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The following is a summary of a graduate study by Dennis Schroeder, Vo Ag Instructor at Marshall, Minnesota with his advisor, Dr. Gary Leske.

## An Evaluation of the Importance of Agricultural Machinery Competencies to Farmers in Southwestern Minnesota

Dennis Schroeder

This study was undertaken to determine the importance farmers in southwestern Minnesota assign to performing specific agricultural machinery competencies in order to develop the most appropriate curriculum for agricultural machinery courses in vocational agriculture programs in southwestern Minnesota. The specific objectives were to: (1) identify specific competencies in the area of agricultural machinery, (2) determine the importance farmers of southwestern Minnesota assign to performing specific agricultural machinery competencies, (3) evaluate who performs specific competencies associated with given agricultural machinery on southwestern Minnesota farms, and (4) develop a model agricultural machinery curriculum.

The survey instrument contained 108 competency statements in three major sections: services and routine maintenance competencies for specific agricultural machines, general machinery competencies, and specific agricultural machinery competencies. The importance of performing scale ranged from 1 to 5 with 5 being essential. The who performs question had five possible responses: always myself (you, your family or employees), usually myself, 50/50, usually agribusiness, always agribusiness (company, service or repair personnel) and does not apply.

The author and 4 other instructors used Farm Management class time to contact the 55 farmers who completed surveys. These farmers were from 10 of the 16 counties of southwestern Minnesota. Cooperating instructors were provided transparencies and written materials to use in explaining the survey and survey instruments to the cooperating farmers.

The following conclusions were drawn based upon the information obtained.

1. The top six machines ranked in order of importance of performing service and routine maintenance were the row-crop planter, crop sprayer, combine, moldboard plow, drilling equipment and field cultivator.
2. Of all the machines surveyed, the performance of service and routine maintenance by agribusiness personnel was the highest

for the anhydrous ammonia and the dry chemical application equipment. With mean scores of 4.17 and 4.04, farmers indicated that these competencies are still important.

3. Soil rollers and pulverizers along with the rotary tiller were designated the lowest tillage machines in terms of importance of performing service and routine maintenance competencies.
  4. Bale wagons and transport equipment competencies were ranked the lowest in importance in the harvesting equipment area.
  5. Seventy-four percent of the general machinery competencies were rated above 4.00 on the scale of 5 to 1. One hundred percent of the farmers designated the top seven general machinery competencies as applying to their operation. These were: lubricate appropriate points; perform field adjustments; adjust equipment for initial operation; service, maintain and adjust belts, chains, pulleys, universals and other driveline parts; set-up tractor for equipment operation; read and interpret operator's manual; and service and maintain hydraulic and electrical parts.
  6. Farmers designated the read and interpret operator's manual competency as the competency most likely to be performed themselves or usually themselves.
  7. The loading and unloading of crated equipment competency ranked lowest for the entire survey in terms of mean score.
  8. Ninety-one percent of the specific machinery competencies were rated 4.00 or higher on a scale of 5 to 1.
  9. The top 17 specific competencies were all from the planting, harvesting and chemical application areas. Tillage and crop cultivation competencies were rated lower in importance by the farmers surveyed although 13 of these competencies were designated essential by 70 percent or more of the respondents.
  10. There was an apparent direct correlation between the percent of farmers recording the competencies as essential and the percent of farmers performing machinery competencies themselves. As the percent designated essential dropped, the percent of farmers performing that competency themselves usually dropped. Because of the high predictability of the responses to the importance and the who performs categories, the authors question whether future studies need to ask both questions.
- A model outline for an intensive nine week agricultural machinery curriculum was developed as a result of the data obtained. The outline follows:

## Model Agricultural Machinery Curriculum Outline.

### General Machinery Competencies

1. Lubricate agricultural machinery
2. Service, maintain and adjust belts, chains, pulleys, universals and other driveline parts
3. Service and maintain hydraulic and electrical parts
4. Service and maintain wheels, tires and bearings
5. Describe recommended safety precautions
6. Service and maintain frame and hitch parts
7. Describe the fundamentals of machine operation
8. Identify component parts of each machine
9. Calculate potential field capacity

### Row Crop Planter

1. Read and interpret operator's manual
2. Set-up tractor for equipment operation
3. Adjust equipment for initial operation and unit spacing
4. Lubricate appropriate points
5. Perform field adjustments: leveling mechanisms and depth of seed placement
6. Read and interpret instructions on seed containers for correct selection of metering
7. Calibrate fertilizer and chemical applicators
8. Determine proper rate of travel to correspond with field and machinery conditions
9. Interpret readings of seed monitoring devices
10. Service, maintain and adjust: seed hoppers, agitators, seed tubes, fittings, meters, applicators, pumps and other parts
11. Trouble shoot equipment under field or shop conditions
12. Operate equipment safely under field and transport situations

### Crop Sprayer

1. Read and interpret operator's manual and nozzle selection literature
2. Determine application rates based on field, climatic, equipment and chemical requirements
3. Select crop sprayer nozzlers for desired application rate and pressure
4. Determine rate of travel
5. Calculate required quantities per acreage
6. Set-up tractor for equipment operation
7. Lubricate and perform field adjustments
8. Service, maintain and adjust: sprayer nozzles and fittings; regulators; gauges; filters; strainers; valves and other sprayer components
9. Trouble shoot equipment under field or shop conditions
10. Operate safely under field and transport situations

