Farmers' Use of Strategies in Machinery Trades

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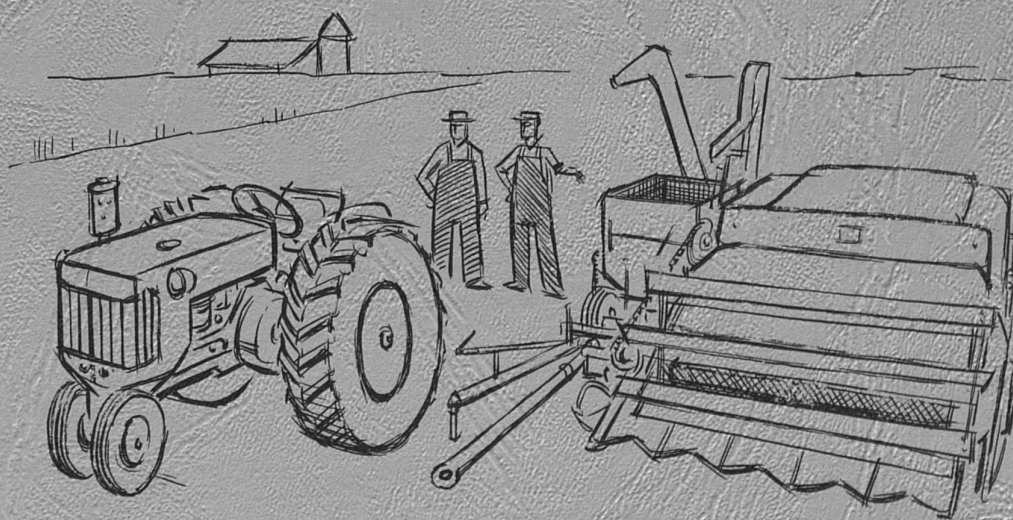
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INTRODUCTION

Farmers often find themselves in bargaining or trading positions with other individuals. The trading or bargaining may be done with relatives, neighbors, the corner grocery store, the feed man, or strangers. Usually the persons involved in the trade do not possess the same information about the items to be traded, the personalities of the "opponent(s)" and other considerations that might enter into the bargaining. In this kind of situation an individual may use certain devices, techniques, or expressions that we may call "strategies" to enhance his position. In situations where strategies are used we might consider such trades as "games."

If we wish to extend our analogy we can classify trades according to the various characteristics of the game involved. We could classify games according to these characteristics: (1) number of players, (2) amount of pay-off, (3) number of plays or moves in the game, and (4) amount of information each player possesses.

Several examples will demonstrate the feasibility of classifying by the above characteristics. (1) A trade between two neighbors could be called a two-person game, whereas a deal between a farmer, a trucker, and the livestock buyer would be a three-person game. (2) The amount of payoff or the net effect of the trade for the first player is $100 in the situation where a farmer trades one of his cows worth $200 for two of his neighbors' sows worth $100. (3) While in chess or checkers a play of the game is easily discerned as the moving of a "man," it is not so easily recognized in real life games. A move might include a whole sequence of actions, one spoken word, or even a gesture. (4) The amount of information available to the players regarding past plays will vary with the individuals involved. Trades between strangers compared to trades between fathers and their sons will be affected differently by the amount of information they possess about one another.

The most important feature of games or trades from the standpoint of the participants is the outcome. The strategy or strategies that the players use determine the outcome. By strategy we will mean the possible ways a player can play the game within the structure of the game given by the four above characteristics. While a game or trade may be specified by the number of players, their information on each other's position, the payoff, and the number of moves, the final outcome of the game, (win, lose, or draw) is determined by the combination of strategies that each player uses.

In a game such as football where the four characteristics are well specified, the set of strategies open to the quarterback to call are numerous and, to a large extent, determine the outcome of the game. Extending this analogy to real life situations is difficult, but obviously many strategies are open to the players in trades and business deals that help to determine their outcome.

