USE OF INFORMATION AND COMPUTERS BY EASTERN CAPE DAIRY FARMERS

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A survey conducted amongst 26 dairy farmers in the Eastern Cape was aimed at determining their sources and costs of information, and use of computers. Respondents spent an average of R1336 per year on information sources and rated financial consultants and own farm records highest for usefulness in decisions. A regression analysis revealed the following factors to be important in influencing the use of consultants: The farmers' perceived value of own farm records in production decisions; self-rating of management skills in overall farm management; computer use; degree of farm diversification; off-farm investment, and farmer's age. Of the respondents, 73.percent used computers in their farm business. Computers were rated as 'providing better information' and 'saved time' compared to 'hand' records. Preparing financial statements and farm planning were the most highly rated applications of the computer. A multivariate logit analysis suggested the following factors to have a significant impact on computer use: Self-rating of skills in financial management; debt-asset ratio of the business; rating of own farm records, and the relative willingness of the farmer to take risks.

Gebruik van inligting en rekenaars deur Oos-Kaaplandse suiwelboere

'n Opname onder 26 suiwelboere in die Oos-Kaap was daarop gemik om die bronne en koste van hul inligting vas te stel, asook hul gebruik van rekenaars. Respondente het gemiddeld R 1 336 per jaar aan inligting bestee en aangedui dat finansiële konsultante en hul eie plaasrekords die nuttigste bronne vir besluitneming is. 'n Regressie-ontleding het laat blyk dat die volgende faktore die gebruik van konsultante beïnvloed: die boer se siening oor die waarde van sy eie plaasrekords in produksiebesluite; selfevaluering van bestuursvaardighede in algehele plaasbestuur; rekenaargebruik; mate van diversifisering; belegging buite die plaas; en die boer se ouderdom. Van die respondente gebruik 73 persent rekenaars in hul boerderysaak. Volgens hulle verskaf rekenaars beter inligting en bespaar tyd in vergelyking met 'hand'-rekordhouding. Die voorbereiding van finansiële state en boerderybeplanning is die hoogste aangeslaan wat die gebruik van rekenaars betref. 'n Meerveranderlike-logit-ontleding suggereer dat die volgende faktore 'n beduidende impak op rekenaargebruik het: selfevaluering van vaardighede in finansiële bestuur; skuld-bate-verhouding van die besigheid; evaluering van eie plaasrekords; en die relatiewe gewilligheid van die boer om risiko's te aanvaar.

1. Introduction

Farmers make decisions in a world of uncertainty. This influences the use of resources and the reliability of future plans. Farmers use information to minimise risk or to increase expected income (Jones *et al.*, 1990). Information reduces uncertainty at all stages of production allowing the farmer to measure, evaluate, control and improve the performance of his farm business (Barry *et al.*, 1988). Farmers can manage risk better if they have access to relevant information. Furthermore, computers enhance the usefulness of information by making it more readily available to the decision-maker.

This paper discusses the use and costs of various information sources amongst a sample of Eastern Cape dairy farmers and evaluates factors influencing the use of private consultants. The use of computers and the factors impacting on computer use are also investigated. The data source and some characteristics of the respondents are described in the next section.

2. Data source and characteristics of respondents

A survey was conducted amongst dairy farmers in the Alexandria/Grahamstown region of the Eastern Cape in 1992. The questionnaire was based on the one used by Ortmann *et al.* (1992) in their study of information sources, use of computers and risk management amongst leading commercial Cornbelt farmers in the USA. This questionnaire was shortened and slightly modified to be more applicable to dairy farmers in the South African situation. Approximately 50 copies of the questionnaire were distributed, from which 26 usable copies were obtained. Most of the respondents are members of two financial study groups organised by a business consultant. The sample is therefore not a random sample of dairy farmers in the region.

