid. High		High	
16. demonstrate knowledge required to construct agricultural structures?	1	2	3	4	5	NA	1	2	3	4	5	NA
17. demonstrate skills associated with project management? (i.e. machinery, landscape, buildings, proposal, presentation.)	1	2	3	4	5	NA	1	2	3	4	5	NA
18. demonstrate skills associated with pesticides application?	1	2	3	4	5	NA	1	2	3	4	5	NA
19. demonstrate skills associated with internal combustion engines?	1	2	3	4	5	NA	1	2	3	4	5	NA
20. demonstrate skills associated with machine power distribution systems? (i.e. transmissions, planetary systems, belt drives, chain drives, etc.)	1	2	3	4	5	NA	1	2	3	4	5	NA
21. demonstrate skills associated with machinery management?	1	2	3	4	5	NA	1	2	3	4	5	NA
22. effectively analyze performance data?	1	2	3	4	5	NA	1	2	3	4	5	NA
23. demonstrate skills associated with materials handling? (i.e. grain, hay, manure, silage.)	1	2	3	4	5	NA	1	2	3	4	5	NA
24. demonstrate skills associated with hydraulics?	1	2	3	4	5	NA	1	2	3	4	5	NA
25. demonstrate skills associated with irrigation?	1	2	3	4	5	NA	1	2	3	4	5	NA
26. demonstrate skills associated with surface water management?	1	2	3	4	5	NA	1	2	3	4	5	NA
27. demonstrate skills associated with precision agriculture?	1	2	3	4	5	NA	1	2	3	4	5	NA
28. demonstrate skills associated with 12 volt electricity? (i.e. machinery systems)	1	2	3	4	5	NA	1	2	3	4	5	NA
29. demonstrate skills associated with 120 volt electricity? (i.e. building or structural systems)	1	2	3	4	5	NA	1	2	3	4	5	NA
30. demonstrate proficiency in using electronics technology? (i.e. programmable logic controllers, machine control panels, micro sensing systems, etc.)	1	2	3	4	5	NA	1	2	3	4	5	NA

Please continue ➡

In your own words, please provide your overall evaluation of our graduates.

What potential new course topics do you believe should be an integral part of today's and future Agricultural Systems Management degree programs?

Please continue

What additional skills/skill areas should the ASM program emphasize/de-emphasize?

Additional Comments:

Please continue

Demographic Information

How long have you been involved with agriculture? _____

What is the name of the company that you work for? _____

What is your job title? _____

Including this year, how long have you worked for this company? _____

Including this year, how long have you held your current position with this company? _____

Have you obtained further formal education after high school? _____

If you have obtained further formal education after high school please list your highest degree earned. _____

If you obtained further formal education after high school please list the institution that you attended. _____

If you obtained further formal education after high school please indicate when you completed that education. _____

How many University of Missouri Agricultural Systems Management (ASM) graduates have you or your organization hired in the past five years? _____

How many University of Missouri ASM interns and/or co-ops have you or your organization hired in the past five years? _____

Please use the pre-addressed, postage-paid envelope to return this questionnaire to the researchers.

Thank you for participating in this study!

If you have any questions or comments feel free to contact:

Mr. Shannon Snyder
207 Agricultural Engineering Building
Columbia, MO 65211
1 800 995 8503
scsy92@missouri.edu

APPENDIX B:

INTRODUCTION POSTCARD TO EMPLOYERS

Dear _____

In a few days you will receive a questionnaire designed to collection information about the Agricultural Systems Management (ASM)program at the University of Missouri. You have been selected to participate in this study because you are an employer of ASM Program graduate(s).

I am contacting you prior to the actual mailing of the questionnaire because many people prefer to know in advance that they will be receiving a request of their time. Your response to this questionnaire is important because it will be used to evaluate and update the educational curriculum of theASM program.

Thank you for your time and consideration. With your input, we will be able to ensure that our graduates are best prepared for employment in this vitally important field.

Sincerely,

Shannon C. Snyder
Graduate Student

Leon G. Schumacher
Professor

Shannon C. Snyder
207 Agricultural Engineering Building
Columbia, MO 65211

Mr. John Doe
12345 Anywhere Street
Somewhere, MO 65123

APPENDIX C:

QUESTIONNAIRE COVER LETTER

UNIVERSITY OF MISSOURI LETTERHEAD

Today's date
Respondent name
Respondent address
Respondent address

We recently sent you a postcard concerning our efforts to review the Agricultural Systems Management (ASM) Program at the University of Missouri. We believe that the first step in this process is to determine the skills/competencies needed by our graduates.