The idea we are trying to develop is that farmers use different strategies in trades with other people and that it is the particular combination of strategies that determines the outcome of the trade. Whether the set of strategies used by an individual stems from ethical, economic, or prestige reasons is an interesting question, but is not our concern here. Rather in the remainder of this report we want to consider: (1) Do farmers use different sets of strategies in making machinery trades? (2) If they do, will a particular set of strategies determine the outcome of the trade?

OBJECTIVES OF THE PROGRESS REPORT

The general objective of this progress report is to review the research now in process on the use of strategies by farmers. This research is only a part of the research going on in decision-making studies in farm management. This type of research had its beginning at the Kentucky Agricultural Experiment Station in the publication of Bulletins 593 and 610.[1] The empirical results reported here are from the Interstate Managerial Survey conducted in 1953 in Kentucky and six other midwestern states.

The specific objectives of this report are:

1. Review the techniques used in obtaining answers to questions involving farmers' use of strategies in a machinery trade.

2. Review the procedure and results of the analysis used to distinguish sets of strategies used by farmers in a machinery trade.

3. Point out the kinds of research necessary to further the work in this phase of the decision-making study.

INTERSTATE MANAGERIAL SURVEY

The Interstate Managerial Survey concerned itself with the decision-making functions of individual farm managers with gross incomes of $2,500 or more in Kentucky, Iowa, Michigan, Indiana, South Dakota, Ohio, and Kansas.

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[1]G. L. Johnson and C. B. Haver, Decision Making Principles in Farm Management, Kentucky Agricultural Experiment Station Bulletin 593 (Lexington: University of Kentucky 1953). G. L. Johnson, Managerial Concepts for Agriculturists, Kentucky Agricultural Experiment Station Bulletin 619 (Lexington: University of Kentucky 1954).

Although the results of this report are based on interviews from 362 farmers, the total contacted was 1,075. The main outline of the schedule used in the survey can be summarized under the following two points:

1. Control questions asking for tenure status, size of farm, type of farm, background, education, income, liabilities, and other personal characteristics.

2. Structured and unstructured questions concerned with:

   a. Types of information used by farmers in organizing and operating farms.

   b. Use of managerial functions (observation, analysis, decision, action, responsibility bearing) in solving analytical problems.

   c. Sources and means of securing information used by farmers.

   d. Expectations of prices, people, institutions, and events.

   e. Use of informal insurance practices.

   f. Utility of gains and losses of wealth.

   g. Recognition by farmers of knowledge situations.

   h. Use of strategies.

While the last item is the main concern of this report, answers to the other questions are used in the analysis.

The specific questions that were asked with reference to strategies are:

We would like to ask you what you think should be done in the following situation. A farmer wants to trade his combine for a tractor. There are other farmers in the neighborhood who also want to deal for a tractor. (RECORD ANY COMMENTS)

(a) While he's still looking around to see who has a tractor to trade for, should he keep quiet about his intentions so as to keep people he might want to trade with from having plenty of time to decide on how much they would want to get?

_____ Should

_____ Shouldn't

(b) When he finally decides who he'd like to trade with, is it a good idea for him to act as though he's not sure whether he wants to trade so that other farmers who might also be interested in a trade would think the tractor was not desirable?

_____ Yes

_____ No

(c) If he finds out that his neighbor is trying to make a trade for the same tractor, should he improve his competitive position by trying to find out what he neighbor is offering without letting his neighbor know what his offer is?

_____ Yes

_____ No

(d) If he meets someone else who wants to trade for a tractor but doesn't know about the one that he's interested in, is it better for him not to mention that he knows about this tractor?

_____ Yes

_____ No

(e) Is it wise to for him to make the man he's dealing with think that a combine is what he needs most, so that trades for other items won't be given much consideration?

_____ Yes

_____ No

(f) If he finds the tractor needs minor repairs the owner hasn't told him about, is it better for him not to mention anything that might be wrong with his combine so that he can make the trade successfully?

