RISK, UTILITY AND THE PALATABILTY OF EXTENSION ADVICE TO FARMER GROUPS

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Using the results of an empirical study of farmers' utility functions, evidence is presented that risk plays a measureable role in farmer decision making. The extension implications of such risk influences are discussed with particular emphasis on the possible efficacy of using group utility functions as a basis for group recommendations.

In the past, much of the extension advice given in Australia has concentrated on the dissemination of technical possibilities. More recently, the importance of economic considerations in managerial decision making has received increasingly greater recognition by extension authorities, and in particular by farm management consultants. As a consequence many of the economic factors which have contributed to the non-acceptance of extension advice have been recognized. But there has generally been a lack of recognition of risk as a factor contributing to the failure of farmers to accept recommendations.

We believe explicit recognition of the importance of risk would allow modification of many recommendations and so increase their likelihood of adoption. The failure of farmers to adopt prescribed management techniques is often attributed to ignorance. This will sometimes be true but it might just as validly be argued that in many situations a farmer's antipathy to a technique is due to the high subjective risk he associates with the technique and his risk aversion. Thus, steps taken to eliminate general ignorance may not be the most successful method of combating farmers' non-adoption of a technique.

This paper presents some of the empirical evidence for our contentions that risk is a significant influence in farmers' managerial decisions and that risk aversion or preference can be quantified via utility analysis in a meaningful way for use in making recommendations to farmers. Following consideration of this evidence and its extension implications, the problems of incorporating risk in making group recommendations are examined by way of an empirical study. Finally the implications of making recommendations from utility functions are discussed and several suggestions concerning their use are made.

Evidence of the Role of Risk in Managerial Choice

Over the past decade a number of empirical studies have made explicit the significance of risk in farmers' managerial decisions. In the United States the Interstate Managerial Study [9] was a major effort

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to examine decision making in farm management. The portion of this study which utilized utility functions is of particular relevance here. Individual utility functions were derived for a large group of farmers and related to specific managerial practices and decisions. One of the most interesting variables which related to the slope of the utility function at a specified point was the type of farming engaged in by the decision maker. It was found that those farmers who have a high (relative) marginal utility for gains and a low (relative) marginal disutility for losses are most likely to be engaged in the more risky types of farming such as cash cropping or fat-stock feeding. Those who attach less marginal utility to gains and more disutility to losses are engaged, in general, in more diversified enterprises. In addition, indications were found that the shape of the utility function is related to an individual's debt position, net worth position, income level, age and number of dependents.

Another study conducted in the United States by P. Johnson [10] found that farmers' price expectations were consistent with a hypothesis of risk preference. He concluded that the consistency which he found with the hypothesis required an assumption that farmers are expected-utility maximizers or that they behave as if they are. Davidson and Mighell [4] subsequently pointed out that the results obtained by Johnson may be attributed to communication problems between the researcher and his farmer respondents. They concluded that farmers in general have an aversion to risk.

In an exploratory Australian study, McCarthy and Anderson [12] attempted to derive utility functions for a sample of beef cattle farmers. Because of design problems in their questionnaire and interviewing difficulties, they found they were only able to derive utility functions for 17 of their 82 farmer respondents.

Except for the above-mentioned studies, agricultural economists have made few attempts to work in terms of utility functions. Because of this, attempts to accurately incorporate the parameters of risk into practical recommendations have been blocked. Yet, solving a decision-under-risk problem using the criterion of maximizing expected utility can be shown to provide decisions which are consistent with the decision maker's preferences among risky actions [1] [11] [13]. Because of this consistency, utility analysis could be expected to be a productive way of accounting for risk as a parameter in practical decision making.

Results of an Empirical Study

A study of decision making under risk conducted in September 1966 in the Armidale region of N.S.W. related the utility functions of five farmers to their managerial practices. The five farmers (predominantly wool growers) were randomly selected from a larger group of farmers stratified on the basis of stocking rate and property size. The study was conducted during the 1965/66 drought, a time which demanded decision making under extremely risky conditions.

Estimated Utility Functions

Utility functions for both costs and returns[1] were derived for the five

[1] Because the respondents were unused to dollar values, pounds rather than dollars were used throughout the study.

farmers, as listed in Table 1. The utility functions were derived using the Ramsey model as described by Officer and Halter [17] and more thoroughly by Officer [14].