### Combine

1. Read and interpret operator's manual
2. Adjust for initial operation: concaves, cylinders, sieves, cutting and other components
3. Lubricate and perform field adjustments
4. Service maintain and adjust: air flow com-

ponents; knives, flails, sickles and other cutting components; ear snappers; pick-up attachment; safety devices; and other combine parts

5. Trouble shoot under field or shop conditions: identify the source of harvest losses and calculate cylinder and threshing losses
6. Remove and install head components
7. Operate equipment safely under field and transport situations

### Moldboard Plow

1. Read and interpret operator's manual
2. Set-up tractor for equipment operation
3. Adjust for initial operation and tillage depth
4. Lubricate and perform field adjustments
5. Trouble shoot equipment under field or shop conditions
6. Operate equipment safely under field and transport situations

### Drilling Equipment

1. Read and interpret operator's manual and instructions on seed containers
2. Set-up tractor and adjust equipment for initial operation
3. Determine proper rate of travel to correspond with field and machinery conditions
4. Lubricate appropriate points
5. Perform field adjustments: depth of seed placement and leveling mechanisms
6. Service, maintain and adjust hoppers, agitators, seed tubes, fittings, chains, and other component parts
7. Trouble shoot equipment under field or shop conditions
8. Operate equipment safely under field and transport situations

### Field Cultivator

1. Read and interpret operator's manual
2. Set-up tractor and adjust equipment for initial operation
3. Lubricate and perform field adjustments
4. Service, maintain and adjust cultivation equipment
5. Trouble shoot equipment under field or shop conditions
6. Operate equipment safely under field and transport situations

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Since the University of Minnesota granted its first B.S. degree in Agricultural Education, industry and government have sought to hire highly qualified agriculturists and educators from the teaching ranks of Vocational Agriculture Instructors. Elmer Ziegenhagen wrote the following article for the July Visitor in 1944.

### GREENER PASTURES

Elmer Ziegenhagen, University of Minnesota

When an individual gives up a certain type of work in favor of some other, it is often found that the change is made because "other pastures look greener". On first thought that would not seem to require any further explanation but actually there might be some point in analyzing, as it were, the viewpoint of persons leaving a profession such as that of teaching vocational

agriculture. There are two reasons why I make this statement. First of all there are those who leave the profession because of certain dissatisfactions about the work. If it is true that the men who leave the profession because they are dissatisfied agree to any considerable extent as to the source of these dissatisfactions, it suggests that possibly there are things which might be improved, and that such improvements would bring about considerable benefits to the whole program. One usually does not become dissatisfied about his work overnight. It is generally a cumulative type of thing which finally builds up to the point where it prompts some action. There can be no question that a person going through such a process of metamorphosis is handicapped in his work and his program suffers accordingly. I am not thinking so much about the fellow who becomes dissatisfied and soon leaves the profession and gets into some other field, that is perhaps more to his liking. The bigger problem, as I see it, is that many of the men who stay in the profession for years are perhaps bothered by the same factors which eventually contribute to many another man choosing a different type of work. The "Old-timer" may be less susceptible to these irritations but just the same they do not contribute anything to his welfare or the quality of work he is doing. The point that I am trying to make here is that we might do well to try to discover what some of these "burs under the tail", are rather than take a passive attitude toward the situation. Stability within a profession contributes not only to the welfare of the profession itself, but also to each person who is engaged in the profession. I would suggest that more might be done in an effort to discover the reasons why teachers leave the profession. The results of such studies should be applied with the idea of making changes wherever possible so as to make the profession more attractive and thus contribute toward increased stability and pave the way to greater progress.

The second main reason why teachers voluntarily leave the profession is not that they are particularly dissatisfied with their work in vocational agriculture but rather that they see better opportunities elsewhere. It should go without saying that this is a healthy situation and certainly is to be encouraged. It would indeed be a sad situation if the caliber of vocational agriculture teachers in general were such that they were never sought by other fields. If you talk to the good agriculture teachers, who have been on the job for many years, you will find that they have all had a number of offers to go into other lines but have chosen to stay with their first love - teaching agriculture. Show me a man who is doing a real job of teaching agriculture, and I will show you a man who would do equally as good a job in most any other related field. Thus, even though top-notch men leaving the profession is in itself a weakening process, I believe that it is to the benefit of the profession to have a program which develops men who are good enough to find even better opportunities in other fields. Everything that can possibly be done should be done to encourage this.

I would like to enumerate some of the factors which are or might be contributing toward the

development and improvement of teachers of agriculture to the extent where they are able to do a really effective job in teaching and also which contribute toward the opening up of other opportunities for what we will call advancement in other lines. This will also touch on those things which made for contentment and satisfaction of those who continue in the profession.