_____ Yes

_____ No

INDIRECT APPROACH OF THE STRATEGY QUESTIONS

The strategy questions are concerned with a hypothetical situation in that they ask what the respondent thinks should be done in a trade of a combine for a tractor. The situation is constructed so the respondent will place himself in

the position of the farmer with the combine. It is believed the respondent will answer the specific questions as though he were making the trade. Their attitude toward use of strategies in this situation is believed to indicate the extent to which farmers use strategies in their own affairs.

A set of questions using a direct approach was constructed and pre-tested prior to the main survey, and was found unsuccessful in obtaining answers. Apparently, farmers are reluctant to admit they use strategies. However, while specific questions may have been unanswered, no farmer refused to answer the entire set of indirect questions. It remains to be seen whether answers to hypothetical questions are meaningful with respect to other personal characteristics and behavior of the farmers interviewed. The results of the analysis are presented in a later section. Table 1 shows the distribution of answers to the six questions.

Table 1. - Distribution of Answers of 362 Farmers to the Six Strategy Questions

Answer	Question					
	(a)	(b)	(c)	(d)	(e)	(f)
Should or Yes	168	171	151	245	161	131
*Shouldn't or No because bad strategy	18	13	7	2	5	17
*Shouldn't or No because poor ethics	18	15	28	10	20	48
**Shouldn't or No, unspecified	139	152	161	95	162	156
No Answer	19	11	15	10	14	10

*These responses were interpreted from comments written by the interviewers on the schedules.

**Unspecified means there were no comments to interpret.

TECHNIQUE OF ANALYSIS

Answers to the six strategy questions indicate the opinion or attitude of the respondent toward using certain strategies. It was believed that certain patterns of responses not evident in Table 1 would be found in a closer examination of the answers. In fact, it was believed that (1) if a numerical weight could be given to each type of answer and (2) if these weights were added into a score for all questions, then the response made by an individual to a particular question could be predicted from knowledge of that individual's score. The method of constructing the score is known as the Guttman technique of scale analysis.[1]

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[1] The theory and techniques used in this report for scale construction are given in chapters written by Guttman and Suchman in Measurement and Prediction, by S. A. Stauffer, Louis Guttman, E. Suchman, P. F. Lazarsfeld, S. A. Star and J. A. Clausen (Studies in Social Psychology in World War II, Vol. 4; Princeton, Princeton University Press, 1950).

A shorter explanation is given by M. A. Hagood and D. O. Price in Statistics for Sociologists (N. Y., Henry Holt and Company, 1952).

   While we are not interested in giving the complete details of the technique here but rather results of analysis, we will summarize the construction of the scale in the following steps:

(1)   The "most positive" reply, a "Yes" or "Should" in our case is selected for each question.

(2)   The other responses are ranked according to their positiveness or negativeness, in this case "No, Unspecified" is most negative.

(3)   The responses are given weights from zero for the most negative to 3 for the most positive.

(4)   A total score is computed for each individual by adding up the weights corresponding to his responses.

(5)   All the individuals are then arranged in order of their total scores from highest to lowest.

(6)   The questions are arranged in order from the one with the fewest positive responses to the one with the most positive responses.

(7)   Ideally, all the responses down to a certain point would be positive and beyond this point all the responses would be negative. The pattern might look like that of Table 2.

   In the actual situation under consideration the ideal pattern did not appear but only an approximation to it. In fact, the two responses "Yes" and "No, bad strategy" were combined to make the most positive response and "No, poor ethics" and "No, unspecified" were combined to make the most negative response. The responses were re-weighted and new scores computed for each individual. Again the individuals were arranged in order by their score and the question ranked by their positiveness and negativeness.

   The pattern of responses indicated that question numbers (a) and (c) could not be used to form a scale. After eliminating these questions the four remaining questions produced a scale with the patterns displayed in Table 3.

   The table shows that question (d) was most positive, i.e., more individuals answered it either "Yes" or "No, bad strategy" than any other question. Further, (f) was most negative in that more individuals answered it "No, poor ethics" or "No, unspecified" than any other question. Individuals denoted by scale type I were more positive about all the questions than the other scale types. Thus, from knowledge of the scale type (or total score) of an individual we can predict how he answered the four questions. Hence, scale type V answered all four questions either "No, poor ethics" or "No, unspecified."

