RELATING PERCEPTIONS AND ASSOCIATED ECONOMIC CRITERIA TO ECONOMIC SURVIVAL IN COMMERCIAL DRYLAND FARMING IN SOUTH AFRICA

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Uittreksel
Die rol van persepsies en ekonomiese kriteria tot die ekonomiese voortbestaan van kommersiële droëland boerdery in Suid-Afrika

Data van 100 kommersiële boere in die Aberfeldy pedosisteem (noord-oos Vrystaat, Suid-Afrika) is gebruik om voorgestelde persepsie en ekonomiese kriteria van elke enterpreneur met werklike ekonomiese sukses 'n dekade later te vergelyk. Bestaande skaalvoordele impliseer dat die optimum plaasgrootte nie dieselfde kan wees vir verskillende bestuurders nie. Die studie toon dat boere wat beter bestuurders is, meer effektief is, grootter plase bewerk, laer vaste verbeteringe per hektaar aangaan, hoër inkomste per hektaar (bruto en netto) realiseer, en meer realisties optree t.o.v. finansiële beplanning en probleemsituasies. Bogenoemde het belangrike implikasies vir strukturele veranderinge binne die Suid-Afrikaanse landbou en bied geleenthede waar meetings van sukses en bestuursvermoë gebruik word vir finansiële en ander instansies.

Abstract

Data from 100 commercial farmers in the Aberfeldy pedosystem (situated in the north-eastern Orange Free State, Republic of South Africa) were used to calculate suggested economic and perception criteria for each entrepreneur and to compare this data with actual success rates estimated individually for each case a decade later in 1991. Existing economics of scale means that optimal farm size is not the same for any two managers; the better the manager, the larger the optimum farm size. Furthermore, this commercial dryland study showed that better managers are more effective land users. Better managers farm bigger areas, have lower fixed improvements per hectare, higher income per hectare (both gross and net) and are more realistic in decision making, both with regard to financial goals as well as problem consciousness. The above has important implications for structural adjustment of South African agriculture and offers distinct possibilities when potential success ratings have to be estimated by financial and other institutions.

1. Introduction

Investigations as to why managers are successful have been of interest to decision makers, researchers and academics for decades. Decisive questions have often centred around perceptional differences of these managers and the relations between such perceptions and economic success in commercial agriculture. Some preconditions to success such as economic efficiency, managerial ability and risk management have been accepted as cornerstones of economic survival.

It has also been alleged that the quality of management in South African agriculture is low; indeed this is sometimes cited as one of the basic problems of agriculture in this country (Groenewald, 1973). Better management and the resultant higher profit margins normally result in the gradual increase in farm size due to the efficient combination of resources.

In this study an attempt will be made to evaluate the South African farmer as a manager by using such criteria as farm sizes, solvency ratios, liquidity ratios, profitability and efficiency ratios. Approaching the problem from an extension perspective, Koch (1987) suggests that accurate problem perception (by the entrepreneur) leads to appropriate practice adoption and farming success. Because estimates (self-evaluations) of present (own) levels of practice adoption are subject to differential perception, one would expect to find the most favourable (accurate) evaluations (of own performance) with the best (most successful) achievers (assuming that the practices under review are appropriate and the comparative control estimates are accurate).

Against this background it was decided to use the data collected by Koch in 1981 (*cf* Koch, 1985) on a universal basis from 100 commercial farmers in the Aberfeldy pedosystem (situated in the north-eastern Orange Free State, Republic of South Africa) to calculate the suggested economic and perception criteria for each entrepreneur (respondent) and to compare this data with actual success rates estimated individually for each case a decade later in 1991.

2. Criteria

2.1 Problem perception

During the 1981 survey, respondents were asked to independently estimate their own adoption levels regarding nine specific maize cropping practices, namely:

- Division of land according to physical production potential criteria;
- Fertilizing crops according to realistic/objective yield potentials/expectations;
- The build-up of the phosphate status of their soils;
- The liming of excessively sour (cultivated) land;
- The extent to which crop choice is interfaced with soil type;
- Certain aspects of chemical weed control;
- The alleviation of soil compaction problems where applicable;
- Minimum tillage practices (under certain conditions); and
- The construction of recommended soil conservation works.