Of the respondents, 22 were sole owners of their farms, three were involved in partnerships and one business was a close corporation. The average farm size operated was 606 hectares (median of 421 hectares) of which 478 hectares were owned and the remainder rented. Dairying dominated the enterprises with a herd average of 180 mature cows. Seventeen respondents (65 percent) were purely dairy farmers and the remainder derived most of their income from dairying. Gross farm sales in excess of R500 000 were achieved by 85 percent of the respondents. Debt-asset ratios greater than 30 percent were experienced by 38 percent of the farmers compared to 55 percent of leading Cornbelt farmers (Ortmann *et al.*, 1992). The respondents' mean age was 42,6 years and formal education averaged 14,5 years. The corresponding statistics for leading Cornbelt farmers were similar, namely 39,7 and 14,9 years respectively. Respondents rated their management skills in production, financial and overall farm management as above average, relative to other farmers. More details regarding the respondents' business characteristics are given by Hildebrand (1992).

3. Information sources

Generally, information for all decisions may be located in the media (newsletters, magazines, newspapers, radio and television broadcasts), from specialists (extension workers, salesmen, consultants and university specialists) or through discussions at field days, conferences and advice from other farmers. These are commonly known as formal sources of information. Access to informal sources can further enhance the decision-making process. Such information is developed through keeping and analysing own farm records over the years. Computerization has improved the efficiency and usefulness of own farm records. These records pertain more specifically to the farmers' particular environment.

3.1 Costs of Information

Information, be it of a formal or informal nature, has an acquisition cost which incorporates the time involved in obtaining it. However, information also has an economic value because it helps estimate the value of something, thus aiding the decision process (Buccola, 1984). What the farmer has to decide is whether the benefits of the additional information outweigh the costs of obtaining it. The difficulty arises in putting a value to the benefits (Streeter, 1991). The farmer is assumed to be rational and thus will continue to obtain information to the level where its incremental value equals the increased cost, the point of maximum utility (which is subjective). Byerlee and Anderson (1982) defined the value of information as the maximum price the decision-maker could pay for that information and remain as well off (in utility terms) as he was without the information.

The questionnaire included a section on the costs of information used by the respondents, excluding the value of time spent in searching for information, reading and consulting with specialists; that is, only cash costs were considered. The response to this section was disappointing. Only 15 respondents attempted to complete this section by presenting cash costs for various sources of information obtained. Table 1 summarizes these costs. Over the 15 respondents, the average amount spent on information was R1 336 per annum. This is considerably less than the average of R3 504 per year spent by a sample of commercial farmers in Natal (Woodburn, 1993) and the US$2 578 spent by respondents in the Cornbelt survey (Ortmann *et al.*, 1992). Of the R1 336, over 80 percent was spent on consultants.

3.2 Assessment of information sources

Respondents were asked to rate various sources of information in terms of their usefulness for decision making on a scale of one (low value) to five (high value). The mean ratings computed for the various sources of information with respect to production, marketing and financial decisions are summarized in Table 2. These ratings may provide useful indications to consultants and other suppliers of information as to the perceived usefulness of different information sources to dairy farmers in the study region.

In all three divisions of decision-making (production, marketing and finance) the financial consultant and own farm records were rated highest. The high rating of own farm records conforms to the results obtained by Ortmann *et al.* (1992) and Woodburn (1993) in which own farm records were ranked highest in all three decision-making areas. It is not surprising that the financial consultant was rated highly in the Eastern Cape survey as the study was conducted mainly amongst a consultant's clients; if they did not rate these services highly they would not participate in the study group. Furthermore, own farm records are a necessary component of the respondents' membership of the study group, hence their perceived importance.

For both production and marketing decisions other farmers were ranked third. This suggests some interaction between farmers of the region. Membership of a study group would facilitate such interaction. However, it was surprising to note the low ratings of 3,0 and below given to field days/conferences. Government extension officers and salesmen were also rated relatively lowly.

Information sources for financial decisions were, in general, rated higher than for production and marketing decisions. For financial decisions, the accountant, management consultants and lenders were also rated highly (after financial consultants and own farm records). The farmers' response to rating various information sources for marketing decisions was poor; those who did respond, gave low ratings. This may be ascribed to the lack of control that these farmers have over the marketing of their product.

