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## THE IDENTIFICATION OF FACTORS THAT INFLUENCE FARMERS' BUYING BEHAVIOUR OF NEW AGRICULTURAL TRACTORS

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The purchase of tractors by the participants in the various agricultural sectors continues to be problematic due to the high price of tractors and its accompanying implements. The purchase is thus a substantial capital investment in equipment that results in a thorough pre-purchase examination of the various alternatives and the choice of a manufacturer. Since the average age of agricultural tractors is constantly increasing, the probability of replacement purchases of tractors is also increasing. This scenario demanded a study in buying behaviour that examined what factors are deemed to be important by the buyers of tractors for agricultural use.

Eight factors were identified by means of principle varimax factor analysis. These factors are: Product and service qualities, Operational qualities, Pre-purchase planning, After-sales service, Ergonomics, Ease of operation, Cost of credit and Potential savings. These factors declare a cumulative variance of 55,65 per cent. Three major groups could benefit from the results. First, the buyers of agricultural tractors since it could increase their level of understanding of the important considerations that are connected to the replacement of old tractors. Secondly, agricultural economists and advisors should be able to increase the quality of their advice if they have a better understanding of tractor buying behaviour. Thirdly, financial institutions may benefit by a more in-depth knowledge why a farmer applies for a loan to buy a new tractor.

### 1. Introduction

South African farmers are currently subjected to severe economic and financial pressure due to the aftermath of prolonged droughts and the well documented cost/price squeeze since the early seventies. In addition, the capital equipment of farmers deteriorates annually in age and condition. De Villiers (1991:36) regards the problem of ageing tractors as a country wide problem. Tractors in use are ageing and numbers are declining (see Table 1).

In Table 1 it is indicated, first, that the absolute number of agricultural tractors decreased by 66 902 between 1984 and 1991 and secondly that the number between the ages of ten and fourteen years increased by 2 305. In essence, there is a tendency towards the use of older tractors. De Villiers (1991:36) argues that this phenomena is directly related to the financial problems of farmers in South Africa, and warns that a continuation of the ageing tendency will probably lead to tractor manufacturers and dealers withdrawing from the South African agricultural machinery supply industry. However, as highlighted in Figure 1, the productivity of South Africa's tractor fleet is seriously doubted since the majority of the tractors are older than ten years (59,6%), while only 16,6% of the tractors are younger than five years.

The purchase of expensive capital equipment, such as tractors, frequently causes anxiety among prospective buyers. This is especially true since farmers' attempt to improve their current financial situation by improving the productivity of their farming operations (Giles & Stansfield, 1983:44). The timely replacement of capital equipment should ensure that the equipment is still economical to replace before it becomes obsolete (Hendricks & Moore, 1981:11).

Various alternatives exist in the replacement of old tractors. One alternative is to rebuild or recondition the old tractor. A fully reconditioned tractor could cost up to 43 per cent of the price of an equivalent new tractor (North-Western Co-operative workshop quotations, July 1990). This alternative may appeal under certain conditions if the tractor is in a repairable condition.

Another worthwhile alternative could be the purchase of a second-hand tractor if its history is known. Farmers are, however, cautious to buy second-hand tractors because tractors perform strenuous work under less than perfect conditions.

The problems of affordability, feasibility, the size of the tractor, its accompanying implements (and their costs), the amount of hectares to be cultivated and the current condition of the other tractors on the farm must also be considered. Statistics (1984 - 1991), however, indicate (Table 1 & Figure 1) that farmers did not sufficiently replace their tractors during that period of time. This leads to the need for a study in tractor buying behaviour.

The theoretical structure of agricultural tractors purchasing behaviour corresponds to that of mechanized irrigation systems, a purchasing behavioural model refined by Runyon & Stewart (Bisschoff & Marais, 1991).

Two hypotheses were formulated and tested:

H1

Farmers plan before they buy a new tractor;

H2

Farmers consider non-price criteria before they buy a specific tractor;

Table 1: Comparative analysis regarding the ages of tractors - 1984 and 1991

Description	1984 (a)	1991 (b)	Difference (a - b)
Total number of tractors	203852	136950	66902
Number between 10 and 14 years	51492	53797	(2305)
Aged tractors as percentage of total tractors	25.26%	39.28%	(14.02%)

Source: De Villiers (1991:36)

## Total tractor fleet = 136 950 tractors

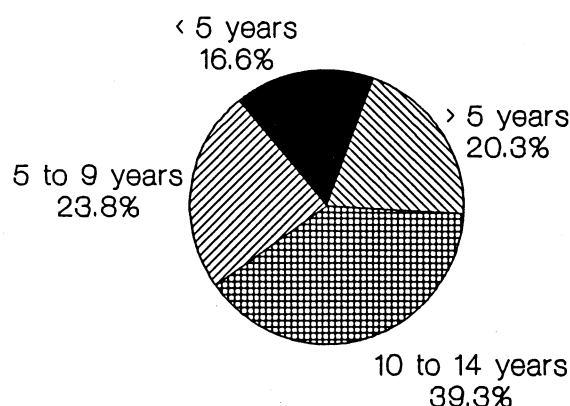


Figure 1: An age analysis of South Africa's tractor fleet - 1991

Source: De Villiers (1991:36)

### 3. Methodology

A structured questionnaire recorded responses on a seven point Likert scale ranging from 1 (extremely unimportant) to 7 (extremely important) to indicate the importance that respondents attach to different statements regarding the choice in the purchase of a tractor. Ninety evaluative criteria were included in statement format.

