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A STUDY OF SOME PERSONAL AND SOCIAL FACTORS IN RELATION TO FARMER PERFORMANCE*

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1. INTRODUCTION

Since the publication in 1958 of Emery and Oeser's¹ study of factors affecting decisions and action in an agricultural community, there has been a heightened interest in the theoretical aspects of agricultural extension. It is now widely accepted that farmers vary considerably in the rate at which they adopt improved production processes or techniques. This variation is, to a large extent, ascribable to inadequate communications, i.e. a relative failure of the process by which a farmer is made effectively aware of the nature and advantages of such processes or techniques. Clearly, rural sociology and social psychology may be expected to contribute to an understanding of such failures, and to an improvement of communication methods as used by agricultural advisory workers.

Failure to adopt, in a specific instance, is not of course necessarily due to failure of communication. Profit maximization may not be the farmer's aim and, even if it were, certain courses of action might, for various non-economic reasons, be considered unacceptable. Nevertheless, these seem to be special cases only, for the adoption of economically desirable practices usually becomes widespread. If the acceptance of a desirable practice is unduly prolonged, ineffective or partially ineffective communication can with some assurance be assumed.

* The authors wish to thank Messrs L. E. Cozens, H. A. White, and R. Leslie, all of the Department of Agriculture, Melbourne, for their help with various aspects of this study, and Dr R. Jarnagin of the University of Illinois, U.S.A., for helpful criticism of an earlier draft of the manuscript. Thanks are also due to the Gippsland dairy farmers who co-operated with the authors.

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¹ F. E. Emery and O. A. Oeser, *Information, Decision and Action* (Melbourne University Press: Melbourne, 1958).

Cozens and White² report the results of an economic study of dairy-farming in Woorayl Shire, South Gippsland, in 1958. They conclude that, in general, the main factor affecting farm income was the scale of the operation involved (as indicated by the number of milking cows) and that, secondarily, butterfat production per cow could be economically increased by the judicious use of concentrates. That total farm production can, most readily, be increased in these ways is not new, but the study gave a very desirable emphasis to those facts, for some farmers do not seem to have appreciated them.

Undoubtedly, some farmers in this area could increase their income by an increase in herd size, without suffering any subsidiary ill-effects, and some could profitably use concentrates. This suggests that, in Woorayl Shire, communication has not been fully effective in respect of these aspects of production, although the situation in regard to concentrate feeding is somewhat controversial. Cozens and White³ also considered other farm management practices—in particular, a selection which, while specifically recommended by the Department of Agriculture, has not been fully adopted by the farmers in this area.

The present study reports a further investigation of this community and its aim was to examine certain factors affecting, or thought to affect, successful communication. Measures of farmer performance—net farm income per acre and degree of adoption of recommended farm practices—were available, and these are taken to indicate the extent to which, in different directions, communication processes have been effective. Various personal and social factors were measured and their association with the performance indicators then considered, the expectation being that those factors would help to explain farmer performance.

In particular, this study arose out of Emery and Oeser's investigation and was planned with the aim of providing, amongst other things, a more critical examination, using more sophisticated statistical methods, of certain concepts which they emphasized.

2. SURVEY DESIGN AND TECHNIQUES

The sample comprised 60 dairyfarmers in Woorayl Shire, South Gippsland. Cozens and White,⁴ in their survey of 1958, took a random sample of over 150 dairyfarmers with more than 25 cows and retained 118 of them: the others being rejected for various reasons—large beef or sheep income, ownership of more than one farm, inadequate records, etc. The 118 farms were classified according to topography, as "Hills", "Undulating" or "Plains", and for the present study 51 of the "Undulating" and nine closely similar "Hills" farms were selected to make up the sample of 60. Because of deaths, farm sales etc., 60 original "Undulating" farms were not available in 1963, that being the year of the present survey. A general description of this industry, in Woorayl Shire, is available in Cozens and White's report.

² L. E. Cozens and H. A. White, *A Survey of Dairy and Pig Farms in Woorayl Shire, South Gippsland, Victoria* (Victorian Department of Agriculture, Melbourne 1961).

³ *Op. cit.*

⁴ *Op. cit.*

Several measures of economic performance were considered: net farm income, net farm income as a percentage of capital invested and net farm income per acre. The first of these is a common measure of success with which a farmer operates but since acreage is, in the short term, effectively fixed and unlikely to be sensitive to the action of communication processes, comparability requires that performance be assessed on a relative basis. Of the last two measures, the latter has been selected since, as already noted, acreage rather than capital is a fixed factor from the farmer's point of view. Net farm income per acre is one common way of assessing farming efficiency. High net farm income per acre is, in general, favoured by high stocking rate and high production per cow.

Net farm income per acre was available from the 1958 survey, and was calculated again for 1963 from information collected during the interview and from income tax and butter factory records.

Degree of adoption of recommended farm practices was available from the 1958 survey, the farmer scoring 1 or 0 according as he had or had not adopted each of the practices:—

- Autumn saving of pastures ;
- Strip grazing ;
- Hay feeding in excess of 1,500 lb/cow/year ;
- Growing of fodder crops ;
- Rotational grazing ;
- Herd testing ;
- Silage making ;
- Intensive subdividing of the farm.

These practices were all recommended by the Department of Agriculture in 1958 (the position in this respect is still virtually the same) and are such as to make for a somewhat higher physical production per cow, stability of production or preservation of the pasture.

Woorayl Shire is an old established area with little evidence of change over the past five years and, as was to be expected, the correlation of the 1958 and 1963 net farm incomes per acre was quite reasonably high (0.75). For these reasons, the 1958 data for both net farm income per acre and degree of farm practice adoption were used in the statistical analysis subsequently discussed. Degree of adoption of farm practices was not determined again in 1963.

The remaining variables, associated with personal and social aspects of the farmer's situation, were measured by scales constructed from specially selected items contained in the verbally administered (1963) questionnaire. Thus, as described above, this study investigates the relationships between personal and social factors measured in 1963 and performances measured five years earlier in 1958. This procedure is thought to be justified by the undoubted stability of the farming community involved, for in the opinion of experienced officers there has been little or no evidence of change in this area.