3.3 Factors influencing the use of consultants

Expenditure on consultants (including accountants, and financial, soil fertility and management consultants), which accounted for 80 percent of the cash expenditure on information sources, was used as the dependent variable in a regression analysis aimed at determining the factors influencing the use of consultants. A number of farmer and business characteristics were considered as explanatory variables. Only variables with associated t-values greater than 2 were retained in the model, which is as follows:

$$EXPC_i = bo + b_1VFRP_i + b_2RMSO_i + b_3USE_i + b_4DIV_i + b_5OFIY_i$$

where $EXPC_i$ is expenditure on consultants for farm i. VFRP is the farmer's perceived value of farm records for production decisions on a scale of one (low value) to five (high value); RMSO is the farmer's self-rating of skills in overall farm management relative to other farmers, also on a scale of one (low) to five (high); USE represents computer use (1 = use of computer, 0 = otherwise); DIV is the degree of farm diversification (ranging from 1 = highly specialized to 5 = highly diversified), and OFIY represents off-farm investments of the farmer (1 = off-farm investments, 0 = no off-farm investments).

Results for the model are presented in Table 3. Unfortunately, with only 15 farmers attempting to answer the question on information costs, the number of degrees of freedom is only nine. Nevertheless, the model has a high R^2 of 0,822 and the significant coefficients provide interesting indications as to the factors influencing the use of consultants by the respondents.

The negative and highly significant VFRP coefficient suggests that the more a respondent values his own farm production records, the less he will require someone else (a consultant) to advise him. The RMSO coefficient suggests that the higher a respondent rates his general management skills the more likely he will use a consultant to give him expert advice which he could use profitably. The USE coefficient indicates that a respondent with a computer would make greater use of consultants. Perhaps the more readily accessible are farm data the more beneficial the advice from a consultant, which would reflect a complementary relationship between computers and consultants.

Table 1: Mean annual cash costs of various sources of information, Eastern Cape dairy farmers, 1992.

Sources of Information*	Mean Annual Cost 1** (R)	Range (R)	Mean Annual Cost 2*** (R)
Farm magazines	139 (12)	72-560	111
Own farm records	453 (4)	150-1100	121
Field days/conferences	92 (5)	60-100	31
Accountants	2625 (4)	1000-6000	700
Private consultants - financial	775 (6)		
- soil fertility	350 (2)	300-2000	310
- management services	240 (1)	300-400	47
		-	16
TOTAL			1336

* Sources of information for which no cash costs were reported include agricultural newspapers and newsletters; radio and television reports; government extension officer; local dairy marketing service; university specialists; Colleges of Agriculture; salesmen; other farmers; the farm work force; marketing services; and lenders.

** Cost 1 = Average cost for farmers who incurred the cost. Figures in parentheses are number of farmers who reported costs for this source.

*** Cost 2 = Average cost over 15 respondents who reported costs for at least one of the information sources.

Table 2: Mean ratings* of various sources of information, Eastern Cape dairy farmers, 1992.

Sources of Information	Production Decisions	Marketing Decisions	Financial Decisions
Farm magazines	2,46	2,79	2,67
Agric. newspapers and newsletters	1,91	2,31	2,10
Radio and television reports	1,61	2,36	2,30
Own farm records/budgets	4,23 (1)	3,71 (2)	4,35 (2)
Government extension officer	1,76	1,61	2,00
Local dairy marketing service	1,57	2,14	2,25
University specialists	2,26	2,14	2,25
Colleges of Agriculture	3,00 (4)	2,00	2,50
Field days/conferences	3,00 (4)	2,86	2,44
Salesmen	1,83	2,00	2,10
Other farmers	3,58 (3)	3,15 (3)	3,21
Your farm's work force	2,28	2,09	2,08
Accountant	2,75	2,75	3,86 (3)
Private Consultants - financial	3,78 (2)	3,91 (1)	4,56 (1)
- marketing services	2,00	3,00 (4)	3,16
- soil fertility	2,65	2,00	3,22
- management services	2,47	2,88 (5)	3,78 (4)
Lenders (e.g. banks)	2,75	2,65	3,67 (5)