Table 2. - Ideal Pattern of Scores and Question Arrangement for Three Questions.

Individuals Number Score	(1) Yes No(B.S.) No(P.I.) No				(2) Yes No(B.S.) No(P.I.) No				(3) Yes No(B.S.) No(P.I.) No			
	Yes	No (B.S.)	No (P.I.)	No	Yes	No (B.S.)	No (P.I.)	No	Yes	No (B.S.)	No (P.I.)	No
1 9	X				X				X			
2 7		X				X			X			
3 6			X			X			X			
4 3				X			X			X		
5 1				X				X				X
Question Score	6				8				12			

Table 3. - Patterns of Responses to the Four Questions for the Guttman Scale Types

Scale Type	Question Number				Extent of Scalability	
	(f)	(e)	(b)	(d)	Perfect Cases	Error Cases
	Pattern of Response					
I	+	+	+	+	68	54
II	-	+	+	+	28	13
III	-	-	+	+	29	14
IV	-	-	-	+	49	32
V	-	-	-	-	44	18
					218	131

There were, of course, deviations from the ideal situation given in Table 2 with respect to the pattern for any one question. For example, had individual 2 said "No, (B.S.)" to question 3 instead of "Yes," this would be called an error. The extent of errors is indicated by what is called a "coefficient of reproducibility" given by the formula:

$$\text{Coefficient of reproducibility} = 1 - \frac{\text{Number of errors}}{\text{Number of questions} \times \text{number of individuals}}$$

For the strategy questions the coefficient of reproducibility is:

$$\text{c.r.} = 1 - \frac{131}{(4)(345)} = .905$$

A coefficient of .90 or more is considered sufficient for saying the items form a scale.[1]

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[1] See Stauffer et al., op. cit., p. 77.

The extent of scalability is shown in the last two columns of Table 3. The number of error cases is shown for each scale type. The total number of errors (131) is used in the c. r. formula above. Out of the total of 362 farmers interviewed, 345 could be used in the construction of the scale.

RESULTS OF ANALYSIS

We have said (1) that an individual's attitude toward a set of strategies could be scored and put on a rank scale with other individuals, and (2) that when individuals use different sets of strategies the outcome of the game will be different. In the previous section we described the technique of ascertaining a rank scale. It remains (1) to interpret the meaning of the scale and (2) to find the relationship between the scale and the outcome of the game.

INTERPRETATION OF SCALE

In literature on scale analysis the procedure described in the previous section is said to afford a method for ordering individuals along a single attitude dimension. [1] Attitude dimensions mean such sociological variables as intimacy, neighborliness, role, and status. While one or several of these dimensions may be involved in answering strategy questions, we indicated previously we were more interested in how different strategies determine different outcomes than in finding reasons for their use. Finding reasons may be an important activity, but we believe distinguishing behavior is its prerequisite.

A second purpose of scale analysis given in the literature is to test the assumption that the items or questions "fit together." If the scale does this then we believe it is a powerful tool in discerning sets of strategies that might not be used in making trades (playing games). Although we might be unable to list all the strategies used in a particular trade (game), if we can assist a number of them that individuals will be willing or unwilling to use then we have identified a different set. After identifying sets of strategies we can then classify them, find complete sets of strategies, and perhaps even solve the game. This ambitious undertaking is beyond the scope of our report, but it points out the possibilities that remain to be undertaken.

Hence, the interpretation we want to place on our scale is that it ranks individuals in their use of a given number of strategies and therefore distinguishes sets of strategies that could be used in a trade or game. In the next section we want to examine this interpretation from an empirical standpoint.

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[1] M. W. Riley, J. W. Riley, Jr., and Jackson Toby, Sociological Studies in Scale Analysis (New Jersey: Rutgers University Press, 1954).