TABLE 1
Farmer Utility Functions

Farmer	Utility function
For Returns [(a)]	
1	$U = 2{\cdot}921205x - 0{\cdot}0002020x^2$
2	$U = 2{\cdot}862181x - 0{\cdot}0002081x^2$
3	$U = 1{\cdot}962538x - 0{\cdot}0001043x^2$
4	$U = 1{\cdot}965631x - 0{\cdot}0001039x^2$
5	$U = 3{\cdot}002139x - 0{\cdot}0002885x^2$
For Costs [(b)]	
1	$DU = 0{\cdot}964512x + 0{\cdot}0001686x^2$
2	$DU = 0{\cdot}783336x + 0{\cdot}0001059x^2$
3	$DU = 0{\cdot}314231x + 0{\cdot}0057475x^2$
4	$DU = 1{\cdot}698415x - 0{\cdot}0001065x^2$
5	$DU = 0{\cdot}470849x + 0{\cdot}0003231x^2$

[(a)] U represents utility, and x the size of money returns in £.
[(b)] DU represents disutility, i.e. DU = —U, and x represents costs in £.

The shapes of three functions are depicted in Figure 1, the interpretation of these respective shapes being as follows:

1(a). The decision maker shows diminishing marginal utility for increasing returns. This implies he is a risk averter, being prepared to take only gambles of more than fair odds [5].

1(b). The decision maker shows increasing marginal disutility for increasing costs. This implies he is a risk averter with respect to costs (or losses).

1(c). The decision maker exhibits decreasing marginal disutility for increasing costs. Such an individual will be prepared to take gambles with respect to costs at less than fair odds; he shows a degree of risk preference.

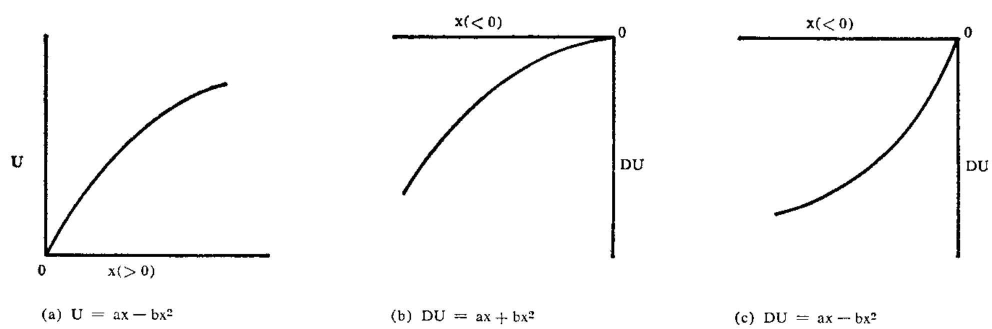

FIG. 1—Possible shapes of a quadratic utility function.

An Index of Risk Aversion

A further interpretation of a decision maker's attitude towards risk can be obtained from an expected outcome versus variance (*E-V*) indifference system. An individual's *E-V* indifference system can be derived from his utility function [7] [13] [17]. For example, a utility function of the form shown in Figure 1(a) implies an *E-V* indifference system such as illustrated in Figure 2. Such an indifference system describes how much the expected outcome from an investment must increase to offset an increase in the variance or risk of the investment. Thus an intuitively obvious way of obtaining a measure of the individual's risk aversion (preference) is to measure the slope of the *E-V* indifference curves since at any point on an *E-V* curve, this slope measures the marginal rate of substitution or compensation between *E* and *V*.