The notation and names used for the scales, and for the two measurements of performance, discussed above, are given in Table 1 and a detailed description of them in the next section. In a pilot study, fifteen farmers were interviewed but not included in the final sample of sixty and the

results used in preparing the final questionnaire. The remainder of this section is concerned with a general description of the technique of scale construction used in the present investigation.

The scales were all constructed in essentially the same way. Typically, a scale is a set of questions (items) to each of which an individual responds "no" or "yes". The questions are then scored 0 to 1, correspondingly, and the total score over the set of questions is the individual's value for the variable measured by the scale. When the questions had a planned negative bias, the scoring is, of course, reversed. As the subsequent account shows, responses can be more complicated than this and the set of items must pass a statistical test before it can be considered as constituting a scale, and as being an instrument of measurement.

In more detail, for any scale, a set of items is selected from the population of possible items thought to be pertinent to the variable being measured. In this study, from six to twelve items were so selected according to the suitability of those available. The items were either factual, e.g., "Do you use an income-tax consultant?", or such as to require an opinion, e.g., "Television has introduced new ideas to farmers in this district." In the former case, the items were scored 0 to 1 according as the response was "no" or "yes", respectively, and in the latter, 0, 1, 2, 3, or 4 according as the response was "strongly disagree", "disagree", "undecided", "agree", "strongly agree". The attitude scales all involved items of this latter type whereas the other scales comprised only factual items. The factual items were, however, sometimes nondichotomous, e.g. "How often do you listen to the Country Hour?"—this being scored 3, 2, 1, or 0 according as the responses were "every session", "every 2 or 3 sessions", "less often than every 2 or 3 sessions" or "never".

A set of items cannot be considered as constituting a scale unless a test of significance justifies the supposition that the component items are all measuring the same (or closely similar) variable (s). If individuals respond randomly to the items of such a set, or if the items are quite unrelated to each other, then individuals scoring high or low on one item will not necessarily tend to score high or low, correspondingly, on the others—as they should do if all the items are measuring the same variable. A coefficient of scalability, W , can be constructed to indicate the extent of agreement of the items of such a set, and a test of significance applied to the null hypothesis that the individuals are assigning scores at random.⁵ If the coefficient W were 1 there would be perfect agreement of the items in partially ranking individuals but, in this particular field of investigation, one would not expect the coefficient to be greater than 0.50, or thereabouts. The farm practices set of items was also tested in this manner.

Other coefficients for the assessment of the scalability of a set of items are available, e.g., Guttman⁶ and Green⁷, but they apply only to sets of dichotomous items. The coefficient W has therefore been used here, since it can be calculated for either dichotomous or nondichotomous sets of items.

⁵ R. Jardine, "Ranking Methods and Measurement of Attitudes", *Journal of American Statistical Association*, Vol. 53, No. 283 (September, 1958) pp. 702-728.

⁶ L. Guttman, "The Basis of Scalogram Analysis". In *Measurement and Prediction* (Ed.) S. A. Stouffer, et. al. (Princeton University Press: Princeton, 1950), pp. 60-90.

⁷ B. F. Green, "A Method of Scalogram Analysis Using Summary Statistics" *Psychometrika*, Vol. 21, No. 1 (March, 1956) pp. 79-88.

If a set of items yields a significant W value then this is evidence that the population of items from which they were selected form a scalable universe. It is reasonable then to "purify" the scale by the removal of certain items if the coefficient W is thereby substantially increased, even though this tends to capitalize on fortuitous associations. However, it is worth emphasizing that this "purification" was carried out only if the original set of items yielded a significant coefficient. If it did not, then the proposed scale was rejected altogether. Given the final set of items constituting the scale, the total score over the items is taken as the measure of the variable involved.

3. DESCRIPTION OF THE SCALES

Scales for the measurement of conceptual skill, urbanization and situational motivation are of special interest and are quite similar to those so named by Emery and Oeser⁸. (Hereafter scales are referred to by the names given in Table 1, capitalized, e.g., Conceptual Skill; and the variable being measured by the same phrase or word uncapitalized, e.g., conceptual skill).

TABLE 1
Scales and Measures of Performance

| Notation | Name |
|----------|---|
| CS | Conceptual Skill |
| UR | Urbanization |
| SM | Situational Motivation |
| SP | Social Participation |
| AP | Attitude to Printed Matter |
| AT | Attitude to Television |
| AR | Attitude to Radio |
| AD | Attitude to the Department of Agriculture |
| AC | Attitude to Commercial Organizations |
| AF | Attitude to Other Farmers |
| APM | Attitude to Profit Maximization |
| EP | Exposure to Printed Matter |
| ED | Exposure to the Department of Agriculture |
| EC | Exposure to Commercial Organizations |
| FI/A | Farm Income/Acre |
| FPA | Farm Practice Adoption |

Conceptual Skill initially comprised eight items, and purports to measure the ability to think conceptually and make abstract generalizations: an ability which is capable of improvement by practice, as with other types of skill (Emery and Oeser⁹). The items in the questionnaire referred to:— using income-tax consultants; keeping physical farm records; willingness to use credit for farm improvement; having specific ideas for the use of

⁸ *Op. cit.*

⁹ *Op. cit.*, pp. 14 and 16.

credit on the farm ; having had milking machines tested ; having production targets ; being past or present member of a Herd Test Association ; being able to appreciate the effect of Federal Government decisions on dairyfarmers. Since all but two of the farmers paid consultants to prepare their taxation returns, this item was excluded ; so also was that referring to having specific ideas for the use of credit, since difficulties of categorizing occurred.

Urbanization comprised six items, and purports to measure the degree to which an individual adopts the instrumental attitude to knowledge characteristic of urban industrialized cultures as opposed to the traditional attitude characteristic of agrarian cultures (Emery and Oeser¹⁰). It is thought to be associated with an "outward-looking" or "cosmopolite" attitude, which might result from contact with, or experience of, the urban way of life. The items of the questionnaire referred to:—having visitors from city or town on the farm ; having taken vacations in the previous three years ; having had employment other than as a rural worker ; having seen war service ; having spent childhood in town or city ; having received relatively higher education.