BASIS FOR DISTINGUISHING SETS OF STRATEGIES

We believe our scale provides a means of distinguishing different sets of strategies. We would now like to test the effectiveness of the scale in this regard. This testing may be carried out in a number of ways which differ in their adequacy. One of these is to ascertain in an actual trade the outcomes of using the different sets of strategies distinguished by the scale. Another is attempting to find out through hypothetical questions the possible outcomes of trades in which these strategies are used. A third is to see if the scale types make sense when related to characteristics and past behavior of the respondents in real life games. While the first way may be the most conclusive in regard to the objective, it is also the most difficutl to carry out, particularly considering the state of our theory about real life trades. The last is probably the least conclusive in the evidence which it offers but it has the advantage of being a "rough and ready" check on the procedure in its early stages. For these reasons the third way of testing the effectiveness of our scale was used.

Distinguishing the playing of different games in the real world is no simple task. Going beyond this to distinguish different sets of strategies that might be appropriate for playing any particular game seems almost an impossibility. However, the closest that we can come to saying what we mean by different strategies at this stage of our theoretical understanding is to describe different characteristics, behavior, or acts of the individuals under consideration. By characteristics we mean such things as age, number of dependents, family structure, and other things that might be considered fixed for a given point in time. We believe that certain characteristics may be associated with the use of different strategies in a given game. Other characteristics that might influence the use of strategies are education, farming experience, and other past experiences.

The past outcomes of games could also materially affect the present choice of strategies. Hence, such acts of decision as type of farming to engage in, size of farm, net worth, income, debts, and farming practices could be associated with our scale types. We have some empirical bases for saying we have actually distinguished some sets of strategies if (1) we can say we have adequately identified a game in the trade into which the respondents were asked to project themselves; (2) our scale types have adequately distinguished different sets of possible strategies to be used in this game; and (3) we can find a correlation between the scale types and some of the characteristics and types of behavior.

We now want to examine some of the empirical relationships that we found or did not find by correlating the five scale types of Table 3 with information on the characteristics and behavior of the same individuals. This information was obtained from the Interstate Managerial Schedule referred to on page 3.

SCALE TYPES AND FARMERS' CHARACTERISTICS AND BEHAVIOR

Six characteristics were found to be statistically related at the 30 percent level or more by Chi-square tests of independence to the scale types. These were (1) education, (2) number of dependents, (3) number of children living with respondent, (4) stage in family cycle, (5) structure of household, and (6) experience of growing up on a farm.[1]

Table 4. - Scale Types and the Last Grade of School Completed[a]

Scale Type	Percent Completed Specified Grade					
	<8	8	9 to 11	12	>12	Total
I	10.2	35.2	11.3	33.1	10.2	100
II	22.5	12.5	22.5	40.0	2.5	100
III	16.3	41.0	23.3	9.3	9.3	100
IV	3.3	36.0	19.7	32.8	8.2	100
V	10.1	29.1	24.1	30.4	6.3	100

[a]Chi-square significant at 1 percent level.

Table 5. - Scale Types and the Number of Respondent's Dependents[a]

Scale Type	Percent with Specified Number of Dependents[b]			
	1 - 2	3 - 4	>4	Total
I	50.1	26.3	23.6	100
II	29.7	37.8	32.5	100
III	50.0	25.0	25.0	100
IV	41.7	28.3	30.0	100
V	44.6	12.2	43.2	100

[a]Chi-square significant at 5 percent level.
[b]Dependents include individuals who receive support from the respondent.

Table 6. - Scale Type and the Number of Children Living with the Respondent[a]

Scale Type	Percent with Specified Number of Children[b]			
	None	1 - 2	> 3	Total
I	67.2	25.9	6.9	100
II	47.5	37.5	15.0	100
III	51.2	34.8	14.0	100
IV	44.3	40.9	14.8	100
V	47.4	32.0	19.8	100

[a]Chi-square significant at 10 percent level.
[b]Children are 10 years or less.

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[1]Characteristics found to be statistically unrelated were 4-H membership and variables related to farming experience.

Table 7. - Scale Types and the Stage in the Family Cycle[a]

Scale Type	Couple with no Children or Children less than 5 years old	Couple with Children 5-10 years old	Couple with Children over 10 years old	Total
I	32.0	34.9	33.1	100
II	35.3	55.9	8.8	100
III	33.3	44.4	22.3	100
IV	41.3	34.5	24.2	100
V	44.0	30.0	26.0	100

[a]Chi-square significant at 10 percent level.

