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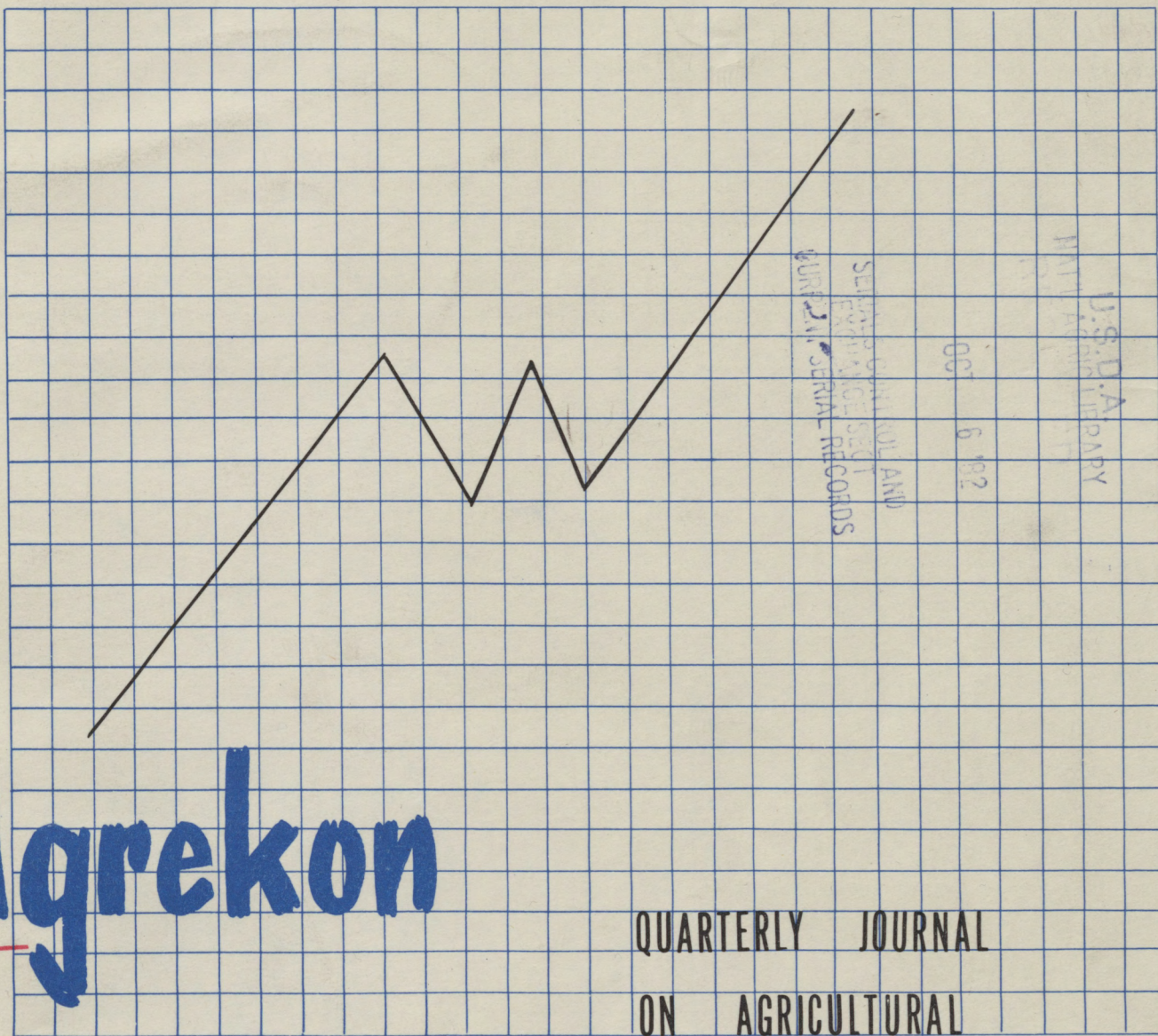
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BUSINESS GROWTH IN AGRICULTURE V: RISKINESS OF ALTERNATIVE LAND ACQUISITION STRATEGIES

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1. INTRODUCTION

The avoidance of risk is an important aspect of entrepreneurial conduct. Certain entrepreneurs will forfeit profitable opportunities in favour of those that afford a lower but more stable income. Others, again, are willing to enter high risk industries if the potential compensation is high enough.