* Where 1 = not important and 5 = very important. The mean ratings include the ratings of those farmers who responded to the question, ie. the means include only nonmissing values. Since the data are ordinal, the means should be roughly interpreted to give an overall view of the perceived importance of information sources, and standard errors would not be meaningful, and hence are not given.
Figures in parentheses show the five highest rankings.

The DIV coefficient indicates that the more diversified the farm business, the greater will be the respondent's need for consultants. The returns from investing in specialists' advice in each enterprise would thus be more apparent. The positive OFIY suggests that with more off-farm investments a respondent will require more advice from consultants, such as accountants, lenders and financial advisors. The significant coefficients estimated for VFRP, RMSO, USE and OFIY support the findings by Ortmann *et al.* (1992).

Inclusion of the variable OAGE (owner's age) had a destabilizing effect on the above model, particularly on the USE coefficient. It was then decided to exclude OAGE from the model, which may have caused specification bias. The model was rerun by excluding USE and including OAGE. The R^2 dropped slightly to 0,82 and the coefficient of OAGE was estimated as -11,15 with an associated t-value of -3,33. The negative coefficient of OAGE conforms to expectations. Older farmers are known for not making use of private consultants to the same extent as younger farmers. Perhaps they view their experience as adequate or sufficient to make the necessary management decisions.

Due to the small sample of farmers in this study, more research needs to be done to verify the above findings. Nevertheless, these findings may enhance the understanding of factors influencing the demand for consultants. Consultants should heed such factors when targeting their services to the farming community. The results imply that consultants should have a thorough knowledge of the characteristics of the potential clientele group in order to provide an effective service.

Table 3: Regression model: Factors influencing the use of consultants, Eastern Cape dairy farmers, 1992.

Variable	Parameter estimate	Standard error	t - statistic
Intercept	320,0	274,0	1,17
VFRP	-316,3	49,2	-6,43***
RMSO	195,2	52,6	3,71***
USE	238,9	71,2	3,36***
DIV	182,1	54,0	3,37***
OFIY	165,1	75,8	2,18*
DF (Residual)	9		
F-Test	13,911***		
R^2	0,822		

* Significant at 0,10 level
*** Significant at 0,01 level

4. Respondents' use of computers

With the growing complexity of the commercial farm business there is a growing demand for computers. Financial records, planning, budgeting and tax aspects can be more efficiently managed with the use of computers.

Of the 26 respondents surveyed, 19 (73,1 percent) used computers in their farm business. This compares with 80 percent of leading Cornbelt farmers using computers (Ortmann *et al.*, 1992), but is a higher percentage when compared to the findings of other studies. For example, Woodburn (1993) found that 48 percent of a sample of commercial farmers in Natal had adopted computers compared to 25,6 percent of respondents in Tulare County, California (Putler and Zilberman, 1988), 24,2 percent of commercial farmers in Ohio (Batte *et al.*, 1990), 15 percent of a sample of New York dairy farmers (Lazarus and Smith, 1988), and 37 percent of respondents in a survey of Texas rice producers (Jarvis, 1990). Possible reasons for the higher adoption rate of computers in the Cornbelt study are that the respondents are younger, more highly educated and operate larger farms, factors found to have a significant impact on computer adoption (Batte, *et al.*, 1990; Putler and Zilberman, 1988). In the Eastern Cape study the incidence of computer use is expected to be higher since respondents participated in a financial study group.

The seven respondents who did not own computers gave a variety of reasons for this, of which 'lack of confidence to use computers' was the main factor. The cost of a computer system ranked as the second most important reason, with unsuitable software packages and insufficient time also being mentioned.