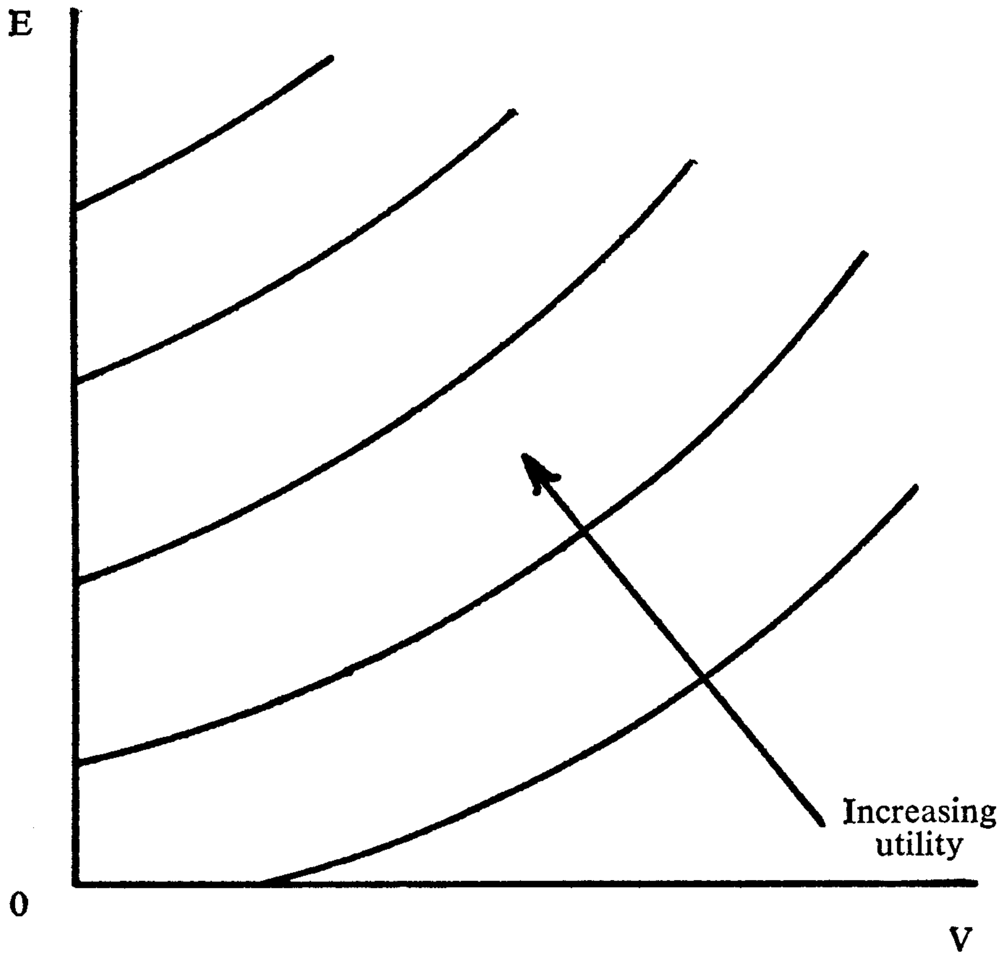

FIG. 2—E-V indifference system corresponding to the quadratic utility function $U = ax - bx^2$.

As discussed by Officer and Halter [17], in this study quadratic functions were found to give the best description of the subjects' utility functions compared with other polynomial functions. As an expected utility function, the quadratic utility function can be expressed in terms of the moments *E* and *V* of the probability distribution of outcomes from an investment, *E* and *V* being the co-ordinates of the *E-V* indifference system. Denoting expectation by ξ, the equation for expected utility from a quadratic utility function is given by

$$\xi(U) = \xi(ax + bx^2)$$
$$= aE + bV + bE^2.$$

Differentiating with respect to V, keeping $\xi(U)$ constant (so as to imply iso-utility), and solving for dE/dV, we have

$$dE/dV = -b/(a + 2bE)$$

as the equation for the slope of an E-V indifference curve at a particular locus specified by the value of E. By definition, dE/dV is a measure of local risk aversion.[2]

A comparison of the slopes of individuals' E-V indifference curves at a particular locus can be used to compare their local risk aversion. For positive sums of money, the greater the slope the greater the degree of local risk aversion. The measure is invariant for linear transformations of the utility function—therefore there are no problems of interpersonal comparisons of utility. However, the measure requires constant rates of marginal utility if direct inferences are to be drawn about global risk aversion. When this condition does not hold, if comparisons of risk aversion are to be made over a range of outcomes (risk aversion in the large), the slopes of the individuals' E-V indifference curves must be measured at a number of loci. If the same order of ranking between individuals holds for the measure of each locus, then a categorical statement can be made about relative risk aversion over the range tested. If the order of ranking changes, or the indifference curves change direction over the range, then statements about relative risk aversion can only be made with reference to specific outcomes over the range.

Subjects' Relative Risk Aversion

The risk aversion indices implied by the utility functions of Table 1 for an expected return of £3,000 and an expected cost of £800 are given in Table 2. The amount of £3,000 was selected because it was approximately the median of the average expected returns of the subjects. The local risk aversion at this point also reflects relative risk aversion of subjects over the range of returns from £200 to £5,000. Likewise, for costs the index at £800 reflects the relative risk aversion of subjects over the range of costs from £0 to £3,500.