The concept of risk is often expressed in terms of variability in the distribution of possible outcomes for a certain happening or variable. In this way risk can be expressed in terms of averages and standard deviations.

Theoretically, a rational decision-maker will prefer an alternative which has a lower variation at the same average. The decision-maker may be undecided where he has to choose between a high average income with a high standard deviation and a lower average income with a lower standard deviation. The choice will be determined by the decision-maker's willingness to accept risk.

2. RISKINESS OF SPECIFIC STRATEGIES

The riskiness of a specific strategy in the stochastic model as described by Louw¹ can be determined by, amongst other things, establishing the number of times an undertaking was sold during the 20 repetitions. In the model a farm is sold when, in three successive years, the minimum satisfaction level is not attained.

Out of the 60 simulated cases, 14 farm sales occurred. Table 1 also shows that sales mainly took place in cases where the highest variability occurred in expected end net value levels. According to this table sales took place mainly under loan restriction 1 in conditions of high inflation. For the beginner entrepreneur the probability of sales in the case of loan restriction 2 is reasonably low (0,10). The act of selling, however, was a last resort as a result of unsatisfactory achievement. It also appears that sales occurred mainly in the second half of the planning period. The incidence of sales in the case of the beginner farmer was particularly high and this is an indication that his chances of survival under conditions of high inflation are scant. It appears that the conditions of high inflation led to a considerable number of sales in the case of beginner farmers, irrespective of the land acquisition strategy followed. For the beginner

entrepreneur the probability of sales is highest with strategy 1, loan restriction 1 (0,50) and lowest with strategy 4 (0,35); the chances of selling are considerably less with loan restriction 2. In conditions of high inflation the beginner farmer cannot meet the required level of satisfaction and considerable profitability and cash-flow problems are experienced.

It is noteworthy that land sales took place only during conditions of high inflation and that fewer sales took place under strategy 2 than under the other strategies. In strategy 2 a sale occurred only once, in the case of the beginner farmer with the conservative loan restriction. The success of strategy 2 under these conditions can, to a certain extent, be ascribed to the fact that all land purchases were on a cash basis and that relatively few land purchases took place. This did not go hand in hand with large increases in the use of external financing. However, in cases where land was purchased with the aid of external financing, the pressure on cash-flow as a result of debt and interest obligations on the one hand and a decreasing profit margin on the other hand may have become unmanageable. This strategy therefore emphasises the importance of the availability of cash as well as the importance of cash management in conditions of high inflation.

An alternative method of evaluating the results of a stochastic model is to couple probabilities and the results obtained vis-à-vis objectives in the form of previously determined net values at the end of the planning period. This information is of particular importance when alternative farming management decision-making strategies for the maintenance of a specific growth rate are analysed. A comparison of averages and variations of the accumulated net values of the different cases can provide additional information about the effect of different variables on growth.

In those cases where few farms were sold, the results were used in the above-mentioned approach. Various end net values were obtained for the two beginning situations. For every beginning situation the average net value of the 20 repetitions of the first simulated year was taken as the objective (R206 365 for the established and R141 453 for the beginner farmer respectively). After that distributions were made as follows:

TABLE 1 - Frequency and probability of land sales under conditions of high inflation for both beginning situations

Beginning situation 1					
Strategy	Loan restriction	Frequency of sales	Probability of sales P	Net value R1 000	Coefficient of variation %
1	1 ¹	2	,10	-507,4	127,7
3	1 ¹	2	,10	-741,5	126,3
4	1 ¹	2	,10	-525,5	119,7
5	1 ¹	2	,10	-508,9	123,8
3	2 ²	2	,10	346,8	118,5
4	2 ³	1	,05	244,5	181,1
Beginning situation 2					
1	1 ⁴	10	,50	-	-
2	1 ⁵	8	,40	-	-
3	1 ⁶	8	,40	-	-
4	1 ⁷	7	,35	-	-
5	1 ⁶	8	,40	-	-
1	2 ⁸	1	,05	-104,7	605,3
3	2 ⁹	2	,10	233,5	236,7
5	2 ¹⁰	1	,05	139,1	450,4