The problem must inevitably go back to the selection of high school graduates who are encouraged to go on in the field of agricultural education. I believe that generally the best teachers come up from the ranks as former vocational agriculture students and FFA members. That kind of experience is just as valuable for a prospective teacher as regular farm experience is for a boy who is going into farming. It follows then that, if we are going to have a continuous supply of men who are to join the profession and will be worthy additions, it is largely up to the present teachers to see that some of their best students, who have the prerequisite characteristics and abilities, get headed into the University training program in preparation for teaching agriculture. No matter what the administrators, or you as a professional organization do, you cannot get around the necessity of having good teacher material continually coming into the program.

The next step is to provide a good training program which will make available a constant supply of teachers that know what the job consists of and who will have the necessary abilities and experiences to be able to go out and do a good job without floundering around for several years in an effort to get their feet on the ground and find out what it is all about. There is no need for us to hesitate in saying that the training program has by no means been perfect in the past. It is encouraging to see that efforts are continually being made to improve the training program. Most divisions recognize the importance of making adjustments in college courses which will better meet the needs of prospective teachers of vocational agriculture. If you, individually or as an organization, can contribute anything to the study by the Department of Agricultural Education in an attempt to discover the strong points and deficiencies of the training program in the past with the thought of being ready to make such adjustments as might be necessary when we again get back to normal registration in the college, I am sure that you will be making a contribution which is very much worthwhile. Having had several years of experience with a practice teaching center, I might also add the comment that, in my opinion, one of the greatest deficiencies in the program in the past has been the fact that the supervised teaching experience program has been quite inadequate. That is no reflection on anyone in particular because it is no small job to set up a student teaching experience program that will tie in with the whole University curriculum and which will not interfere with the program in other divisions. Such changes come about rather slowly. I hope, however, that we are about at the stage where conditions are ripe for a change which will allow more time for this very important phase of the training program. In my opinion suggestions of a fifth year, which would

be largely apprenticeship work, are not carrying the idea too far by any means. I feel confident that many good men have left the profession after one or two years of teaching simply because of the discouragements which resulted from lack of adequate preparation for the job, and which was caused by too short an apprenticeship teaching program while in college. Going back to the point I made earlier, all of us as teachers would have benefited by having these men stay with the profession for a longer period of time than just a year or two.

Another point which I think adds immensely to the possibilities for growth and development of the individual and which keeps the door open to possibilities for advancement is following up on professional improvement work. Of course that is difficult in these times but in normal times I am convinced that the profession would benefit and so would also each individual if more teachers followed a systematic and well-planned program of graduate work. Not necessarily that the credits in themselves would mean so much but rather that a systematic program of study is definitely necessary to stimulate professional growth and to keep a person from going stale on the job.

The points which I have touched on thus far all deal more or less with problems which concern the individual teacher. I would like to mention a few problems which pertain to you as an organization. I cannot visualize much progress being made as a profession if each individual teacher is left to feel that all that matters is what goes on in his own little sphere. The psychological effect of feeling that one belongs to a strong organization which is going places is of inestimable value. When you add to this the actual benefits which an organization can bring to its individual members, it appears to me to be one of the most effective forces of bringing about a sense of satisfaction about the work and of generating enthusiasm and promoting real progress.

Perhaps it is unfortunate that we have to depend on organizations to act more or less as pressure groups at times to bring about needed changes and adjustments. Fundamentally, though, I see no harm in pressure groups if they are rightly used. After all, they are a form of democracy in action. As such, I see the continued need for as strong an organization in this as in any other profession. If we keep an organization on sound principles and if we stay within the territory defined by our program, I do not think we need to be afraid of criticism. The fact remains that you men know your job better than anyone else. You must be strong enough individually, and as a group, to exert some influence in formulating policies in a truly democratic manner. I hope I am not misunderstood in that. My only plea is for you as an organization to keep your ear to the ground at all times and listen for rumblings which might, through misguided judgement on the part of some individual or some other group, lead to the relegating of your program to some back-seat position which is not commensurate with its importance. By being alert to such matters and by giving evidence that you do have a well formulated concept of what your program should

be and where it should be heading, you will be demanding strong leadership. There can be no substitute for strong leadership. The blind cannot lead the blind, Neither can the blind lead those who have vision. All this, I insist, is possible through purely democratic processes which can function through the medium of a strong, sound organization in which every member has a part to play.

In closing may I very briefly summarize the points I have tried to make in this little recital which simply expresses some of the opinions of a "has-been" in the profession and which are given purely for what they may be worth. There are two main reasons why teachers voluntarily leave the profession; one is that they are dissatisfied with the work and the other is that they see greater opportunities elsewhere. As to the first of these, I have suggested that insofar as stability within the profession is to be desired, it would be well to attempt to discover the major sources of dissatisfaction and study the possibilities of eliminating their causes. It is a healthy thing to have teachers advancing to better opportunities in other fields. It is desirable to encourage improvement and progress which might eventually lead to advancements even though they be in another field. However, in order to keep the profession strong it is necessary to continually recruit some of the best material available as a source supply of good teachers. Training programs need to be improved, and I might add here that more in-service training and assistance would seem also to be highly desirable. Continuous professional improvement work is necessary to bring about maximum progress. And finally, strong organization and loyalty of those engaged in the profession is indispensable.

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