Table 8. - Scale Types and the Structure of the Household[a]

Scale Type	Respondent Unmarried	Married with no Children	Married with Children or Others Present	Total
I	4.8	29.3	65.9	100
II	12.5	12.5	75.0	100
III	4.8	28.6	66.7	100
IV	1.6	27.9	70.5	100
V	7.5	20.3	72.2	100

[a]Chi-square significant at 25 percent level.

These characteristics are all of a sociological nature as they are the results of social institutions, or social interaction. This fact is interesting in and of itself. It is also highly important when we consider their relationship to the social act of bartering for some economic good. For example, consider the specific relationship between education and the scale types. There is a general indication that a group of similar farmers with no more than eight years of school would be expected to be of a scale type with a larger index number, i.e., would be expected to say "No" to more of these questions than those with more education. Evidence supporting this statement is increased by the fact that more of those with 12 years of education or more could be expected to be in a scale type of lower index and would be expected to use different strategies than those with less education.

In addition to education the relationship between the scale types and the social institution of the family seems impressive. In relation to number of dependents, scale type five has the largest percentage with one to two dependents. This relationship is further generalized by Tables 6, 7, and 8 where the influence of children on the scale type is shown.

Table 9 shows the effect on scale type of having grown up on a farm.

Table 9. - Scale Type and Whether the Respondent had Childhood Experience on a Farm[a]

	Percentage Having Specified Experience		
Scale Type	All of Childhood	Part of Childhood	None of Childhood
I	33.8	50.0	25.0
II	12.7	3.8	0.0
III	11.4	19.2	25.0
IV	17.5	15.4	37.5
V	24.7	11.5	12.5
Total	100	100	100

[a]Chi-square significant at the 30 percent level.

Although the statistical significance is relatively low generally those with childhood farm experience are more likely to be scale types who answered "Yes" to the strategy questions. This variable is even more interesting and perhaps more information from the standpoint of bargaining in trades when one considers that age is not a statistically significant variable. Usually one thinks of our older farmers as more likely to have had childhood farm experience, but since age is unrelated to the scale types, the rural background may be more useful in explaining differences in the strategies farmers use.

Some of the behavioral variables we found to be statistically related to scale types were (1) geographical location, (2) debt position of respondent, and (3) ranking of types of information.

The state of origin or location is a significant variable in understanding why different farmers might be using different strategies. The debt position of a farmer seemed a likely variable for explaining the differences in the way farmers might actually make trades and hence in the set of strategies they would choose. It may also indicate the outcomes of previous bargaining in which strategies may have been used.

Ranking various types of information as to difficulty in acquisition by the individuals in the scale types may be the best indication that players in any trading game have various kinds and levels of information; hence, ranking aids in understanding the choice of strategy.

The relationship between these three variables and the scale types are shown in Tables 10, 11, and 12.

The state where the respondent lives appears to be a highly significant variable from the statistical standpoint as shown in Table 10. The distributions over the scale types for Kentucky, Iowa, and North Dakota are approximately the same. However, these distributions are different from Ohio and Michigan as a group which also differs from Indiana and Kansas as a group. As the type of farming variable was not statistically related to the scale type, we cannot conclude that it is due to type of farming differences. In addition, upon

Table 10. - Scale Types and Geographical Location by State[a]

Scale Type	State						
	Ky.	Ohio	Ind.	Mich.	N. D.	Iowa	Kansas
I	58.3	18.1	28.1	27.7	36.3	53.8	36.0
II	5.5	11.3	12.5	11.1	20.4	15.3	6.0
III	8.3	15.9	10.9	12.5	20.4	10.2	8.0
IV	19.4	22.7	32.8	22.2	13.6	10.2	34.0
V	8.5	32.0	15.7	26.5	9.3	10.5	16.0
Total	100	100	100	100	100	100	100

[a]Chi-square significant at one percent level.