Situational Motivation initially comprised nine items, and is intended to measure the extent to which personal and social factors in the individual's environment influence and support his motivation (Emery and Oeser¹¹). The items in the questionnaire referred to: wife having an interest in farming ; health ; having children at school or under school age ; having a debt or mortgage on the farm ; satisfaction with present level of farm production ; having belief that farm is at maximum productive capacity ; age ; having education aspirations for children ; allowing sons to share responsibility. The final item was negatively correlated with the remainder and as no logical basis for this relation was apparent, it was deleted immediately. Prior to the collection of data, it was thought that this item would be positively correlated with the others, but the opposite result made it clear that the nature of this aspect of farmer behaviour was not properly understood. In this situation such an item is best rejected, although in other cases, as stated earlier, when an item is constructed in advance so that it is negatively correlated, the scoring can legitimately be reversed in direction. Of the other items, those referring to health and educational aspirations for children were finally rejected.

Social Participation initially comprised six items, and measures participation in formal organizations. The items in the questionnaire referred to:—membership of a political party, a committee, a sporting club, farming organizations ; participation in church activities ; having family members of clubs and organizations. The first of these items was finally rejected.

The seven attitude scales proposed were Attitude to Profit Maximization, Printed Matter, Television, Radio, Department of Agriculture, Commercial Organizations, and Other Farmers. These scales were designed to measure the farmers attitudes to a particular farming goal and to six media as sources of useful farming information. Farming newspapers and magazines were used in the construction and selection of appropriate items, and some reduction in the initial set was finally made for Attitude to Profit Maximization,—Printed Matter,—Radio. The items involved in these scales are

¹⁰ *Op. cit.*, pp. 9 and 10.

¹¹ *Op. cit.*, p. 12.

not listed here in detail but may be found in Appendix V. The items were all of the type previously described (the farmer responding on a five-point scale from "strongly disagree" to "strongly agree") and are exemplified by typical items from the scale Attitude to Printed Matter:—"Digests and magazines help the farmer to keep up with the latest ideas in his industry"; "Articles in digests and magazines describe methods which are good in theory but are not practical"; "It is worthwhile putting aside a few hours each week to read about farming".

At this point it may be noted that an attitude is considered here to be an "enduring, learned predisposition to behave in a consistent way towards a given class of objects" (English and English¹²). There is, however, no way of directly measuring such predispositions and the usual procedure (as here) is to sample opinions, where these latter are "viewed as verbal 'answers' that an individual gives in response to stimulus situations in which some general 'question' is raised" (Hovland *et al.*¹³). The close connection existing between attitudes and opinions justifies the claim that attitudes are in this way being measured.

The three exposure scales constructed were Exposure to the Department of Agriculture ;—Commercial Organizations ;—Printed Matter. Satisfactory scales could not be constructed for exposure to television or to radio, although farmers apparently had attitudes to radio as a medium even when there was little exposure.

Exposure to the Department of Agriculture comprised items referring to various agents—District Agricultural Officer, Dairy Supervisor, Government Veterinary Officer, Stock Inspector—and to such events as having heard them speak at meetings, read articles written by them, had telephone conversations with them, received visits from them at the farm, etc. Exposure to Commercial Organizations was similar, except that it referred to commercial rather than government agents. Exposure to Printed Matter comprised items referring to having read articles in the *Weekly Times*, *Dairyfarming Digest*, *Stock and Land*, *Journal of Agriculture*, etc., and to farmers' reading habits (reading page by page ; selecting articles ; flipping through pages).

4. RESULTS OF STATISTICAL ANALYSIS

The data available for statistical analysis are therefore from the two assessments of farmer performance and the sets of items associated with thirteen personal or social factors. It was assumed that the aspects of performance measured would be sensitive to the action of communication processes and it was expected that the personal and social factors would be shown, by their associations with performance, to affect these processes.

¹² H. B. English and A. C. English, *A Dictionary of Psychological and Psychoanalytic Terms*, (David McKay: New York, 1958).

¹³ C. I. Hovland, I. L. Janis and H. H. Kelly, *Communication and Persuasion*, (Yale University Press: New Haven, 1953), p. 6.

Tests of significance were applied to the sets of items described in the previous section, and the sets yielding significant coefficients were "purified" by the omission of certain items where this was thought desirable. Levels of significance and other relevant information are given in Table 2. Attitude to Television was rejected, since the coefficient was not significant, but the other proposed scales were all accepted. Social Participation was also retained, since the coefficient only just failed to reach significance. As may be gleaned from the previous section, one item was rejected from Situational Motivation prior to test, since its introduction was obviously an error; and two exposure scales were rejected simply on examination, since the degree of exposure was much too inadequate for these sets of items to be of any use.

TABLE 2

Coefficients of Scalability for the Initial and Final Scales†

| Scales | Initial Items | | Final Items | | |
|--------|---------------|-----------------------|-------------|-----------|----|
| | n | W | n | W | MS |
| CS | 8 | 0.302*** | 6 | 0.393 | 9 |
| UR | 6 | 0.322* | 6 | 0.322 | 9 |
| SM | 8 | 0.257** | 6 | 0.333 | 8 |
| SP | 6 | 0.271 | 5 | 0.356 | 6 |
| AP | 11 | 0.275*** | 8 | 0.310 | 32 |
| AT | 9 | 0.149 ^{n.s.} | | (omitted) | |
| AR | 7 | 0.491*** | 7 | 0.491 | 28 |
| AD | 7 | 0.344*** | 7 | 0.344 | 28 |
| AC | 7 | 0.552*** | 7 | 0.552 | 28 |
| AF | 9 | 0.253*** | 6 | 0.343 | 24 |
| APM | 8 | 0.362*** | 6 | 0.413 | 24 |
| EP | 6 | 0.311*(*) | 5 | 0.416 | 9 |
| ED | 12 | 0.518*** | 12 | 0.518 | 13 |
| EC | 7 | 0.361*** | 7 | 0.361 | 13 |
| FP | 8 | 0.402*** | 8 | 0.402 | 8 |

† n = no. items: W = coefficient of scalability: MS = maximum possible total score (minimum score = 0): significance — n.s. = not significant, (*) = almost 5%, * = 5%, *(*) = almost 1%, ** = 1%, *** = 0.1%.