Only two of the respondents had two computers each. About 79 percent of the users had purchased computers in the four years 1989 to 1992, which reflects a need to keep pace with technological improvements. Except for three Apple II microcomputers, the computers used were IBM-compatible. The time taken before the computer became useful varied from 'immediately' to 14 months after purchase, with 84 percent of respondents indicating that computers became useful within the first six months.

4.1 Computer usefulness

The degree of usefulness of the computer in various farm business activities is summarised in Table 4. Respondents were asked to give a rating of computer usefulness on a scale of one (low usefulness) to five (high usefulness), and the hours per month the computer was used for various tasks. Keeping financial records (4,78) and planning (4,69) were rated highest with a median use of 15 and 11 hours per month respectively. Hours of use for these two activities were much higher than those recorded by Ortmann *et al.* (1992) for Cornbelt farmers, namely 7,5 and 3,0 respectively, and Woodburn (1993) who recorded median hours per week of 2,75 and 1,0 respectively. The median hours per month of 15 for computer use in livestock recordkeeping and its rating of 4,44 illustrates how beneficial respondents perceived computers to be in dairy management.

Compared to 'hand' records, the respondents rated the computer for 'saving time' at 4,0, and for 'providing better information' at 4,11, on a scale of one (not at all) to five (very much). The computer users in this study apparently are benefitting from their use of this facility, especially in farm financial aspects and dairy recordkeeping.

4.2 Factors influencing computer adoption

In order to discover the factors influencing the use of computers, a multivariate logit regression analysis was performed since the dependent variable USE is of a binary nature (1 = computer use, 0 = no computer use). A number of variables reflecting farmer and business characteristics were considered. Due to a high degree of correlation between some of the prospective explanatory variables, composite terms were created. For example, the term VREC was created by the addition of the ratings of farm records in production and financial aspects. The term RWILL was formed by the product of the ratings (on a scale of one to five) of the relative willingness to take risks in production, financial and overall management decisions.

Only variables with coefficients significant at the 10% (or higher) level were retained in the model. The following logit model was estimated:

$$Ln[P_i/(1 - P_i)] = b_0 + b_1RMSF_i + b_2DAR_i + b_3VREC_i + b_4RWILL_i$$

Where P_i is the probability of using a computer on farm i; RMSF is the respondent's self-rating of management skills in farm finance relative to other farmers, on a scale of one (low skills) to five (high skills); DAR is the debt-asset ratio of the farm business; VREC is the value attributed to own-farm records, and RWILL is the respondent's willingness to take risks relative to other farmers.

Table 4: Ratings and use of computers in various management activities, Eastern Cape dairy farmers, 1992.

Management Activities	N*	Mean Helpfulness Score**	N*	Median Hours/Month
Business financial records and statements	18	4,77 (1)	16	15,0
Business planning (budgets, cash flows)	16	4,68 (2)	14	11,0
Tax computation	9	3,56	6	3,0
Payroll preparation	4	2,50	2	1,3
Business correspondence	15	3,60 (4)	13	5,0
Crop recordkeeping	3	1,67	1	1,0
Livestock recordkeeping	18	4,44 (3)	16	15,0
Marketing and price analysis	2	1,00	-	-
Spreadsheet-aided decision analysis	8	3,50	6	4,0

* Not all respondents who rated computer helpfulness for a particular management activity indicated the number of hours per month spent on that activity.

** Where 1 = low and 5 = high. The mean ratings include the ratings of those farmers who responded to the question, ie. the means include only nonmissing values. Figures in parentheses show the top four rankings.

The results of the logit regression are presented in Table 5. The perfect relationship between predicted and observed responses, and the significance of the variables at the 5 percent level, indicates the strength of the model. The model estimated by Ortmann *et al.* (1992) correctly predicted 97,6 percent of the observed responses.

The positive and highly significant RMSF coefficient indicates that the higher a respondent rates his financial management skills relative to other farmers the more likely he will use a computer. This seems logical as computers are recognised as an aid in financial management.