Table 11. - Scale Type Related to Debt Position of Respondent by Percentage[a]

Scale Type	Amount of Debt in Dollars					
	None	<999	1,000-4,999	5,000-9,999	10,000-99,999	Total
I	48.1	13.9	21.3	6.5	10.2	100
II	36.8	7.9	31.6	13.2	10.5	100
III	58.9	5.2	15.4	12.8	7.7	100
IV	35.7	7.2	34.2	10.0	12.9	100
V	38.5	7.7	19.2	15.4	19.2	100

[a]Chi-square significant at 20 percent.

re-grouping the farmers according to specialized or diversified farming and relating this to scale type within the three state groupings, no significant relationship was found.

An examination of Table 11 reveals the interesting generalization that the lower the index number on the scale type the more likely it is that the individuals have some debts. In other words, if an individual has debts he is more likely to say "No" to the strategy questions. Whether or not this indicates an avoidance of further deals that might increase debts or a general conservatism on the part of certain farmers in uncertain. A better way of measuring risk aversion than answers to these strategy questions would seem desirable before this question could be answered.

The outstanding feature in both sections of Table 12 is that Types I and V agree that information about other humans is the most difficult to acquire. A second feature is the differences between scale types. If the percentage is taken as the ranking within each scale type and numbering the kind of information from left to right across the top of the table, [1] then the scale types rank the type of information thus:

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[1] 1 stands for price, 2 for production, 3 for new developments, 4 for human and 5 for institutional information.

| | | | Rank | | |
Scale Type	1st	2nd	3rd	4th	5th
I	4	3	5	1	2
II	4	1	3	5	2
III	1	5	3	4	2
IV	2	5	3	1	4
V	4	3	1	5	2

Table 12. - Scale Types and Their Ranking of Information as to its Difficulty in Acquiring

Percentage Who Ranked Number One
Kind of Information[a]

| | (1) | (2) | (3) | (4) | (5) | |
Scale Type	Price	Production	New Developments	Human	Institutional	Total
I	19.5	14.3	22.0	23.4	20.8	100
II	25.9	3.7	22.2	26.0	22.2	100
III	33.3	6.1	21.2	12.1	27.3	100
IV	18.2	29.1	18.2	14.5	20.0	100
V	20.6	5.9	23.5	35.3	14.7	100

Percentage Who Ranked Number Five
Kind of Information[b]

I	39.5	21.1	6.6	11.8	21.0	100
II	36.0	28.0	4.0	28.0	4.0	100
III	46.2	19.2	7.7	15.4	11.5	100
IV	30.4	13.0	13.0	17.5	26.1	100
V	46.4	28.6	10.8	7.1	7.1	100

[a]Chi-square significant at 10 percent level.
[b]Chi-square significant at 30 percent level.

Outside of Type I and II which are very similar there appears to be no pattern. Lack of pattern could mean the other three types are not completely defined by the scale technique. It could also be the first clear indication that the four items used for the scale did not fit together as well as the scale indicated. Let us consider the four items that did scale and notice that (f) and (e) are strategies used in a two-person game, i.e., between the owner of the combine and the owner of the tractor. However, the strategies (b) and (d) indicate at least a three-person game, i.e., between the owner of the combine and the owner of the tractor and any one or more persons who might be interested in the same trade. The fact that (f) and (e) fall on the most negative end and (b) and (d) on the most positive end could further indicate the strategies are appropriate for two different games, one with two persons and another with more than two. The fact that our scale technique placed them in this order adds strength to its usefulness in discerning sets of strategies. Had the researchers who formulated the questions been more cognizant of the

classification of games, the items could have been constructed in such a way as to avoid asking about more than one game at a time. The chances of the respondents making errors would have been reduced. Actually, farmers are probably participating in several games at one time; however, the stage to which this kind of research has advanced dictates an over-simplified approach.

CONCLUSIONS FROM THE ANALYSIS

Two of our objectives set forth at the beginning of this report were (1) to review the technique used in obtaining answers to questions concerning use of strategies, and (2) to review the procedure and results used in distinguishing sets of strategies used by farmers in a machinery trade. We will set forth certain conclusions from our efforts to accomplish these two objectives before proceeding to the third objective, that of pointing out kinds of studies to further the research in this area. These conclusions are given in the statements that follow.