As a group, the first four scales—Conceptual Skill, Urbanization, Situational Motivation and Social Participation—yielded coefficients less significant than those of the attitude and exposure groups, which in general were highly significant. This is, no doubt, due to the nature of the variables involved, for those measured by the scales of the first group are rather more complex than any of the others.

The statistical analysis of these data was carried out in two stages. Firstly, a factor analysis of the table of correlation coefficients (Appendix II) for the thirteen scales was performed, the aim being to reduce this set of scales to a smaller set of more meaningful, more nearly uncorrelated,

derived scales. Secondly, the correlation table for the six derived scales so obtained together with the measures of farmer performance was calculated and this table used as the basis of the subsequent discussion of the results. The derived scales are defined as in Table 3 and the correlation coefficients given in Table 4. A more detailed description of the factor analysis is given in Appendix I.

TABLE 3

*Derived Scales: Definitions in Terms of Original Scales**

| Derived Scale | Definition | Associated with Factor— | Name |
|---------------|-------------|-------------------------|---------------------------------------|
| MO | (CS + ED)/2 | A | Managerial Orientation. |
| SM | SM | B | Situational Motivation. |
| UR | UR | C | Urbanization. |
| AMM | (EP + AR)/2 | D | Attitude to Mass Media. |
| ACO | (AC + EC)/2 | E | Attitude to Commercial Organizations. |
| AF | AF | F | Attitude to Other Farmers. |

* Compare with Appendix IV.

TABLE 4

*Correlation Matrix: Derived Scales and Measures of Farmer Performance**

| | FI/A | FPA | MO | SM | UR | AMM | ACO | AF |
|------|------|-----------|-----------|------|-----------|-----------|-----------|-------------|
| FI/A | 100 | — 11 | 18 | — 11 | 00 | — 04 | 07 | — 15 |
| FPA | — 11 | 100 | 40 | 01 | 07 | 04 | — 05 | — 03 |
| MO | 18 | 40 | 100 | 15 | 16 | 33 | 10 | 01 |
| SM | — 11 | 01 | .. | 100 | 14 | 00 | 10 | 05 |
| UR | 00 | 07 | .. | .. | 100 | — 01 | 11 | — 08 |
| AMM | — 04 | 04 | .. | .. | .. | 100 | 19 | 26 |
| ACO | 07 | — 05 | .. | .. | .. | .. | 100 | 04 |
| AF | — 15 | — 03 | .. | .. | .. | .. | .. | 100 |
| AD | .. | .. | 40 | 20 | 29 | 09 | 31 | — 04 |
| SP | .. | .. | 41 | 00 | 23 | 17 | 39 | — 26 |
| AP | .. | .. | 20 | — 09 | — 10 | 34 | 16 | 31 |
| APM | .. | .. | 21 | 15 | 18 | — 04 | 37 | 11 |

* Notation in Tables 1 and 3. Decimal points omitted, 100 = 1.00.

Coefficients printed in **bold** type are significant at the 5% level.

The rationale of the analysis of data presented here may be considered in general terms from two aspects. Firstly, the justification for the claim that, to select a particular case, an attitude scale really does measure some characteristic of farmers is that a test of significance provides evidence that farmers are consistent in their responses to a set of items. Clearly,

a single item can provide no such evidence but, when a number of distinct items invoke consistent response, it is then reasonable to suppose that this reflects some predisposition of the farmers to respond in that way. An attitude is just such a predisposition and, similarly, in other cases, consistency is the basis for supposing that certain variables are being measured. It can always be argued that a scale does not measure the variable it purports to measure, but this is different from claiming that it does not measure at all.

Secondly, unlike the items of a scale which all measure the same or closely similar variables, the scales themselves are intended to measure different variables. However, when as many as thirteen scales are constructed it is not immediately evident to what extent they are really different. Factor analysis offers a reasonably objective way of examining this matter and, in the present case, suggests that six scales, if properly constructed, contain most of the information of the original thirteen scales. The six derived scales were constructed with this in mind. Even when a derived scale is simply a single one of the original scales its status is not just that of one of those original scales, for it has been singled out by the factor analysis as relatively independent and especially relevant in explanation of the others. Nevertheless, in this study, the factor analysis is really secondary and only a means of reducing a set of scales some of which are, inevitably, redundant. The derived scales are, therefore, new rationally defined scales, rather than estimators of factors. Considering Table 4, it is to be noted that the correlations among the derived scales are all low except that for Managerial Orientation and Attitude to Mass Media, this presumably being due to the reasonably high loading of Attitude to Radio on factor A (see Appendix IV). Farm Income/Acre and Farm Practice Adoption are uncorrelated and the only significant correlation of a scale with either of these two assessments is that of Managerial Orientation with Farm Practice Adoption. The correlation here was 0.40 and highly significant ($P < 0.01$). Table 4 shows, as a matter of interest, the correlations of the scales not involved in the derived scales with those latter.

5. THEORETICAL CONSIDERATIONS

The present investigation involves a re-examination (1963) with respect to certain personal and social factors, of some sixty farmers who were previously observed (1958) in connection with an economic study. These factors are considered here with a view to explaining farmer performance, assessed as it was in two different ways.

Now, while it is obvious that not all relevant factors are being considered, it is also obvious that only in relation to some theoretical model can one see just what factors, or possible factors, are being ignored. Social psychology has not, of course, advanced to the point where very precise models can be formulated but, even so, sufficient can be done to clarify, and to provide a more or less adequate framework for, the foregoing empirical analysis.

Emery and Oeser¹⁴ found "that exposure to all sources of information tended to have adoption of new practices as a result. It was shown that the rate of adoption could be affected indirectly by increasing the degree

¹⁴ *Op. cit.*, p. 89.

of exposure to information either indirectly or directly; and that, to a very much smaller extent, adoption could be affected directly". They state that exposure may be influenced indirectly by the urbanization, situational motivation and conceptual skill of the farmer. They also emphasize the point of view that the adoption of a desirable practice or innovation by a (non-adopting) farmer is primarily the result of appropriate communication processes.