TABLE 2

Index of Risk Aversion for Gains and Losses

Subject	Returns about £3,000	Costs about £800
1	0·118	0·137
2	0·129	0·111
3	0·078	0·605
4	0·077	—0·076
5	0·227	0·327

[2] A similar procedure is used to measure local risk aversion given a cubic utility function. However, if there is a degree of skewness of the probability distribution of outcomes for investments it also enters this expression, making it algebraically more complex.

On the basis of the degrees of local risk aversion given in Table 2 we can rank the subjects for relative risk aversion over the ranges specified. In order of decreasing degree of risk aversion, the ranking is $5 > 2 > 1 > 3 > 4$ for returns, and $3 > 5 > 1 > 2 > 4$ for costs. Having established a ranking of subjects on the basis of their measured risk aversion, we can compare these rankings with the subjects' managerial practices and the relative risk implied by their adoption of these practices.

Management Practices and Implied Risk Aversion

The following questions were put to the farmers with respect to their management practices:

Stocking Rate—

1. Estimated stocking rate before the drought?
2. Estimated current stocking rate?
3. Stocking rate aimed for when fully recovered from the drought?

Pasture Improvement—

1. Proportion of property fully improved?
2. Usual annual superphosphate application on improved areas?
3. Intended annual superphosphate application for improved country?

Fodder Reserves—

1. Stock of fodder, in terms of months of total hand feeding, held before the drought?
2. Types of fodder used during the drought and relative proportions?
3. Reserves of fodder intended after the drought is over?

Insurance—

1. Insurance cover on sheds and buildings?
2. Other forms of insurance on the property (fodder, stock, fences, etc.)?

Diversification—

1. What different enterprises are undertaken on the farm?

Borrowing—

1. Current equity position?
2. Minimal acceptable equity given the opportunity and the necessity for borrowing?

A summary of the answers to these questions is given in Table 3.

Stocking rate is one guide to the amount of risk a farmer is prepared to take. The higher the stocking rate the greater the variance (risk) about the expected returns [2], reflecting the relatively greater savings in profit between good and bad seasons. Also, high stocking rates are more prone to losses through disease and mis-management than low stocking rates.

The fairly comparable degree of pasture improvement amongst the subjects does not allow discernible relationships between pasture improvement and the farmers' attitudes to risk. *A priori,* one would expect that the greater the amount of pasture improvement the less the seasonal risk, so long as stocking rate remained unchanged. But the latter is not the case so that there are interactions between stocking rate and pasture improvement in relation to the variance of returns.

TABLE 3

Management Practices of Subject Farmers

Practice [a]	Farmer				
	1	2	3	4	5
Stocking Rate					
1 (dry sheep/ac.)	4·5	4·5	4·0	6·5	2·0
2 (dry sheep/ac.)	1·7	1·5	3·0	5·0	1·8
3 (dry sheep/ac.)	4·0	4·0	5·0	7·0	7·0
Pasture Improvement					
1 (per cent)	90	100	60	100	100
2 (cwt./ac.)	1	1	1	1	1
3 (cwt./ac.)	1	1	1	3	½
Fodder					
1 (months)	5	2	2	0	12
2 (type)	wheat	nuts	wheat	sorghum	hay, nuts
3 (months)	6	0	2	0	12
Insurance					
1 (per cent)	0	65	75	75	75
2 (per cent)	0	0	0	0	0
Diversification					
1 (types)	wool, fat lambs	wool, cattle, crops	wool, fat lambs, cattle	wool, cattle	wool, cattle
Borrowing					
1 (per cent)	82	100	87	60	100
2 (per cent)	60	80	80	60	90

[a] The numbers in this column correspond to the questions as numbered in the text.

The amount of fodder reserve carried, and the amount intended to be carried in the future, should reflect the farmers' attitudes to risk. Generally the greater the reserve the lower the risk, but again the relationship between fodder reserve and risk will be to an extent confounded with stocking rate. The type of fodder fed during drought can also reflect the manager's attitude to risk. Grain feeds such as wheat and sorghum, as well as being relatively new in a technical sense, can be toxic to sheep under certain conditions, and thus can be considered more risky than traditional feeds such as hay and sheep nuts.