1. Sales take place in years 14 and 14.
2. Sales in years 9 and 13.
3. Sales in year 9.
4. Sales take place in years 12, 11, 11, 12, 10, 14, 11, 14, 9, 13.
5. Sales take place in years 12, 11, 11, 12, 10, 14, 9, 13.
6. Sales in years 12, 11, 14, 10, 14, 11, 12, 13.
7. Sales in years 11, 14, 10, 14, 11, 12, 13.
8. Sales in year 11.
9. Sales in years 13 and 10.
10. Sales in year 13.
11. Owing to the high frequency of sales no average net value and coefficient of variation were calculated for this group.

Growth rate

1. 0 %
2. 0-5 %
3. 5-10 %
4. 10-15 %
5. 15-20 %

The beginning values were compiled at the relevant rate for 14 years, e.g. for a growth rate of 0-5 %: $R141\,453 (1 + 0,05)^{14} = R141\,453 (1,9799) = R280\,062$.

The distributions and the number of observations per category and probability distribution for both beginning situations are given in Tables 2 and 3. This is done to avoid the effect of large extrapolation errors; consequently no such calculations were made in the case of the beginner farmer with loan restriction 1 under conditions of high inflation.

2.1 Non-inflationary conditions

According to Table 2, loan restriction 1 results in a bigger distribution of results, whereas loan restriction 2 produces more stable results with smaller fluctuations. It also appears from the table that growth rates varied mainly between 5 and 15 per cent in the case of the second loan restriction whereas they fluctuated between 0 and 20 per cent in the case of the first loan restriction.

Nevertheless, it appears that with both loan restrictions, under the non-inflationary conditions, strategy 2 provided the best and most stable results with a $p = 1,00$ probability of realising a net value of between R783 000 and R1 460 000. On the other

hand, strategy 3 gave the second highest and the second most stable results with both loan restrictions.

According to Louw², in the case of the beginner farmer lease strategy 1 gave the lowest and most unstable net value. In Table 3 the probability of realising a net value exceeding R537 000 with strategy 1 over a period of 15 years is only between 0,40 and 0,45 whereas it is at least 0,90 with any other strategy. Under loan restriction 1 strategies 2 and 3 show identical divisions. Both have a probability of 1,0 of realising a net value exceeding R537 000. Strategy 2 with loan restriction 2 shows a slightly greater variability, however.

It appears from both beginning situations under conditions of no inflation that the highest and most stable growth rate is obtained with strategy 2. From average results this would also appear to be the case.³ The probability of the undertaking being successful if this strategy is followed is therefore high. With most strategies end net values amount to between R783 000 and R1 460 000 in the case of the established entrepreneur and between R537 000 and R1 000 900 in the case of the beginner entrepreneur.

2.2 Conditions of moderate inflation

Within the limits of the results obtained in this study, with strategy 2 and loan restriction 1 under conditions of moderate inflation, the established entrepreneur (Table 2) realised with certainty ($p = 1,00$) a net value of between R1,46 million and R2,65 million after 15 years, compared with a probability of 0,75 that this figure would be

TABLE 2 - Number of observations, and probability that a specific growth rate will be realised under various inflation conditions, loan restrictions and strategies for the established above-average entrepreneur