Feather¹⁵, analysing such processes in more detail than those authors, distinguishes between (a) the source (e.g., a member of the Department of Agriculture), (b) the message (e.g., conserve fodder), (c) the communication (e.g., a radio broadcast embodying the message in some one of many possible scripts), and (d) the receiver (e.g., the farmer). Feather is mainly concerned with the relationships which must hold between these four elements of the process for structural balance (the precise nature of which does not have to be specified), but his analysis is of more interest here as a basis for consideration of the types of factors which can influence the communication process.

The distinctions referred to above provide an adequate basis for the subsequent discussion. However, it is of interest to note some further refinements suggested by Read¹⁶. Firstly, the receiver may discriminate between the original source (a person or organization) and the particular sender (agent of the source) of the message. For example, a member of the Department of Agriculture may be perceived by a farmer as the source of a message; or, alternatively, as a sender of a message perceived as originating with the Department of Agriculture. In this latter case, there is scope for a conflict of attitudes which could conceivably affect the communication process.

Secondly, the communication (distinguished here from the communication process) is the physical manifestation carrying the message and, for a given source, sender and message, may be characterized in respect of two different aspects. Namely, the verbal (also perhaps visual or auditory) form in which the message is embedded and, independently, the medium (channel) by which it is transmitted. Clearly, the source (or sender) can vary both these characteristics of a communication with the aim of making the transmission of the message more effective.

A distinction between impersonal mass media and face-to-face communications processes is commonly emphasized but it is worth noting that this distinction is only one of degree, namely, the degree of proximity of the source (or sender) to the receiver.

Adoption is taken to be the final outcome of exposure to one or more communication processes, spread perhaps over a considerable period of time, involving a particular farmer, a particular message (concerning some practice or innovation), and a variety of sources and communications (embodying that message). Adoption presumably occurs as a result of

¹⁵ N. T. Feather, "A Structural Balance Model of Communication Effects", *Psychological Review*, Vol. 71, No. 4 (July, 1964), pp. 291-313.

¹⁶ H. Read, "The Effective Role of Mass Media in Agricultural Extension Education", *Reviews, Papers and Reports, Australian Agricultural Extension Conference* (C.S.I.R.O.: Melbourne, 1962), pp. 249-250.

the cumulative effect of these communications when the farmer acquires a favourable attitude to the action advocated by the message. Clearly, a study of the factors affecting this final result is of great interest, for by their manipulation the adoption period might be considerably shortened. Moreover, even when these factors cannot be readily influenced, it is of interest and importance to understand how and to what extent they operate.

The communication process considered here has been studied in some detail by psychologists, e.g., Hovland *et. al.*¹⁷, and three stages may be recognized. Various factors may affect (1) exposure to a source, (2) acceptance of the message, or (3) the subsequent response. Consider (2) first, taking note that it is the receiver's perceptions which matter.

Factors affecting acceptance of a message may be associated with (i) the source—its perceived credibility, prestige, trustworthiness, intentions, affiliations; (ii) the message—the perceived characteristics of the practice or innovation advocated; (iii) the communication—its perceived character, as engendered by the organization of its arguments and by the affective qualities of its presentation, or (iv) the receiver—his personal characteristics and predispositions, abilities, attitudes, suggestibility, conformity to group or social norms, etc.

It is evident that factors associated with the receiver, above, will play a part in determining both the degree of exposure of the receiver to sources and his subsequent response to an accepted message (whether it is superficial or genuine and, if the latter, whether it is retained sufficiently long for appropriate action to ensue). Finally, the operation of environmental factors, as perceived by the receiver, are influential at all stages of the process.

The present study is concerned solely with relative differences between farmers, no consideration being given to the actual characteristics of sources of communications as factors affecting the average level of performance. Such personal and social factors are the least easily influenced of the various elements of the communication process but, as emphasized previously, it is important that their operation be understood.

Of the variables studied here conceptual skill, urbanization, and the six attitudes can immediately be classed as personal characteristics or predispositions and will be expected to affect a farmer's perception and evaluation of a communication, and of the situation in which it occurs. Conceptual skill and urbanization are both expected to facilitate decision-making, in consequence of the superior evaluative ability they imply, and urbanization in particular is conceived (Rogers¹⁸, Emery and Oeser¹⁹) to favour a greater degree of exposure to communication sources.

Attitude to profit maximization should be pertinent to whether or not a particular message arouses motivation for some appropriate action, and the other five attitudes are expected to affect the farmer's perception of various sources in respect of their credibility and, more specifically, their

¹⁷ C. I. Hovland, *et. al.*, *op. cit.*

¹⁸ E. M. Rogers, *Diffusion of Innovations* (Free Press: N.Y., 1962).

¹⁹ *Op. cit.*, p. 83.

usefulness. Situational motivation and social participation characterize certain aspects of the farmer's environment, relevant probably to all stages of the process—exposure, acceptance, response. The former was one of the key variables considered by Emery and Oeser.

The exposure variables are somewhat ambiguous, in that they can be regarded as directly describing exposure to sources or as indirectly reflecting the operation of personal factors which act at all stages of the communication process. The latter point of view is adopted here, and is justified by the fact that exposure to these sources of information is usually voluntary. This is particularly so of exposure to the Department of Agriculture: for there is, in fact, little difference between the item of the scale Exposure to the Department of Agriculture and an item referring to "seeking expert assistance in the preparation of taxation returns". Such an item was included by Emery and Oeser²⁰ in their Index of Conceptual Skill and, initially, in the Conceptual Skill scale of this study.

Thus, the 13 variables considered were all thought, prior to any collection of data, to be relevant to the problem being investigated. The factor analysis replaced them by a smaller set which, however, retains the most important concepts involved and the most readily interpretable scales. Managerial orientation replaces conceptual skill and is a personal characteristic quite closely related to it, while urbanization and situational motivation are retained unchanged. The remaining three variables are attitudes—to mass media, commercial organizations, and other farmers—and in interpreting them the above comments on the exposure variables are pertinent.