As we mentioned on the post card, one of our alumni listed you as their employer. We believe that your input concerning how well you consider your employee(s) was prepared will help the ASM faculty determine what modifications are needed in the ASM curriculum.

Your response to this questionnaire is completely voluntary. However, it will be of great assistance to the ASM program if you are able to provide your opinions concerning the items listed on the questionnaire. If you prefer not to respond, simply return the blank questionnaire in the enclosed stamped envelope. The input you provide will be kept confidential and will only be released in summary form so that no individual's name will be identified. When we receive your completed questionnaire, your name will be deleted from the mailing list and will never in any way be connected with the information that you have provided.

If you have any questions or comments about this study please feel free to contact us. Our toll-free phone number is: 1-800-995-8503. You can write to us at the address on the letterhead, or email Shannon Snyder at scsy92@missouri.edu.

Thank you very much for helping with this important study!

Sincerely,

Shannon C. Snyder
Graduate Student
Agricultural Education

Leon G. Schumacher
Professor Agricultural Systems Management, Biological Engineering Department

APPENDIX D:

REMINDER CARD TO EMPLOYERS

June 13, 2007

A few weeks ago a questionnaire requesting your input about the Agricultural Systems Management (ASM) Program at the University of Missouri was sent to you. You were selected to receive the questionnaire because you were indicated as an employer of ASM graduates.

If you have completed and returned the questionnaire to us, please accept our thanks. If not, please take the time to do so today. We are especially thankful for your help because it is only with your input that we are able to prepare our graduates for success in the workplace.

If you did not receive a questionnaire, or if it was misplaced, please call us toll-free at 1 - 800-995-8503 or email scsy92@missouri.edu and we will send you another today.

Sincerely,

Shannon C. Snyder
Graduate Student
Agricultural Education
University of Missouri

Leon G. Schumacher
Professor
Agricultural Systems Management
University of Missouri

APPENDIX E:

FOURTH CONTACT COVER LETTER

UNIVERSITY OF MISSOURI LETERHEAD

Today's Date
Respondent name
Respondent address
Respondent address

Nearly a month ago we sent you a questionnaire that sought input about the materials taught in the Agricultural Systems Management (ASM) Program at the University of Missouri. To the best of our knowledge the questionnaire has not yet been returned.

Due to the diversity of careers pursued by our graduates, the responses to the questionnaire that have been received back have shown a variety of skills needed. The insight gained from responses submitted by other people via their returned questionnaires has helped teachers in the ASM Program form a basis for developing future materials taught.

We are contacting you again because of the importance that your questionnaire has for helping to get accurate results. We hope to receive a genuine representation from all employers of ASM graduates in order that no career area is overlooked. The focus of the ASM program is to prepare informed individuals for service in a field of their choosing relative to their education. Completion of this questionnaire will serve as your contribution to aid in the fulfillment of this goal.

If you believe that you are ineligible to complete the questionnaire due to the fact that you may no longer employ an ASM graduate, please let us know by writing it on the cover of the questionnaire so that we can remove your name from the list when the packet is returned.

A note with regard to confidentiality of the materials gathered by this questionnaire. An identification number which corresponds with your name is printed on the label of the return envelope. This method is used so that we can determine which responses have been received and can appropriately remove these names from our mailing list. After all the questionnaires have been received, the list of names will be destroyed so that individual persons cannot be connected with the results in any way. Protecting the confidentiality of people's answers is very important to us as well as to the University.

We hope that you will fill out and return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning a note or blank questionnaire in the enclosed stamped envelope.

Sincerely

Shannon C. Snyder
Graduate Student
Agricultural Education
University of Missouri

Leon G. Schumacher
Professor
Agricultural Systems Management
University of Missouri

P.S. If you have any questions Please feel free to contact me. The toll free number where I can be
reached is 1-800- 995-8503 or email at scsy92@missouri.edu

APPENDIX F:

FREQUENCY AND PERCENT OF EMPLOYERS' PERCEIVED MASTERY OF COMPETENCIES RESPONSES

Table 15.