The interviewer did a similar independent rating, basing his estimate on the relevant chemical and physical data and collecting additional "on site information" where necessary.

The respondents' and interviewers' ratings were done on identical five point rating scales, the difference between the two estimates serving as a measure of distortion or problem perception discrepancy. It was expected that the least distortion would occur with the best entrepreneurs and the widest (most unfavourable) discrepancies / distortions with the lowest achievers. Koch (1987) in effect used this method to classify his respondents into four distinct problem perception types with the top group averaging a negative problem perception reading, indicating that these respondents were hyper-critical of their own practise adoption levels - often allocating themselves a lower rating than that allocated to them by the interviewer. With the low achievers the opposite appeared true, namely that these entrepreneurs either could not (or would not) subject themselves to an accurate self-evaluation regarding the extent of their own (very real) production problems.

2.2 Economic efficiency

Efficiency can be characterized as technical or allocative efficiency, where efficiency is associated with economies of scale and the use and output mix to relative prices, respectivly. Overall economic efficiency is a function of both allocative and technical efficiency, and an entrepreneur is only efficient economically when he/she minimises cost per unit of output.

In analysing the impact of success restrictions, the relevant criterion is whether economic efficiency increases with farm size; that is, whether the long-run average cost curve declines as size increases. Price and technical efficiency due to scale are partial indicators of the causes of economies of size; but in order to assess the distributional and other impacts of farm-size restrictions, more complete knowledge is needed (Hall & LeVeen, 1978).

Measures of the relation between size, cost of production and rate of return can, however, be calculated directly by making use of cross-sectional data of agricultural production by farm-size. In both commercial irrigation and mixed dryland case studies, Sartorius von Bach, Van Zyl & Koch (1992) found that better managers have lower farm expenditures per hectare, higher disposable income per hectare and are more efficient than less skilled managers. An investigation of the sum of the coefficients obtained in Cobb-Douglas production functions supported the existence of constant returns to scale in South Africa when the independent management variable is excluded, and when managerial ability is explicitely taken into account, increasing returns to scale are implied (Heady & Dillon, 1961).

2.3 Managerial ability

Management is often defined as a decision-making process, which is instrumental in determining the relative economic success of the individual entrepreneur. The manager is responsible for developing a strategy to guide his/her operations. He/she is both an administrator and a manager, meaning that he/she is involved with organising, staffing, supervising and controlling daily activities, and organising and formulating workable strategies to produce desired results.

Patrick and Eisgruber (1968) concluded that the managerial ability of the farm operator was a major factor in explaining growth of farming enterprises. Louw (1980) pointed out that for an enterprise to grow, managerial capacity must increase in direct proportion to management practices. According to Morris (1967), the farmer with average managerial ability is not able to grow, because of a lack of growth ambition, of a profit maximization motive and growth expectations, and because of risk aversion and knowledge deficiencies. Under sustained cost-price squeeze conditions, the average manager is likely to fail financially (Louw, 1981). In this respect, Rodgers (1988) concludes that the size distribution of farm enterprises is a consequence of the heterogeneous managerial input which has an inelastic supply. According to Lucas (1978), the distribution of entrepreneurial ability leads to an equilibrium in firm sizes; the larger firms being managed by the better entrepreneurs.

The notion that increase in output will be proportionately larger than the rise in managerial ability received some support from two agricultural studies in South Africa during the early seventies and eighties (Groenewald, 1991). Burger (1971) developed and validated a scale of *managerial aptitude* of farmers, based on five different factors, namely confidence in agriculture, the presence of a managerial centre, record keeping, budgeting and efficiency of maintenance. This scale was found to be positively associated with some other variables, including gross income. In a subsequent study, it was assumed that if this scale was indeed an acceptable measurement of managerial input, then its effect on production should be quantifiable. In a study involving fairly homogeneous farming areas, this index was therefore included in Cobb-Douglas type cross sectional production functions (Jansen *et al,* 1972). It was found that returns to size and optimal farm size were not the same for any two managers; the better the manager, the larger the optimum size. Schmidt (1988) argues that an efficient and optimal allocation of resources among farm enterprises - and hence, maximum utility - can be obtained only if marginal returns to these resources are the same in all enterprises. This condition is satisfied under competition if every enterprise maximizes profit by producing where marginal revenue equals marginal costs.