With the exception of subject 1, all the farmers carried a comparable amount of insurance on sheds and buildings. However, none of them considered their attitude to risk was an important parameter of this decision; the amount of insurance carried appeared to be more of an historical decision than a decision reflecting current attitudes.

Diversification of enterprises is one of the most generally accepted methods of reducing risk. Unfortunately, the general homogeneity of enterprises on the farms in this study meant no comparison could be made between enterprise combinations and the farmers' attitude to risk.

Comparisons Between Measured and Implied Risk Aversion

The rankings of subjects' relative risk aversions as determined from the slope of their *E-V* indifference curves were $5 > 2 > 1 > 3 > 4$ for returns and $3 > 5 > 1 > 2 > 4$ for costs. The ranking of intended stocking rates of the farmers is $4 > 3 > 1 = 2 > 5$. This is the reverse ordering of relative risk aversion for positive outcomes, and therefore provides support to the hypothesis that the measured risk aversion reflects farmers' attitudes to risk in their stocking rate decisions. In this study the farmers with relatively high measured risk aversion intend to carry fewer stock per acre than those with a lower risk aversion.

The ranking of intended fodder reserves, in order of the greatest to the least, is $5 > 1 > 3 > 2 = 4$. The only clear-cut relationship between fodder reserves and risk aversion is between the two extreme cases, i.e. subjects 4 (low risk aversion) and 5 (high risk aversion). It has been previously mentioned that there is likely to be some interaction or substitution effect between fodder reserves, risk and stocking rate. If the substitution effect was large then it would be expected that the relative ranking of stocking rate would be the same as the relative ranking of the amounts of fodder reserve kept, i.e. those with high stocking rates would tend to offset the risk by keeping large reserves of fodder. In fact the reverse is true for subjects 4 and 5, with the relationship for the other subjects being almost but not quite the expected relationship. The conclusion is that the fodder reserves are not kept purely to offset the risks of a higher stocking rate, so that one would expect a relationship between stocking rate and measured risk aversion.

There is some relationship between measured risk aversion, the equity farmers have in their properties, and the degree of indebtedness they are prepared to accept. The ranking of relative acceptable indebtedness is $5 > 3 = 2 > 1 = 4$. Subject 5 again shows up as being very conservative. Subjects 1 and 4 are prepared to undertake fairly heavy debt burdens; subject 4 has a lower risk aversion than subject 1, but subject 1 has a greater equity in his property which may influence his attitude to indebtedness.

Implications for Extension Advice

On the basis of the above studies two conclusions appear warranted: (1) that farmers do adopt different management practices because they have different attitudes towards risk; and (2) that the degree of relative risk aversion among and between farmers can be measured and compared.[3] These conclusions imply that extension personnel, farm management consultants and advisers should allow for farmers' attitudes towards risk in their recommendations.

In particular, two recommendations appear to be important relative to incorporating the risk element into advice to farmers. One which will not be discussed at length here is the format in which information is provided to farmers. Information should be provided in a format which makes the risk elements apparent to the decision maker. Here we would

[3] Another factor which can contribute to the explanation of the differential adoption of risky management practices is the subjective probabilities which farmers attach to the possible outcomes (payoffs) of the technique. Although this factor was not specifically quantified in this study, it can be measured and would be a useful thing to do in subsequent research.

recommend the Bayesian decision making framework in which the alternative actions, possible states of nature, and the monetary payoffs from state-action combinations are made explicit [14]. This type of format would allow the decision maker to attach his own subjective probabilities to the states of nature and evaluate the monetary payoffs intuitively or in terms of utility [15]. However, many extensionists have come to believe that a single valued recommendation must be made.[4] When this is the case, our second recommendation becomes important. This second recommendation is that the risk preference or attitudes of the farmers should be allowed for in extension advice. In the remainder of this paper we will consider this possibility and the problems involved in its implementation.

Group Recommendations Under Risk

Extension personnel are unable to give individual attention to all farmers who may ask for or require it. As a consequence they are forced to give advice and recommendations to groups of farmers. Government extension authorities frequently provide group recommendations through mass media. Farm consultants often circulate advice and recommendations by way of a group newsletter, rather than by visiting each farmer individually. The use of group recommendations in these circumstances can probably be justified by the scarcity of extension resources and the high cost involved in making individual recommendations. It is unlikely that this cost, in many circumstances, can be offset by the added value of making an individual recommendation rather than a group recommendation. At any rate, we will assume that the high cost of making individual recommendations renders this form of extension uneconomical. We will concentrate on the problems of making group decisions or recommendations.