Frequency and Percent of Perceived Mastery Level of Competencies

	Frequency / Percent					
Skill	1	2	3	4	5	N/A
Apply skills associated with mathematics	0/0	0/0	5/19.2	10/38.5	11/42.3	0/0
Apply skills associated with mathematics	1/3.8	0/0	8/30.8	10/38.5	5/19.2	2/7.7
Effectively use scientific technologies	1/3.8	0/0	7/26.9	8/30.8	4/15.4	6/23.1
Incorporate safety into the workplace	0/0	0/0	7/26.9	13/50	6/23.1	0/0
Demonstrate effective computer skills	0/0	0/0	4/15.4	11/42.3	10/38.5	1/3.8
Develop solutions to problems by locating relevant information	0/0	0/0	2/7.7	14/53.8	9/34.6	1/3.8
Develop solutions to problems by analyzing possible alternatives	0/0	0/0	6/23.1	9/34.6	10/38.5	1/3.8
Effectively use financial skills	0/0	0/0	6/23.1	12/46.2	7/26.9	2/7.7
Demonstrate skills associated with marketing of a product	0/0	1/3.8	9/34.6	5/19.2	5/19.2	6/23.1
Understand the global dimension of agriculture	1/3.8	1/3.8	6/23.1	8/30.8	2/7.7	8/30.8
Demonstrate effective written communication skills	0/0	0/0	12/46.2	6/23.1	8/30.8	0/0
Demonstrate effective oral communication skills	0/0	0/0	4/15.4	14/53.8	8/30.8	0/0
Effectively demonstrate human resource skills	0/0	1/3.8	8/30.8	12/46.2	3/11.5	2/7.7
Demonstrate professional ethical responsibilities	0/0	0/0	2/7.7	11/42.3	13/50	0/0
Demonstrate a willingness to adapt to new concepts	1/3.8	0/0	3/11.5	12/46.2	10/38.5	0/0
Demonstrate knowledge required to construct agricultural structures	1/3.8	1/3.8	1/3.8	7/26.9	5/19.2	11/42.3
Demonstrates skills associated with project management	0/0	0/0	3/11.5	9/34.6	6/23.1	8/30.8
Demonstrate skills associated with pesticides application	1/3.8	1/3.8	6/23.1	2/7.7	2/7.7	13/50
Demonstrate skills associated with internal combustion engines	0/0	1/3.8	5/19.2	4/15.4	4/15.4	12/46.2
Demonstrate skills associated with machine power distribution systems	0/0	2/7.7	7/26.9	4/15.4	4/15.4	9/34.6

Table 15 (Continued).

Frequency and Percent of Perceived Mastery Level of Competencies

	Frequency / Percent					
Skill	1	2	3	4	5	N/A
Demonstrate skills associated with machinery management	0/0	0/0	7/26.9	4/15.4	7/26.9	8/30.8
Effectively analyze performance data	1/3.8	1/3.8	5/19.2	9/34.6	6/23.1	4/15.4
Demonstrate skills associated with materials handling	1/3.8	2/7.7	6/23.1	6/23.1	4/15.4	7/26.9
Demonstrate skills associated with hydraulics	0/0	2/7.7	4/15.4	9/34.6	3/11.5	8/30.8
Demonstrate skills associated with irrigation	1/3.8	3/11.5	4/15.4	2/7.7	1/3.8	15/57.7
Demonstrate skills associated with surface water management	1/3.8	2/7.7	3/11.5	4/15.4	1/3.8	15/57.7
Demonstrate skills associated with precision agriculture	1/3.8	2/7.7	4/15.4	4/15.4	2/7.7	13/50
Demonstrate skills associated with 12 volt electricity	0/0	2/7.7	4/15.4	6/23.1	8/30.8	6/23.1
Demonstrate skills associated with120 volt electricity	1/3.8	1/3.8	4/15.4	8/30.8	4/15.4	8/30.8
Demonstrate proficiency in using electronics technology	0/0	3/11.5	4/15.4	6/23.1	6/23.1	7/26.9

Note. Scale: 1.00–1.50 = Low Competence, 1.51 – 2.50 = Moderately Low Competence, 2.51 – 3.50 = Moderate Competence, 3.51 – 4.50 = Moderately High Competence, 4.51 – 5.00 = High Competence.

APPENDIX G:

FREQUENCY AND PERCENT OF EMPLOYERS' PERCEIVED IMPORTANCE OF COMPETENCIES RESPONSES

Table 16.