Inflation condition	Loan restriction	Strategy	Growth rates (%)									
			< 0		0-5		5-10		10-15		15-20*	
			Net value limits (R) ¹									
			<206 365		206 366-408 582		408 583-783 671		783 672-1 460 177		1 460 178-2 649 562	
No	1	1	n	P	n	P	n	P	n	P	n	P
		2	2	,10	2	,10	13	,65	3	,15	0	0
		3	0	0	0	0	0	0	20	1,00	0	0
		4	0	0	0	0	6	,30	13	,65	1	,05
		5	0	0	0	0	16	,80	4	,20	0	0
	2	1	0	0	4	,20	13	,65	3	,15	0	0
		2	0	0	0	0	0	0	20	1,00	0	0
		3	0	0	0	0	7	,35	13	,65	0	0
		4	0	0	0	0	14	,70	6	,30	0	0
		5	0	0	0	0	9	,45	11	,55	0	0
Moderate	1	1	0	0	1	,05	3	,15	16	,80	0	0
		2	0	0	0	0	0	0	0	0	20	1,00
		3	0	0	0	0	1	,05	4	,20	15	,75
		4	0	0	0	0	1	,05	16	,80	3	,15
		5	0	0	0	0	0	0	4	,20	16	,80
	2	1	0	0	0	0	4	,20	16	,80	0	0
		2	0	0	0	0	0	0	1	,05	19	,95
		3	0	0	0	0	0	0	3	,15	17	,85
		4	0	0	0	0	1	,05	14	,70	5	,25
		5	0	0	0	0	0	0	4	,20	16	,80
High	1	1	16	,80	0	0	4	,20	0	0	0	0
		2	0	0	1	0,05	18	,90	1	,05	0	0
		3	17	,85	0	0	3	,15	0	0	0	0
		4	16	,80	0	0	4	,20	0	0	0	0
		5	16	,80	0	0	4	,20	0	0	0	0
	2	1	18	,90	2	,10	0	0	0	0	0	0
		2	2	,10	5	,25	12	,60	1	,05	0	0
		3	6	,30	6	,30	5	,25	3	,15	0	0
		4	8	,40	4	,20	6	,30	2	,10	0	0
		5	18	,90	2	,10	0	0	0	0	0	0

n = number of observations; P = probability

* In none of the cases was there a growth rate exceeding 20 %

1. Beginning net value was R206 365.

achieved with strategy 3. The corresponding probabilities are 0,15 with strategy 4 and 0,80 with strategy 5. With loan restriction 2, strategy 2, the probability of such a result being achieved is 0,95; it is 0,85 with strategy 3; 0,20 with strategy 4 and 0,80 with strategy 5. It appears that strategy 2, loan restriction 1, or strategy 3 loan restriction 2, provides the best and most stable results in this case. There appears to be no probability of exceeding R1,46 million with strategy 1.

In the case of the beginner entrepreneur, strategy 3 results in a lower average for both loan restrictions, but a more stable a net value than strategy 2. With both strategies and both loan restrictions a net value of over R1 million is realised over the period of 14 years.

The considerable differences in stability between loan restrictions with strategy 4 in the case of the beginner entrepreneur constitute a peculiar aspect. An entrepreneur following strategy 4 with loan restriction 1 will probably realise a net value of between R0,54 million and R1,00 million; there is only a 10 per cent chance of exceeding a net value of R1 million, whereas there is a 90 per cent chance

if loan restriction 2 is followed. The more conservative attitude towards loans, therefore, led to a lower net value. Where land is not freely available, as is assumed in this strategy, the more liberal loan restriction gives better and more stable results in the long term, subject to relative price movements of the order assumed with this inflation rate.

2.3 Conditions of high inflation

The land sales reflected in the results mean that the number of choices in this inflation category are considerably limited. The established entrepreneur (Table 2) can, if loan restriction 1 in strategy 2 is followed, survive inflation successfully. It appears that the chances of survival are 100 per cent and that in 95 out of every 100 cases a gross growth rate of more than 5,0 per cent can be achieved. In all the other strategies where loan restriction 1 is followed, the chances of survival are slender and there is a probability of 0,80 or higher of a negative growth rate. Strategy 2 with loan restriction 1 fares better than any of the other

TABLE 3 - Number of observations and probability that a specific growth rate will be realised under various inflation conditions, loan restrictions and strategies for the beginner entrepreneur