1. The indirect approach, where the respondent is asked to project himself into a particular situation and then asked what he thinks should be done, is more appropriate than the direct approach where an individual is asked whether he uses a particular strategy. This approach not only was efficient in obtaining uninhibited answers but provided answers that lent themselves to scale analysis.

2. The results from applying the scaling technique to the data consisting of answers to the six questions indicate that all the questions were not necessary or appropriate for accomplishing the specific objectives of the Interestate Managerial Study in the area of use of strategies. However, the results further indicate the technique itself is very effective in identifying sets of strategies that may be used in real games. Although the technique itself did not separate two-person from three-person games, the relationships between the scale types and other variables indicated the scaling had placed the strategies that might be used in the two different games at opposite extremes. The scaling technique may be an even more effective device for separating sets of strategies if we could hold the game constant.

3. The relationships between the scale types and the other variables examined indicate that sociological variables are important to understanding the use of different sets of strategies. The measures we used for the outcomes of past games were probably too gross to give us any clear conclusions. Debt position was one variable which could indicate either past outcomes or future expected outcomes and hence was an inconclusive indicator. The information gained concerning these relationships would be very useful in specifying future samples of respondents that might be used in another survey.

IMPLICATIONS FOR FURTHER RESEARCH

As a result of our experience with this research we would like to make the following suggestions with regard to future research.

1. The reasons for doing further research concerning use of strategies are all positive. The use of strategies in business "games" is unquestioned; however, its exact extent is unknown. Even more important are the outcomes, the present and future effects on the farm business, which we do not know. The outcome of the simple trade of a tractor for a combine could have far-reaching effects on farm businesses concerned. If the use of strategies determines whether a trade will be made or other resources acquired, then strategies are an appropriate topic for research in farm management.

2. Future research must pay stricter attention to the concepts already developed in game theory. The objective of empirical research is to provide an empirical interpretation for certain concepts and then use these concepts in an analysis of actual phenomena. The results of empirical research thus reflect upon the usefulness of the concepts.

   There are many references than can be used as sources of the concepts of game theory;[1] however, there are also problems in using these concepts in empirical research. Two related problems must be solved before the researcher can make progress in using the concepts of game theory: (1) The philosophic problem of whether game theory is descriptive or normative. If it is descriptive then the questions of empirical testing concern the researcher, and he faces the second problem given below. However, if it is normative the researcher faces the same questions as any other missionary, i.e., what are the philosophical bases for his beliefs. (2) If the researcher uses the concepts of game theory as a descriptive theory, then the problem of empirical verification must be solved. For example, the theory uses a well specified set of strategies; however, the researcher is at once at a loss to make such specification in his empirical work. Hence, the researcher must find techniques to make complete specification or be satisfied with making modifications of the theory so that he can carry on tests of empirical verifications of smaller bits and pieces. The latter solution is probably the one most often adopted. The analysis of this report is an example of the way in which two different techniques were combined to get information about the sets of strategies. The results of this report are therefore useful in preparing for further research.

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[1]See, R. D. Luce and H. Raiffa, Games and Decisions (N. Y., John Wiley and Sons, Inc. 1957) and the extensive bibliography contained therein.

3. As a next step in empirical research the following suggestion is made. While the mathematical outlines of game theory are well specified, the job of setting up a statistical correspondence between what the theory purports to describe and the actual phenomena is still to be accomplished. This probably means some modification of the present theory. For example, it seems quite likely the players of a game do not have knowledge of all possible strategies that could be used for any particular barter. A more reasonable assumption is that an individual has some sample of the total and uses this sample in many situations. Through experience he probably arrives at some workable set of strategies that he uses. In summary it seems clear that some of the concepts of statistics will have to be used in conjunction with the theory of game playing. This will lead to modifications of the theory; however, such a modified theory is necessary before empirical testing can be carried beyond simple experimentation.