Frequency and Percent of Perceived Importance Level of Competencies

	Frequency / Percent					
Skill	1	2	3	4	5	N/A
Apply skills associated with mathematics	0/0	1/3.8	4/15.4	14/53.8	7/26.9	0/0
Apply skills associated with mathematics	1/3.8	2/7.7	6/23.1	9/34.6	6/23.1	2/7.7
Effectively use scientific technologies	2/7.7	1/3.8	4/15.4	8/30.8	5/19.2	6/23.1
Incorporate safety into the workplace	0/0	0/0	2/7.7	5/19.2	19/73.1	0/0
Demonstrate effective computer skills	0/0	0/0	4/15.4	8/30.8	13/50	1/3.8
Develop solutions to problems by locating relevant information	0/0	0/0	1/3.8	9/34.6	15/57.7	1/3.8
Develop solutions to problems by analyzing possible alternatives[A]						
Effectively use financial skills	0/0	0/0	3/11.5	9/34.6	12/46.2	1/3.8
Demonstrate skills associated with marketing of a product	2/7.7	2/7.7	4/15.4	3/11.5	10/38.5	5/19.2
Understand the global dimension of agriculture	2/7.7	3/11.5	5/19.2	4/15.4	5/19.2	7/26.9
Demonstrate effective written communication skills	0/0	1/3.8	5/19.2	7/26.9	13/50	0/0
Demonstrate effective oral communication skills	0/0	0/0	1/3.8	11/42.2	14/53.8	0/0
Effectively demonstrate human resource skills	0/0	0/0	3/11.5	11/42.3	10/38.5	2/7.7
Demonstrate professional ethical responsibilities	0/0	0/0	2/7.7	3/11.5	21/80.8	0/0
Demonstrate a willingness to adapt to new concepts	0/0	0/0	1/3.8	8/30.8	17/65.4	0/0
Demonstrate knowledge required to construct agricultural structures	3/11.5	2/7.7	4/15.4	6/23.1	2/7.7	9/34.6
Demonstrates skills associated with project management	0/0	1/3.8	4/15.4	8/30.8	5/19.2	8/30.8
Demonstrate skills associated with pesticides application	2/7.7	3/11.5	1/3.8	4/15.4	3/11.5	13/50
Demonstrate skills associated with internal combustion engines	2/7.7	4/15.4	2/11.5	2/7.7	5/19.2	10/38.5
Demonstrate skills associated with machine power distribution systems	3/11.5	3/11.5	4/15.4	5/19.2	4/15.4	7/26.9

Table 16 (Continued).

Frequency and Percent of Perceived Mastery Level of Competencies

	Frequency / Percent					
Skill	1	2	3	4	5	N/A
Demonstrate skills associated with machinery management	0/0	1/3.8	1/3.8	8/30.8	9/34.6	7/26.9
Effectively analyze performance data	0/0	2/7.7	7/26.9	10/38.5	3/11.5	4/15.4
Demonstrate skills associated with materials handling	4/15.4	0/0	5/19.2	5/19.2	4/15.4	8/30.8
Demonstrate skills associated with hydraulics	2/7.7	3/11.5	3/11.5	6/23.1	5/19.2	7/26.9
Demonstrate skills associated with irrigation	4/15.4	1/3.8	4/15.4	2/7.7	1/3.8	14/53.8
Demonstrate skills associated with surface water management	2/7.7	2/7.7	4/15.4	2/7.7	2/7.7	17/53.8
Demonstrate skills associated with precision agriculture	2/7.7	1/3.8	2/7.7	7/26.9	2/7.7	12/46.2
Demonstrate skills associated with 12 volt electricity	0/0	1/3.8	6/23.1	4/15.4	9/34.6	6/23.1
Demonstrate skills associated with120 volt electricity	2/7.7	2/7.7	5/19.2	5/19.2	5/19.2	7/26.9
Demonstrate proficiency in using electronics technology	0/0	2/7.7	4/15.4	4/15.4	9/34.6	7/26.9

Note. Scale: 1.00–1.50 = Low Competence, 1.51 – 2.50 = Moderately Low Competence, 2.51 – 3.50 = Moderate Competence, 3.51 – 4.50 = Moderately High Competence, 4.51 – 5.00 = High Competence.

[A] One respondent did not provide a score for this section.