2.4 Risk management

In agriculture, yields, prices, costs, technology and future policies are difficult to predict. Consequently, farmers must continually make decisions under changing conditions, without full knowledge of likely outcomes. If a manager is to intelligently deal with problems of risk and uncertainty, he should consider his own ability and willingness to take risks, to evaluate all decisions in terms of alternative actions, positive events and pay-offs, probabilities associated to decisions and lastly to develop managerial strategies to counteract uncertainty which are applicable to his own individual environment.

The evaluation of methods and combinations of whether to manage risk has been a popular area of research. Eidman (1990) divides it into two parts, namely conceptual and empirical. Conceptual research models use the decision environment to deduce the decision maker's response and indicate how the optimal response may be affected by differences in debt level, risk preferences, risk environment and other factors. The empirical studies evaluate the impact of applying risk management methods to specific farming situations.

Risk reducing inputs are designed to reduce yield and net return variability, which in turn may also reduce the expected net return. One of the most effective ways to reduce production risk is to develop appropriate information and control systems for various enterprises. Diversification can reduce production risks by combining enterprises to reduce the variability of net incomes. Farmers can also diversify by allocating some of their resources to non-farm activities.

Methods to reduce the input and product price risk largely depends on the institutional structure surrounding the determination of these prices. Some farmers may be able to identify commodities with relatively low price variability or can make use of forward contracting, which reduces but does not fully eliminate price risk. Hedging, at present not available to South African farmers, can reduce price risks but has disadvantages regarding availability of contracts, economics of size and brokerage fees. Farmers' financial response to risk include liquidity management, formal insurance and various methods of controlling resources used in the operation of the business. These responses affect both the asset and the liability side of the balance sheet and form part of the total risk of the enterprise.

3. Approach

Data from 100 farmers in the Aberfeldy pedosystem in the north-eastern Orange Free State were used in this case study. The respondents were divided into two groups according to three different criteria, namely management skill, household expenditures and net farm income per hectare. This was done by using the SAS' two-sample t-test (Statistical Analysis System, 1987). Managerial skill was measured according to the method proposed by Burger (1971), which was found to be positively linked with important other variables, including gross income. It was hypothesised that problem perception leads to appropriate practice adoption and farming success.

A discriminant analysis was subsequently used to determine variables' impact on economic survival of the remaining farmers, who after ten years had dwindled to fifty after 20 had died or retired, while 13 had left farming because of financial problems (i.e. were sequestrated, had sold their farms or had chosen to hire their farms out to other farmers) and the rest because of other reasons. This dropout can be regarded as normal. Current economic performance and growth values of the remaining managers were determined by a panel of adjudicators including the same two leader farmers involved in the 1981 survey, plus the present agricultural extensionist of the area. Ten of the remaining farmers improved their maize cropping practices of which only four improved in economic growth. The financial situation of 64 per cent of the remaining farmers deteriorated.

4. Results and discussion

Pearson's correlation coefficients showed some interesting results. Management was correlated with farm size (0.442), hectares cultivated (0.510), farm income per ha (0.389), fixed costs per ha (-0.245), short term liabilities per ha (0.357), problem perception during 1981 (0.772) and problem perception of the remaining farmers in 1991 (0.415), all with a significant level of $p < 0.01$. According to the correlation matrix, farmers' interest in enterprises and their diversification in commodities are both highly significantly correlated with the management index. Specialisation in maize production did not correlate with Burger's index.

To test difference of returns to size and optimal farm size for highly and least efficient managers, various independent variables were tested for significant differences at a 10 per cent significance level. These differences are shown in Table 1. (To test the management skill[1] of farmers, a normality test showed that management is normally distributed). These skills were then divided into two groups, the least efficient managers averaging 46 %, while the better managers 76 % on the scale. The mean gross farm income per hectare was R262 for high earners, while the low earners had a mean gross farm income of R 85 per hectare.