Infla- tion condition	Loan re- stric- tion	Stra- tegy	Growth rates (%)											
			<0		0-5		5-10		10-15		15-20		>20 %	
			Net value limits (R) ¹											
			<141 453		141 454- 280 062		280 063- 537 167		537 168 - 1 000 877		1 000 878 - 1 816 140		>1816 140	
No	1	1	n	P	n	P	n	P	n	P	n	P	n	P
		2	0	0	3	,15	9	,45	7	,35	1	,05	0	0
		3	0	0	0	0	0	0	15	,75	5	,25	0	0
		4	0	0	0	0	0	0	15	,75	5	,25	0	0
		5	0	0	0	0	2	,10	15	,75	3	,15	0	0
	2	1	0	0	0	0	0	0	16	,80	4	,20	0	0
		2	1	,05	1	,10	9	,45	9	,45	0	0	0	0
		3	0	0	0	0	0	0	15	,75	5	,25	0	0
		4	0	0	0	0	1	,05	16	,80	3	,15	0	0
		5	0	0	0	0	1	,05	19	,95	0	0	0	0
Moderate	1	1	0	0	0	0	1	,05	18	,90	3	,15	0	0
		2	0	0	0	0	0	0	0	0	16	,80	4	,20
		3	0	0	0	0	0	0	0	0	10	,50	10	,50
		4	0	0	0	0	0	0	0	0	2	,10	0	0
		5	0	0	0	0	0	0	0	0	16	,80	4	,20
	2	1	0	0	0	0	1	,05	15	,75	4	,20	0	0
		2	0	0	0	0	0	0	0	0	12	,60	8	,40
		3	0	0	0	0	0	0	0	0	18	,90	2	,10
		4	0	0	0	0	0	0	2	,10	18	,90	0	0
		5	0	0	0	0	0	0	0	0	18	,90	2	,10
High	2*	1	15	,75	2	,10	2	,10	0	0	1	,05	0	0
		2	13	,65	2	,10	4	,20	1	,05	0	0	0	0
		3	8	,40	1	,05	7	,35	3	,15	1	,05	0	0
		4	8	,40	2	,10	8	,40	2	,10	0	0	0	0
		5	10	,50	2	,10	5	,25	1	,05	2	,10	0	0

* As a result of the high frequency of land sales and the dangers of extrapolation, loan restriction 1 in the high-inflation category was excluded and no probabilities were calculated.

1. Beginning net value was R141 453.

strategies that follow loan restriction 2. It appears that an entrepreneur who follows strategy 2 with loan restriction 2 can maintain an average growth rate of more than 5 per cent with a probability of 0,65, compared with 0,0 with strategies 1 and 5 and 0,40 with strategies 3 and 4. It therefore appears that strategies 1 and 5 are considerably more risky than the other 3 strategies. It also appears that with strategy 3 a growth rate of better than zero could be maintained in 14 out of the 20 repetitions compared with the 12 out of 20 for strategy 4.

In the case of the beginner farmer (in Table 3) all undertakings were sold with loan restriction 1. The more conservative loan restriction 1 is therefore not recommended for the beginner in such inflation conditions, and only loan restriction 2 will be discussed further. It appears that a farmer who follows strategy 3 with a probability of 0,55 will be able to maintain a growth rate of more than 5 per cent compared with a probability of 0,10 for strategy 1; 0,25 for strategy 2; 0,50 for strategy 4 and 0,40 for strategy 5. It further appears that the chances of obtaining a negative growth rate are 0,75 in the case of strategy 1; 0,65 for strategy 2; 0,50 for strategies 3 and 4 and 0,50 for strategy 5. It would appear that in general strategy 3 with loan

restriction 2 yields the best and most stable results relative to the other strategies.

In the majority of situations negative gross rates were obtained under the conditions of high inflation. It should also be noted that reference is made to a gross growth rate and not to a real growth rate. If inflation is also taken into account it appears that a positive real growth rate can seldom be obtained with any strategy under the conditions of high inflation. The conclusions to be drawn from both the real and the gross growth rates are, nevertheless, the same.

3. VALIDATION OF THE MODEL

According to Irwin and Eisgruber⁴ validity entails the "..... examination of objective functions, constraints, decision making processes, information concepts and time horizons". It is obvious that validity is concerned with the whole parcel. A model must therefore be brought face to face with reality.

An empirical test of the validity of the results, therefore, is to compare the results with actual cases. Such a model, however, is often drawn up because actual cases are not available. In reality so many variables are uncontrolled that the analysis of

historical records of farming undertakings is extremely difficult and highly subjective.⁵

The validation, then, has to rely on subjective judgement which preferably takes the eventual decision-maker into account. There will always be a degree of subjective judgement, even when information is available.

Wright⁶ states that "validation of bio-economic models is always likely to be a rather non-vigorous procedure relying heavily on subjective judgement".