Group decisions can be broadly categorized into competitive and non-competitive types. The competitive type of group decision is one in which the strategies taken by members of the group in reaching a group decision affect other members of the group [3]. The non-competitive type of group decision is one in which the decision or recommendation is made from outside the group but affects the members of the group individually without interaction between them. The members of the group do not become involved with each other in adopting a recommendation or making the decisions, and thus no direct conflict situation arises within the group. In the extension context, from the standpoint of the group adviser, we can say he has grouped his clients for his own convenience into a non-competitive synthetic group. We will only be concerned here with this non-competitive type of group decision or recommendation.

When utility functions are used to allow for risk in group decisions and/or recommendations, the extension officer must become involved in making interpersonal comparisons of utility. There have been several

[4] Historically, this situation probably arose because multi-alternatives were confusing to farmers and tended to result in no action being taken. In contrast, a single-valued recommendation, although it might not have been ideally suited to each farmer, could at least benefit the majority of farmers and might therefore have had a greater chance of adoption. Perhaps hopefully, we believe farmers' managerial competence is rising to the extent that they would appreciate more rather than minimal information.

attempts to link the utilities of individual functions to allow meaningful interpersonal comparisons of utility. For example Goodman and Markowitz [6] postulated the use of just-noticeable differences as a common unit containing the same amount of utility. Hildreth [8] suggested the use of common reference points. Neither of these techniques[5] overcome the problem of interpersonal comparisons of utility. In fact it is virtually inconceivable that any technique will be developed which will allow meaningful comparisons of individuals' utilities. The aim here is to examine the benefits and weaknesses of using a group utility function as an aid to group decision making under risk. Possible controversy over the use of group utility functions in this role centres around the fact that given any group recommendation, it must explicitly or implicitly involve interpersonal comparisons. Given this disadvantage, the question is are the gains greater than the costs?

An Empirical Appraisal of Group Utility Functions

Suppose a farm consultant is responsible for making a group recommendation regarding fodder reserves to the five farmers involved in the study discussed above. We will assume that the farm consultant makes one recommendation for each of 10 farm fodder reserve situations based upon a group utility function and then we will compare the amount of error between his recommendations[6] and the actual decisions of the five farmers made for each of the same 10 farm situations.[7] This assumes that an error for each subject has the same consequences, an assumption which would be impossible to prove, but just as difficult to disprove as a satisfactory approximation.

Data for the fodder decision problem were based on the fodder reserve model of Officer and Dillon [16]. The model generates the expected cost and the standard deviation (risk) of keeping different levels (i.e. 0, 1, 2, . . . 12 months supply) of fodder reserve for a particular farm situation. The output of the model was explained in detail to the subjects until it was sure they understood the problem. In particular, risk was explained as one standard deviation unit about the expected cost by telling the farmers that it was 70 per cent certain that the actual cost would fall in this range. For each of the 10 farm situations they were then asked which level of reserve they would keep.

Due to their current drought circumstances, the amount of fodder reserve to keep was a problem farmers were anxious about at the time of the study. As well, they knew that their own farm situation (as specified by price and subjective probability data they had previously supplied) was included (hidden) amongst the 10 choice situations presented to them. It is believed that the farmers took the decisions seriously so that their decisions are a good indication of their preferred choices. Assessment of the errors between the group recommendations and the farmers' decisions is therefore judged to be a meaningful test of the

[5] Luce and Raiffa [11] discuss and criticize these methods.

[6] In practice, the consultant, rather than considering 10 fodder reserve programmes, would be making a recommendation with respect to only one fodder programme and this would be representative of the five farmers' fodder programmes.

[7] Detail and discussion of the farmers' choices relative to their individual utility functions are presented in Officer and Halter [17].

suitability of using a group utility function. It remains to consider the various ways in which a group utility function might be easily derived. In doing so we assume that any consultant worth his salt has his clients' utility functions on file.