Firstly, the management skill (low and high) was tested by analyzing some variables for significant differences. This was followed by testing the difference between farmers with respectively high and low gross farm income/ha. The significance of differences between selected variables for the group means are shown in Table 1.

By comparing different management skills, the least efficient managers had a mean farm size of 983.45 ha, while the top managers had 2467.63 ha; differing significantly at a 0.01 % level and supported by the extent of land ploughed. Inefficient managers rated their farm market value/ha higher with lower productive value (lower gross farm income/ha and net farm income/ha) than the better managers. With respect to land-use, better managers were more effective using land. This was supported by the inefficient managers (smaller farms) renting out more of their pasture land than the bigger farmers. Better managers on big farms hired more additional cultivation land than the smaller farmers. This point supports the findings of Sartorius von Bach *et al.* (1992) that commercial land use is more efficient by better managers or bigger entrepreneurs. Fixed costs per hectare were smaller with regard to the better managers. Better managers had higher short term, medium term and long term liabilities than the other group. With regard to diversification of enterprises, the better managers had both higher non-farm income (per hectare basis) and liabilities than the other group. By determining differences between best and the lowest third with respect to managerial skills, the differences in means were significantly supported.

Table 1: Results for testing the means of the lower and higher management and gross farm income/ha with various independent variables.

Independent variable	Burger's Management criteria			Gross Farm income per ha		
	significance value	lower mean	upper mean	significance value	lower mean	upper mean
Farm size (ha)	0.0000	983.45	2467.63			
Soil ploughed (ha)	0.0092	230.97	491.09	0.0031	277.26	455.22
Estimated farm value	0.0000	682.62	480.96			
Gross income/ha	0.0001	132.63	210.77	0.0000	84.87	261.64
Unused land (ha)	0.0000	578.38	424.01			
Fixed cost/ha	0.0000	104.24	56.95	0.0055	82.17	77.13
Net income/ha	0.0000	49.77	77.55	0.0000	34.63	93.79
Machine cost/ha				0.0328	59.13	130.03
Long term liability/ha	0.0343	51.47	56.66	0.0000	26.73	81.60
Medium term liability/ha	0.0000	18.03	36.33	0.0000	10.61	44.49
Short term liability/ha	0.0989	42.72	70.72	0.0000	27.84	86.73
Total liability/ha				0.0000	65.56	207.75
Rented cultivated land	0.0000	131.95	295.19	0.0000	110.38	323.30
Rented out cultivated land				0.0000	49.74	12.98
Rented out pastures	0.0009	57.00	21.77	0.0000	56.36	21.00
Non-farm income	0.0000	4278.75	21188.4	0.0000	3736.6	22407
Non-farm liabilities	0.0000	875.00	4759.61	0.0000	1800.0	3990.0
Management skill	0.0480	13.79	22.65			
Problem perception	0.0001	5.10	7.38			

By testing differences in gross farm income/ha, the farmers with the higher gross farm income/ha ploughed more land, yielded higher net farm income/ha and had lower fixed costs/ha. Similar to managerial differences, farmers with higher gross farm income/ha rented more cultivated land and rented out less land (both pastures and cultivated). High earners had higher short term, medium term, long term and total liabilities than the low earning group. With regard to diversification of enterprises, the high earners had both higher non-farm income (even per hectare basis) as well as liabilities than the low earners. By determining differences between the best third and lowest third of gross farm income/ha, most of the above differences in means were significantly supported. However, the different liabilities/ha and non-farm activities yielded opposite result; i.e. the high earners had lower liabilities/ha than the low earners and high earners were less involved with non-farm activities. The above clearly illustrate that the high gross income group had high liabilities and were involved in risk management (diversification), while the top earners could take the risk and really could specialise, which clearly supports the theory of Drucker (1985).