To conclude this discussion of theoretical matters, a brief comment on the model presented by Rogers²¹ may be made. Rogers summarizes the results of over 500 studies and produces a paradigm of the adoption process. This does not seem to differ greatly from the model proposed above (which is essentially due to Emery and Oeser), except that the process is considered from a different point of view. Instead of emphasizing the individual communicative acts which are comprised by the adoption process, he is concerned with this latter process as a whole.

Thus, in considering the sequence of communications which eventually lead to adoption he recognizes five stages of response to them, viz., awareness, interest, evaluation, trial, and adoption. He emphasizes, especially, the importance of factors affecting perception of the character of the practice of innovation at the stage of evaluation, and also that a "cosmopolite" attitude facilitates initiation of communication, rather than evaluation after initiation has been achieved.

This reference by Rogers to stages of the adoption process clarifies one aspect of the earlier discussion. It was stated there that adoption is a final response to the cumulative effect of a sequence of communicative acts. This does not, however, imply that until adoption occurs that the farmer is passive, and that earlier communicative acts produce no response: as Rogers states, they produce such responses as awareness, interest, evaluation, and trial—with the cumulative effect perhaps that the message is finally accepted. Rogers recognizes that adoption or non-adoption may then

²⁰ *Op. cit.*, p. 15.

²¹ *Op. cit.*, pp. 305-307.

occur, and that state either be continued or discontinued. Personal characteristics of the farmer and his perceptions of the environment are classified as "antecedents", these being factors which exist prior to awareness of the innovation and persist throughout the adoption process. Clearly, there is nothing in Rogers' account which conflicts with the model previously discussed.

6. DISCUSSION AND CONCLUSIONS

The discussion which follows is concerned with the derived scales of Table 3 and the correlation coefficients of Table 4.

Managerial Orientation is an average of Conceptual Skill and Exposure to the Department of Agriculture. Conceptual Skill measures an ability which manifests itself in an explicit planning of farm operations and organization, and is one which is highly relevant to the managerial function of decision-making. Emery and Oeser²² consider it to be of prime importance, for they state that "The task of extension services, then, can be defined as the increasing of conceptual skills . . . ". Exposure to the Department of Agriculture which is largely voluntary reflects an explicit recognition of actual or potential problems, and a decision to seek technical advice in the major quarter from which it is available. This, also, is evidence of a managerial quality, for it is a function of management to set up and maintain lines of communication which will facilitate decision-making.

Managerial orientation can, therefore, be considered as a personal characteristic which can be learned. It is demonstrated to the degree to which a farmer approaches his problems from a managerial, rather than a traditional, point of view. (The functions of management have, of course, been the subject of study, e.g., Barnard²³). Nevertheless, this variable does not discriminate those who have high farm income/acre (which is one measure of efficiency) from those who have not—as is evident from the lack of correlation of Managerial Orientation and Farm Income/Acre.

Managerial Orientation is, however, correlated with Farm Practice Adoption, and this implies that a farmer rated high on the former scale is more amenable to persuasion, and can be more readily communicated with, than one rated low on the scale. This is perhaps the significance of managerial orientation: that it is a characteristic which facilitates adaptation by the farmer to changing conditions or to the advent of new techniques. In such circumstances, a managerially oriented farmer might well adjust to the new conditions more rapidly and effectively than an efficient farmer whose efficiency was based on the continuance of well-established traditional practices.

Thus, observation of a correlation between Managerial Orientation and Farm Income/Acre is very likely to depend on the type of community involved. Woorayl Shire is an old and stable area, and the existence of successful non-managerially oriented farmers may well be a consequence of the fact that, in these circumstances, traditional practices work very well.

²² *Op. cit.*, p. 86.

²³ C. I. Barnard, *The Functions of the Executive* (Harvard University Press: Cambridge, 1938).

The nature of the practices recommended by the Department of Agriculture is another factor affecting the observed relationships between farm income/acre, farm practice adoption and managerial orientation. In this particular case, it is possible that the practices examined would bring about long-term beneficial effects on production rather than immediate monetary gains. This being so, it is not perhaps surprising that Farm Income/Acre and Managerial Orientation are uncorrelated. However, the importance of managerial orientation is that farmers so characterized tend to adopt practices advocated by an authoritative source (the Department of Agriculture is dominant, in this respect, in Victoria). Then, whatever the nature of the advice given by such a source—whether the emphasis be on long-term or short-term aspects of the situation—managerially oriented farmers will tend to accept such advice if it is in accord with their aims. Since many farmers are concerned to maximize their income, it is clearly important that careful consideration be given by advisory officers to the problem of achieving short-term economic gains without being unduly pessimistic as to the long-term consequences.

Situational Motivation and Urbanization are simply the original scales. Any direct measurement of the farmer's motivations is far too difficult, at least for this type of survey, and the concept of situational motivation was introduced by Emery and Oeser²⁴ in its place. Emery and Oeser²⁵ found that situational motivation and urbanization were factors affecting degree of exposure and, thereby, adoption. However, in this study these two variables were found to be unassociated with each other and with all other variables (except that Urbanization was correlated with Attitude to the Department of Agriculture: see Appendix II). These scales did not, therefore, measure variables which explained farm practice adoption or farm income/acre in the present study.

This result is difficult to explain, and the matter is complicated by the fact that the items involved in these scales are not identical in number or nature with those used by Emery and Oeser. However, the numbers of items used by Emery and Oeser are undesirably small (4 for each of UR and SM), and an attempt was made in this study to enlarge all scales as much as possible. Secondly, the items investigated in this study have as much prior justification for inclusion as do those used by Emery and Oeser, and the observed responses offer the only basis for a final selection. Thus, although items are not identical in the two studies, there seem to be no reasons for rejecting the nominal designation of the scales studied here as Urbanization and Situational Motivation.

The most likely explanation of the differences noted above is that the Woorayl Shire community is markedly different from that investigated by Emery and Oeser. However, while this may be so, the present authors are also of the opinion that although the concepts involved here are almost certainly valuable, the scales constructed are in general (although perhaps successful for Emery and Oeser) too crude to do justice to those concepts. Possibly the relationships in the Bengworden grazing community are simpler and more sharply defined than in Woorayl Shire. This is borne out by the fact that in the subsidiary study of the dairying community at Bengworden, the authors were not able to construct the same scales.²⁶

²⁴ *Op. cit.*, p. 12.