In a second approach findings can be compared with those of previous studies. As long as the general relationships, data and environmental conditions are the same, they are acceptable. However, no such studies have been undertaken in South Africa to date. It nevertheless appears that, in general, findings under conditions of no inflation in this study correspond to a reasonable extent to trends in Patrick and Harsbarger's studies, as well as to those in the studies of other researchers. As soon as the other inflation conditions are considered, there do appear to be differences because inflation has not yet previously been taken into account.

A third approach may be a comparison of the yield rates obtained in the model with the actual yield rate. When inflation conditions prevail, however, it is difficult to validate all aspects of the model. It also appears that there is a lack of adequate on-going historical data. The results of strategy 3 under the conditions of high inflation for the various beginning and management situations are shown in Table 4, as well as the average results of a mail-in record study group in that area and also the results of two collaborators whose data were used in this study (from 1973/74 to 1977/78).

In general Table 4 shows a reasonable measure of correspondence in the relative course of the yield rate. The low yield rate of R3,55 per R100 of capital investment for the study group in year 3 (1975/76) can be ascribed to low yields resulting from copious rain. It also appears from a complete survey by the Department of Agricultural Economics and Marketing that in this year the average NF1 per R100 of capital investment was R2,43 compared with the R7,82 for the best third of the farmers.⁷

Although inflation has not yet begun to show any negative effect, it can be expected, according to the results of the model, that problems will begin to emerge from approximately the 6th or 7th year. This observation largely corresponds to that of Groenewald⁸ who, from data obtained from the Abstract of Agricultural Statistics, indicated the deteriorating situation of the farmer after seven years as a result of inflationary conditions for the period 1971/72 to 1978/79.

In the actual situations NFI per R100 of capital investment began to drop in the fifth year although yields were in no way lower than those of the previous year. No serious financial problems were experienced in either the model or the actual situations in the first year. However, as the

inflation break-even point approaches, the possibility of financing and liquidity problems increases; such problems are at present being experienced in South African agriculture.

From data⁹ on the debt load of farmers in South Africa, and the composition of the debt burden, it appears that the total debt burden of farmers increased from R1 790,4 million in 1974 to R3 219,3 million in 1979 (an increase rate 12,5 per cent per annum). Whereas commercial banks, agricultural co-operatives and commercial credit (all of them mainly short-term credit) comprised about 36,0 per cent of the total debt in 1974, the figure for 1979 was about 45,1 per cent (an increase rate of 17,7 per cent per annum). This, therefore, reflects a real increase. This trend corresponds largely to the results in the simulation study and serves as partial support in the validation of the model.

4. CONCLUSIONS

The following conclusions may be added to those arrived at in a previous article.

1. The deterministic and stochastic models give considerable differences in end net values. Compared with the stochastic model, the deterministic model tends to over-estimate growth rates. The stochastic model is more realistic. In a deterministic model it is assumed that the entrepreneur has perfect knowledge and that his expectations are realised completely. In a stochastic model a probability distribution, even a random distribution with no specific distribution pattern, is assumed and actual results seldom, if ever, coincide exactly with expectations. Utilisation of inputs is therefore normally more or less than optimal.
2. In the initial years the relative differences resulting from the various strategies were not as obvious as in later years. Differences in growth really only begin to emerge after differences in the basis of the resources have been identified. After a certain period resources have reached a level from which growth can begin - a "launching" stage. The first period is fairly critical since external conditions (e.g. inflation) influence this level. Before growth can begin, this period must be survived. Therefore, as soon as this basis has been reached, bigger risks can be taken, more external financing can be obtained, new opportunities can be utilised and growth can begin.
3. The role of the cattle enterprises in the model deserves attention. The meat and dairy enterprises grew with the undertaking in both the stochastic and the deterministic models. Although livestock plays a secondary role here, it plays an important role in view of the regular generation of cash-flow and the potential stability it affords in the low-income years.