The different groups, (a) by means of managerial skills and (b) by means of gross farm income per hectare gave similar results. This commercial mixed dryland case study indicate that better managers farm bigger, have lower fixed improvements per hectare and higher income per hectare (both gross and net). Better managers are more realistic in decision making both with regard to financial goals and problem consciousness. Furthermore, results support the notion that better managers are more efficient (regarding land use) and operate on bigger farms than less skilled managers. The above clearly supports the academic perceptions regarding the cornerstones to successful farming in South Africa. However, do efficiency, managerial skills, risk management and problem perceptions lead to economic survival? This was tested by a discriminant analysis, a technique statistically distinguishing between two groups, for example those who managed to survive during the ten years interval and those who went bankrupt, had to sell or were forced to rent out their property. The method aims to maximise the separation of these groups by forming weighted linear combinations of explanatory 'variables, the latter being variables that measure the characteristics on what the groups are expected to differ, e.g. liquidity ratios, solvency ratios, investment in machinery or usage of fertiliser. Table 2 shows the results obtained in a discriminant analysis. A highly significant factor was that good managers were problem conscious.

Table 2: Variables discriminating between economic survival and losers

Discriminant variable	Standard discriminant function coef.		Partial R^2	Significance ($P < F$)
	Survivors	Failures		
Intercept	-4.26086	-2.56714		
Financial goals	0.03537	0.00491	0.0455	0.0961
Debt ratio	0.02656	0.08938	0.0576	0.0625
Machinery cost/ha	0.01366	0.02510	0.0475	0.0943
Problem perception	1.20761	0.70423	0.1072	0.0088
Proportional distribution	0.79365	0.20635		

The second most important factor was the debt ratio of the farmers, while financial goals and investment in machinery/ha were discriminatory factors too. According to the coefficients of the problem conscious ratings of the managers in 1982, it is evident that high problem (risk) consciousness significantly contributed to economic survival. This variable clearly illustrate the importance of problem perception in a farming enterprise. Testing differences in management from the 1981 surveys, the perceptions of the survivors differed significantly from the failures ($p = 0.0126$), with 3.82 and 3.51, respectively. This corresponds with the negative problem perception reading, indicating that these respondents are hyper-critical. With respect to the appropriate practice adoption, the difference between the two groups were non-significant. In general, accurate problem perception was highly correlated with Burger's management criteria, while appropriate practise adoption was highly correlated with gross farm income per hectare. Because of the interdependence between management and farm income, evidently, the hypothesis is accepted that accurate problem perceptions leads to economic survival and that practise adoption indirectly contributed to success.

Economic survivors had higher financial goals, lower debt ratios and machinery investments per hectare than the losers. The variable machinery investment per hectare includes machinery and farming equipment (e.g. fencing and other infrastructure), which can be seen as a farming infrastructure investment. Correct classifications for the agricultural survivors and failures of the Aberfeldy farmers were 72.0 per cent and 69.23 per cent, respectively, with a classification error of 29.38 per cent. These factors support the theory that good managers are efficient users of scarce resources, have high abilities of management and are risk managers too.

5. Conclusion

Existing economics of scale means that optimal farm size is not the same for any two managers; the better the manager, the larger the optimum farm size. Furthermore, this commercial dryland study showed that better managers are more effective land users. Better managers farm bigger areas, have lower fixed improvements per hectare, higher income per hectare (both gross and net) and are more realistic in decision making, both with regard to financial goals as well as problem consciousness. The above has important implications for structural adjustment of South African agriculture and offers distinct possibilities when potential success ratings have to be estimated by financial and other institutions.

The academic perception of the cornerstones to successful farming in South Africa was evaluated by distinguishing between those who survived for ten years and those who did not. High problem (risk) conscious, high financial goals, low debt ratio, low investment in machinery/ha and accurate self-evaluation regarding your own production problem shortfalls contributed to economic survival. These factors support the theory that good managers are efficient users of scarce resources, have high abilities of management are risk managers and are self-critical.

Results show that the distribution of financial support to commercial farmers should be supported by appropriate extension services to classify problem perception, etc. However, the acurate measurement of perceptions for implementing purposes should be treated with care, since the economic and physical climate play an important role in South African commercial agriculture.

Note

1. Determined according to Burger's (1971) managerial aptitude index

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