²⁵ *Op. cit.*, pp. 58-59.

²⁶ *Op. cit.*, p. 121.

The remaining derived scales measure attitudes to various sources of information. Attitude to Mass Media is an average of Attitude to Radio and Exposure to Printed Matter, and the derived scale Attitude to Commercial Organizations is an average of the original scale Attitude to Commercial Organizations and Exposure to Commercial Organizations. In both cases, the exposure scales are to a considerable extent measuring voluntary activities of the farmer. Attitude to Other Farmers is simply the original scale. Although these scales, assessed by the coefficient of scalability, are quite well established, differing somewhat in this respect from Situational Motivation and Urbanization, they are not measuring variables related to farm practice adoption or farm income/acre. This result also seems to be in conflict with those obtained by Emery and Oeser.

Some of the associations shown by the derived scales and the residual scales are of sufficient interest for a brief comment. Attitude to the Department of Agriculture is correlated with Managerial Orientation and Attitude to Commercial Organizations but not with Attitude to Mass Media, and this suggests an attitude to face-to-face communication as opposed to mass media. Social Participation shows the same correlations (as immediately above) except that it is negatively correlated with Attitude to Other Farmers. That is, those who participate at a high level in formal organizations tend to have a low opinion of the usefulness of other farmers as a source of information.

Alternatively, the correlations of Attitude to Printed Matter with Attitude to Mass Media and Attitude to Other Farmers are positive. Thus, there seems to be a contrast here between those who favour face-to-face communication and have an unfavourable opinion of other farmers and those who favour mass media and have a favourable opinion of other farmers.

The remaining scale, Attitude to Profit Maximization, is correlated with Attitude to Commercial Organizations. Apparently, those rated high on the former scale tend (rightly or wrongly) to see commercial organizations as especially relevant to their aims. These conclusions are, of course, only tentative.

The results of this study are rather more negative than were anticipated, and they certainly suggest the need for a more thorough investigation of the psychological and sociological aspects of the problems involved. The main conclusion, in general agreement with Emery and Oeser,²⁷ is that communication with the farmer can most readily be facilitated, and the adoption period thereby shortened, by inculcating a managerial approach to farming. If this is to be fully effective it is also necessary that solutions to technical and economic problems should be available on demand in so far as this is possible.

²⁷ *Op. cit.*, p. 86.

APPENDIX I

Description of the Factor Analysis

The correlation matrix of the 13 scales is given in Appendix II, the total scores first having been transformed to normal scores using Harter's¹⁸ tables. This transformation is probably not necessary and the correlation matrix is likely to be little different for the untransformed data. The principal axis factors were extracted from this matrix, communalities not being inserted in the diagonals, the procedure being essentially that described by Cooley and Lohnes¹⁹. The latent roots of the matrix are given in Appendix III, and it may be noted that the first 6 factors account for 73 per cent of the total variance.

Only 6 factors were retained, and the principal axis factor matrix was rotated orthogonally to produce a more meaningful set of factors. The resulting factor pattern (and structure) matrix is given in Appendix IV. Oblique rotation by a graphical method gave essentially the same result and the simpler solution has, therefore, been retained. After consideration of the factor loadings in Appendix IV six derived scales were constructed or selected (i.e., defined) which, although not orthogonal, are each reasonably highly correlated with some one of the six factors. The definitions of the derived scales are set out in Table 3.

Thus, the original 13 scales have been replaced by 6 derived scales, and the correlation matrix of these latter, together with the measures of farmer performance, is given in Table 4.

APPENDIX II

Correlation Matrix of the Original Scales*

| Scales | CS | ED | AD | SP | SM | UR | EP | AR | EC | AC | AF | AP | APM |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CS | 100 | 36 | 29 | 29 | 14 | 07 | 12 | 40 | 22 | -18 | -11 | 20 | 19 |
| ED | .. | 100 | 37 | 38 | 11 | 20 | 08 | 33 | 35 | -11 | 12 | 13 | 16 |
| AD | .. | .. | 100 | 34 | 20 | 29 | -06 | 22 | 34 | 17 | -04 | 26 | 45 |
| SP | .. | .. | .. | 100 | 00 | 23 | 12 | 17 | 41 | 22 | -26 | 10 | 08 |
| SM | .. | .. | .. | .. | 100 | 14 | -01 | 01 | 10 | 07 | 05 | -09 | 15 |
| UR | .. | .. | .. | .. | .. | 100 | -03 | 02 | 15 | 04 | -08 | -10 | 18 |
| EP | .. | .. | .. | .. | .. | .. | 100 | 42 | 27 | 13 | 20 | 26 | -06 |
| AR | .. | .. | .. | .. | .. | .. | .. | 100 | 18 | -06 | 24 | 31 | -01 |
| EC | .. | .. | .. | .. | .. | .. | .. | .. | 100 | 32 | 22 | 18 | 34 |
| AC | .. | .. | .. | .. | .. | .. | .. | .. | .. | 100 | -14 | 08 | 26 |
| AF | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 100 | 31 | 11 |
| AP | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 100 | 10 |
| APM | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 100 |

* FPA excluded. Decimal points omitted, 100 = 1.00.

Coefficients in bold type are significant at the 5 per cent level.

¹⁸ H. L. Harter, "Expected Values of Normal Order Statistics". *Biometrika*: Vol. 48, Parts 1 and 2 (June, 1961), pp. 151-165.

¹⁹ W. W. Cooley and P. R. Lohnes, *Multivariate Procedures for the Behavioural Sciences* (John Wiley: New York, 1962), pp. 164-172.

APPENDIX III

Latest Roots Associated with the Principal Axis Factors

| Factor | | | Latent Root |
|--------|----|----|-------------|
| I | .. | .. | 3.072 |
| II | .. | .. | 1.830 |
| III | .. | .. | 1.436 |
| IV | .. | .. | 1.269 |
| V | .. | .. | 1.000 |
| VI | .. | .. | 0.906 |
| VII | .. | .. | 0.781 |
| . | .. | .. | . |
| . | .. | .. | . |
| XIII | .. | .. | 0.244 |
| Total | | | 13.000 |

Variance accounted for I to VI 73.2 per cent.