Averaging Method

An obvious method of deriving a group utility function is to take the average of the individuals' utility functions, i.e. average the coefficients of the individual functions. This method was used to derive a group utility function for the five farmers in the study. The group disutility function for costs was derived from the individual functions presented in the lower portion of Table 1. The group's average utility function, found by averaging the coefficients of these standardized functions is

$$DU = 0{\cdot}86462926x + 0{\cdot}00124773x^2.$$

The errors of the decisions made according to the group's average utility function relative to the subjects' fodder reserve choices are shown in Table 4, together with the errors shown by the criterion of minimizing expected cost, the criterion of minimizing expected disutility using each individual's utility function, and the median method as discussed below. The decision provided by the group's utility function assumes the maximization of the expected utility of the group *per se*, though not of its members considered individually. Comparison with the other methods of arriving at a group decision reveals that the group's average utility function gives the greatest amount of error.

TABLE 4

Comparative Errors of the Various Group Decision Methods[a]

Subject	Average Utility Function	Median Utility Function	Individual Utility Functions	Cost Minimization
1	9	2	2	4
2	10	5	4	3·5
3	4	7	3	10
4	15	8	1	4
5	5	10	3	14
Total error	43	32	13	35·5
Average error [b]	0·86	0·64	0·26	0·71

[a] An error is defined as occurring where the criterion predicted a different decision to that made by the farmer. The degree of error was measured by the total amount, in months of fodder reserve, by which the criterion's decision differed from the farmer's decision over the 10 fodder choice situations presented.

[b] Average error is the error per subject per fodder programme.

The Median Method

The median of the individuals' utility functions (selected in terms of risk aversion) might also be used as a basis of recommendation. The use of the median utility function corresponds to using a majority rule criterion for the selection of a coefficient of risk aversion.

The median of the individual utility functions for costs is function 1 of Table 1. This function was selected on the basis of the relative ranking of conservatism or risk aversion of the functions. This ranking is $3 > 5 > 1 > 2 > 4$. Table 4 shows the decision errors made using this median function. The average error is 0·64, which compares favourably with the average error of 0·86 for the average group utility function and 0·71 for the group decision to minimize expected cost. Still, it compares most unfavourably with the average error of 0·26 for making decisions using the individual utility functions. Nonetheless, the marked reduction in the number of errors using the median utility function, compared with the average utility function, suggests the decisions of the median function may give overall better recommendations (in terms of the group's satisfaction) than the decisions of the average function. Although these units of error are by no means sensitive measures of consequences, they will at least be directly related to consequences, rather than inversely related. So at least in terms of this particular study—based on a no ways atypical group of farmers—it would seem that a risk-orientated group utility function approach can provide better recommendations than a more traditional approach such as expected cost minimization which makes no allowance for risk.

Conclusions and Discussion

The use of a utility function for making group decisions does not overcome problems of interpersonal comparisons of utility. The weaknesses of the assumptions involved in using group utility functions must be balanced against the economic benefits of such an approach. The manner in which the adviser uses the group utility function as an aid to recommendations (if he decides there is economic merit in using it) will vary according to the problem. The adviser should examine the decisions made by the group utility function, and then be prepared to modify them according to his estimate of how appropriate the decisions are in the context of the problem. He must be prepared to defend these subjective modifications with sound reasoning.

Any decision made under risk which does not maximize the expected monetary outcome implies some coefficient of risk aversion (positive or negative) and a non-linear utility function. The derivation and use of a group utility function for group recommendations is a systematic way of getting a representative coefficient of risk aversion. Although susceptible to errors and misinterpretations, it is postulated that this essentially behavioural approach is generally superior to alternative approaches of maximizing expected monetary outcomes or simply consulting a crystal ball. These alternative approaches are either more dictatorial in imposing a coefficient of risk aversion on the group, or less accurate in formulating a representative coefficient than the group utility function. It is concluded that group utility functions have a place as an aid to the adviser qua group decision maker who recognizes their deficiences, but the method does not replace his responsibility for the recommendations.

Obviously, further research is required before a definite statement might be made on the use of group utility functions for extension purposes. Two suggestions concerning research procedures are also pertinent.

First, a behavioural approach, similar to that taken in the study reported here, is to be preferred. Such an approach insures that the decision maker's goals and ambitions as reflected in his behaviour will be incorporated into the analysis of decision making.

Second, different functional forms of the utility function need to be examined in the context of actual decisions. Functions such as those of exponential and logarithmic form need to be tested. While such functions may not give the best fit to the utility data on which they are based, they have operational advantages in that they imply a single global coefficient of risk aversion.

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