The positive and highly significant DAR coefficient suggests that respondents with high debt-asset ratios have a greater probability of using computers. A similar result was found by Ortmann *et al.* (1992) in their 'Cornbelt' survey where this relationship was described as the result of farmers higher in debt reviewing their records more often or producing cash flow statements for the lenders, thus needing a computer. It was also proposed that, because of good recordkeeping in the past, such farmers were able and willing to borrow additional money.

The VREC variable indicates that the higher a respondent values his own farm records for production and financial decisions the greater the likelihood of him using a computer. This is echoed by the high ratings given to computer use in these areas along with the 4,11 (out of 5) rating that computers provide better information than 'hand' records.

Risk perception is considered a factor influencing the use of computers. The positive RWILL coefficient implies that less risk averse farmers in the study will be more inclined to use computers. The decision to adopt a computer is in itself a risky one. Will the benefits outweigh the costs? Besides this, farmers who are willing to take risks prefer to keep their 'finger on the pulse' and know their financial, production and overall business positions so as to reduce the gamble. Computers will help in this regard by enhancing easy monitoring and providing more timely information.

Two variables which (surprisingly) did not appear in the model were OAGE (owner's age) and SIZE (farm size). These variables were expected to be included in the model as they did in other studies (for example, Putler and Zilberman, 1988; Batte *et al.*, 1990; Woodburn, 1993). The owner's age (OAGE) is thought to have a major impact on computer use. Older farmers generally were not exposed to computers during their formal education and therefore are expected to be less proficient in their use. Other variables in the model may have captured the effects of OAGE.

With regard to the size variable (SIZE), the larger is farm size the greater the number of transactions usually incurred and the greater the need to specialize clerical tasks. Computer costs are largely fixed so it will be more beneficial for frequent users to obtain a computer (Putler and Zilberman, 1988). Furthermore, larger enterprises are more likely to have easier access to credit for financing the initial outlay (Welch, 1978). But SIZE did not improve the model because other variables may have captured its effects.

A canonical variate analysis was also performed, however no further insight into the main variables affecting the adoption of computers was discovered. The analysis is therefore not presented.

5. Conclusions

Commercial farmers in South Africa are operating in an uncertain environment which is dominated by political changes and variable weather patterns. The demand for relevant information is expected to increase in the future. Consultants, lenders, government extension officers and researchers should be aware of the information needs of farmers in order to provide them with improved and appropriate information services. By studying the behavioural patterns of farmers and the characteristics that determine a farmer's success, a good indication of the future information and risk management needs of the farmer can be ascertained.

Private consultants, especially in farm finance, are the main sources of information for respondents in this study. The better are own farm records, the greater the benefit derived from consultancy. Computers enhance the usefulness of farm records and help to provide more timely information. However, it is important that software packages are 'tailor-made' for specific enterprises to enhance their usefulness. In this study of selected dairy farmers, over 70 percent of respondents owned and used computers, and general consensus was that computers saved time and provided better information than 'hand' records.

Table 5: Logit model of computer use, Eastern Cape dairy farmers, 1992.

Variable	Parameter Estimate	Change in Deviance	Significance Level (Chi-square)
Intercept	-174		
RMSF	7,30	10,34	0,01
DAR	1,74	9,40	0,01
VREC	10,20	6,05	0,05
RWILL	1,66	4,50	0,05
Number of Observations 26			
Association of predicted probabilities and observed responses: Concordant 100 percent Discordant 0 percent			

Less risk averse respondents and those with higher leverage appear to use computers more. Risk management packages, which account for subjective probabilities of certain events occurring, are being developed overseas and could assist farmers in developing more acceptable farm plans in the future.

Changes in agricultural policies and in the socio-political environment will continue to have considerable impacts on the viability of farming. Farmers must adapt to changing circumstances and will require appropriate information to do so. As the results presented in this paper are based on a selected group of Eastern Cape dairy farmers, more research needs to be conducted to determine the economic and socio-economic factors that influence the demand for information and the use of computers in farming.

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