APPENDIX IV

Factor Pattern and Structure Matrix*

| Scales | Factors | | | | | |
|--------|--------------|--------------|----------------|----------------|----------------|----------------|
| | A | B | C | D | E | F |
| CS | 0.765 | 0.166 | — 0.373 | 0.058 | 0.043 | 0.074 |
| ED | 0.713 | — 0.165 | 0.225 | — 0.048 | 0.206 | 0.085 |
| AD | 0.486 | — 0.164 | — 0.219 | 0.366 | 0.491 | — 0.074 |
| SP | 0.528 | — 0.077 | 0.074 | 0.184 | 0.301 | — 0.578 |
| SM | 0.169 | 0.759 | 0.027 | — 0.488 | 0.148 | 0.148 |
| UR | 0.335 | — 0.085 | 0.568 | — 0.379 | 0.123 | — 0.232 |
| EP | 0.077 | 0.360 | 0.222 | 0.642 | 0.232 | 0.330 |
| AR | 0.531 | 0.144 | 0.011 | 0.440 | 0.734 | — 0.103 |
| EC | 0.240 | — 0.230 | 0.211 | 0.037 | — 0.653 | — 0.488 |
| AC | — 0.341 | 0.174 | — 0.098 | 0.021 | — 0.346 | 0.787 |
| AF | — 0.130 | — 0.131 | 0.308 | 0.043 | 0.461 | 0.353 |
| AP | 0.136 | — 0.258 | — 0.366 | 0.331 | 0.461 | 0.353 |
| APM | 0.085 | — 0.130 | — 0.232 | — 0.525 | 0.584 | 0.046 |

* Principal axis factor matrix after orthogonal rotation.

Figures of greater magnitude than 0.300 are in bold type so as to facilitate the reading of the table.

APPENDIX V**Items Used in Attitude Scales**

(Items marked * were finally deleted)

OTHER FARMERS

Other farmers are helpful when deciding whether or not to try a new idea.

* Farmers know their district and so are in a position to say whether a new practice will be useful or not.

Farmers do not have the latest information on a new idea.

* After trying a new idea farmers are in a position to tell other farmers about it.

* Farmers can help judge new ideas because they know whether or not they will make money or perhaps save time.

Since other farmers are in the same situation as you it is no use asking for their advice.

Other farmers are too slow and behind the times to provide useful information.

Because farmers come up with new ideas of their own they can give valuable information.

Because farmers understand your problems they can suggest helpful ways of overcoming them.

DEPARTMENT OF AGRICULTURE

The dairy supervisor gives useful information on farming besides talking about shed cleanliness.

Advisers should have experience as farmers before they can give information to farmers.

Advisory services in this area are helping farmers to earn more money.

The information the advisers give is not practical.

The government spends money on advisory services but this is more than repaid by the increased production due to these services.

The advisory services can give satisfactory answers to most of your questions.

Some advice these men give has not been tried and tested before it is offered.

The quality of milk supplied to the factory would fall if there were no dairy supervisors.

The dairy supervisor does a good job in keeping careless farmers up to standard.

The dairy supervisor has helped you get fewer grades for your milk.

PRINTED MATTER

It is hard to believe newspaper articles because they are influenced by advertisers.

Farmers should read a farming newspaper regularly.

The writers of these articles do not understand farming problems because they are not practical farmers.

* These newspapers contain much of practical value to the dairyfarmer.

* Digests and magazines help the farmer to keep up with the latest ideas in his industry.

* Articles in digests and magazines describe methods which are good in theory but are not practical.

A dairyfarmer does not have time to read more than one or two articles in each Dairyfarming Digest.

The advertisements in these papers and journals help farmers to keep up with new chemicals, cleaners, pumps and so on.

The helpful information in these papers and journals is mixed with so much rubbish that it is hard to find.

Papers and journals don't give enough details about the ideas they suggest.

It is worthwhile putting aside a few hours each week to read about farming.

TELEVISION

Television has introduced new ideas to farmers in this district.

The standard of farming programs is below the standard of other programs on T.V.

Farmers discuss matters mentioned on farm T.V. programs.

These programs give misleading information.

If the sessions were changed to a time which suited you, you would feel it worthwhile to watch them.

Dairyfarmers are treated unfairly by the people who decide what goes into these programs.

After working on the farm during the day, you find it hard to take farming programs in the evening.

Rather than just talking about things, the program organizers don't make use of T.V. for showing things.

Dairyfarmers are disappointed with the new time for Country Call.

RADIO

Farming programs on radio get information to farmers who would not otherwise be reached.

The information given on these programs is not reliable.

Farmers talk about subjects discussed on farm radio programs.

Farm radio programs give practical information.

These radio programs contain a fair proportion of material which applies to dairyfarming in your district.

The way these programs are presented helps to keep farmers interested.

Farmers would like more farming programs to be broadcast.

COMMERCIAL ORGANIZATIONS

Agents and dealers give farmers useful information.

Even if you don't have to buy a product, it's still worth getting the opinion of agents and dealers on some farming problems.

Agents and dealers understand the problems of dairyfarmers in this area.

On the whole, agents and dealers give answers that satisfy questions about farming problems.

Agents and dealers are more interested in making a sale than helping a farmer.

Agents and dealers keep up to date on the ways of using the products they sell.

Agents and dealers give farmers practical advice.

PROFIT MAXIMIZATION

It is worthwhile writing down plans for spending time and money on the farm.

There is no point in producing more butterfat when the industry has trouble selling its present production.

It is not worth worrying about your production for the year, the season determines that.

After a comfortable income is earned there is no point in increasing production further.

I am busy enough now without worrying about "extras" like herd testing.

The main thing I want from dairying is the satisfaction of a job well done.

*Farming is a business and you should make as much profit from your assets as you can.

*Every farmer should know what his average production per cow is each year.