TABLE 4 - Net farm income per R100 of capital investment for first five simulated years in deterministic model for strategy 3, compared with the actual situation

Managerial ability	Beginning situation	Year				
		1	2	3	4	5
		NBI per R100 of capital investment				
		Rand				
1	1	20,25	24,13	17,27	16,98	12,27
1	2	19,58	26,93	19,66	16,56	17,17
2	1	14,03	19,83	12,98	9,63	11,17
2	2	14,02	22,20	12,98	10,91	11,65
Average study group		19,86	16,86	3,55	10,64	5,36
Collaborator 1		27,98	30,89	14,30	19,93	12,47
Collaborator 2 ¹		42,21	30,53	9,93	33,68	9,56

1. Owing to minimum cultivation practices and a high level of mechanisation maintenance (average age of tractor is 10,5 years) this collaborator annually has the minimum replacements and a particularly low investment in machinery and equipment.

4. It furthermore appears that the leasing of land is generally a poor growth strategy which leads to low net values and a high measure of instability. In strategy 2 which, on the whole, fared best, no new land was leased at any stage. The poorer results obtained with the leasing of land may possibly be ascribed to three factors:

- (i) The role of capital appreciation in net value accumulation;
- (ii) perhaps excessively high rentals; and
- (iii) the fact that rentals absorb cash. The rental remains unchanged irrespective of price and yield trends. In conditions of high inflation this can have a very serious effect.

5. In the stochastic model, net value grew exponentially in conditions of moderate inflation. On the whole, variation increased in net value over a period of time. Similar results were reported by other researchers,^{10 11}

6. In the stochastic model strategy 2 (cash land purchases only) generally yielded the highest and most stable results. With all strategies high inflation conditions affected the growth rate adversely (even negatively). Strategy 2 had a higher probability than other strategies of achieving an annual growth rate of more than 5 per cent for the above-average established entrepreneur under such conditions.

7. In times of high cost pressure inflation the beginner farmer will have to exercise particular pressure on his resources, both physical and financial, in order to survive. For that reason it is necessary that the needs of the average, as well as those of the above-average, entrepreneur who intends farming should receive attention. This may necessitate certain adjustments in the authorities' financing policy.

8. More attention should be given to the managerial abilities of prospective entrepreneurs. Organisations providing credit should give more attention to farmers' financial situation, record-keeping and cash-flow. The Financial Assistance Branch of the Department of Agriculture and Fisheries

is at present the only body that assists young prospective farmers who cannot obtain aid elsewhere. The Land Bank only assists farmers who already have an adequate supply of cash but cannot be assisted by other banks. When farms are sold to beginner farmers on special conditions, it is also of special importance that more attention should be given to the net family income (expendable income), namely money available after all cash expenses have been deducted, obligations have been met and the necessary replacement has been made. To judge an undertaking purely on the basis of its potential profitability without taking into account the standard of living, obligations and similar aspects which concern the beginner farmer, will create problems for the young entrepreneur right from the start. At present few credit-giving organisations give enough attention to this aspect.

9. It is a logical conclusion to draw that cost-pressure inflation at enterprise level can be combated only by increased yields, cost-saving techniques, less waste and better financial management generally. Considerably more research and guidance are needed in order to make these steps possible.

10. It is imperative that, from the point of view of the agricultural industry, the effect of cost-pressure inflation should receive more attention. It has been shown that the deterioration in the ratio between producer prices for crops and prices of farming inputs in South Africa between 1972 and 1977 has been among the worst in the world.^{12 13} In times of cost-pressure inflation the authorities ought also to pay more attention to the effect on agriculture of high interest rates, especially on short and medium term funds, than has been the case in the past. This may even necessitate certain adjustments in monetary policy.

11. From the socio-economic and political viewpoints there is, at present, anxiety concerning the rate at which farms are being abandoned. Policy-makers are making every effort to devise methods that can contribute

to the preservation of the rural population. In this respect the only policy that can succeed in the long term is one that makes enterprises economically viable. However, in the present inflationary conditions the situation has deteriorated to such an extent that methods will have to be found which will make survival possible. The price and marketing policy of certain commodities (maize, meat and milk), as well as the trade policy, *inter alia*, import tariffs on agricultural inputs, are involved here. It is essential that entrepreneurs should always be assured of a market for their produce, of an economic infrastructure to market their produce physically, and also that the ratios between product and input prices are such that the farmer can produce profitably.

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