The data was analyzed with the statistical factor analysis technique which requires some judgement on the part of the researcher when labelling the individual factors (Hair, Anderson & Tatham, 1984: 248-251; Bisschoff, 1992: 165). A factor loading of 0,30 is considered significant, while loadings of 0,40 are considered important, and loadings of 0,45 and higher are generally regarded as very significant for interpretation (Hair, Anderson & Tatham, 1984: 249) at the 20,25 per cent confidence level for each statement (Bisschoff, 1992: 163-166). Since relatively high factor loadings were recorded, a cut-off factor loading of 0,45 was used. A significant negative factor loading only shows that the specific statement contributes inversely to the specific factor.

The sample population consisted of 206 farmers in the Western Transvaal and North-Western Cape who belong to the study-groups of the North-Western Co-operative. A high response rate of 76,7 per cent was recorded.

### 4. Results and discussion

The analysis provided eight factors of farmer buying behaviour in the agricultural tractor industry and ex-

plained a cumulative variance of 55.65 per cent. The twenty most important evaluative criteria were identified and ranked in descending order of importance in Table 2. Mean values and standard deviations were employed in the selection of these criteria.

Statement number 13 concerns the availability of spare parts. Farmers consider it to be the most important criterion when they buy agricultural tractors. Statement number 81 is ranked as the twentieth most important criterion.

The eight most important criteria (statements number 27, 15, 20 and 70) relate to spare parts as well as to service and dependability. Eight factors were identified by means of a varimax rotated factor matrix. The first two factors contributed significantly to the variance explained and various statements relate to these two factors.

#### Factor 1 - Product and service qualities

Thirty of the 90 evaluation criteria load heavily onto the first factor. Factor 1 resembles statements which relate to the quality of the product, the accompanying services and the availability of spare parts (see Annexure A).

Statements 6, 13, 18, 19, 22, 23 and 70 relate to the quality of service supplied by the dealer while statements 38, 42, 52, 57 and 58 relate to financial considerations of running and repairing a tractor. All these statements refer to product quality. Thus, the quality of the product is a function of its durability, which, in turn, determines the running costs of the tractor.

Table 2: Criteria perceived by consumers ranked in descending order of importance according to mean value

Evaluation criteria		Mean value	Standard deviation
Number	Statement		
13	Availability of spares	6,828	0,671
58	Cost of spare parts	6,657	0,810
19	Ordering the correct spare parts the first time	6,646	0,760
45	Dependability of tractor	6,646	0,907
18	Getting "out-of-stock" spare parts fast	6,596	0,768
22	Critical spares are kept in stock	6,586	0,833
23	Satisfactory service during guarantee period	6,525	0,919
16	Quality of workmanship	6,505	1,265
82	Compatibility to a wide range of implements	6,434	0,939
52	Initial purchase price	6,434	1,071
67	Own experience	6,414	0,948
27	High quality components and materials	6,394	0,935
38	Fuel consumption of tractor	6,394	1,077
15	Speed of repairs done by the dealer at his workshop	6,364	1,236
34	Stable lift ensures uniform working depth	6,364	0,931
20	Highly trained mechanics	6,343	1,295
79	Easy to perform pre-startup checks	6,333	0,833
42	Fairly standard oil and fuel filters	6,313	1,113
70	Quality of workmanship the pre-delivery service	6,293	1,127
81	Easy to add oils, fuel and other fluids	6,283	1,011

Table 3: Factor contribution to variance explained

Factor number	Factor label	Variance explained (%)
1	Product and service qualities	17,07
2	Operational qualities	9,41
3	Pre-purchase planning	5,86
4	After-sales service	5,77
5	Ergonomics	4,96
6	Ease of operation	4,92
7	Cost of credit	4,81
8	Potential savings	2,85
Cumulative variance explained		55,65

The initial purchase price of the tractor (statement 52) has a direct influence on the depreciation of the tractor. Statement 38, fuel consumption per kW power, relates to product quality. The North-Western Co-operative's Study-group results (1990: 3) indicate that with older tractors, more kW power is needed per hectare to cultivate the lands. This implies higher fuel consumption.

Statements 25 - 27, 31, 32, 34, 37, 44, 45, 78, 79, 81 and 82 clearly indicate perceptions with regard to tractor design. This perception reflects product quality. Statements 1, 7, 67 and 73 relate to the service qualities rendered by the dealer and his reputation. Factor 1 explains 17,07 per cent of the total variance.

#### Factor 2 - Operational qualities

Thirteen statements loaded to factor 2 and explains 9,4 per cent of the total variance (see Annexure A).

#### Factor 3 - Pre-purchase planning

All six statements identified by factor 3 relate directly to pre-purchase planning (see Annexure A). Statements 63 - 66 correlate positively with advice. Thus, relating to pre-purchase planning. Statement number 68 also relates to pre-purchase planning as the farmer plans accordingly to the date of expected delivery. This factor explains 5,86 per cent of the variance.

#### Factor 4 - After-sales service

The six statements identified by factor 4 relate to the after-sales service rendered by the dealer (Annexure A). This factor explains 5,77 per cent of the total variance.

#### Factor 5 - Ergonomics

All four statements contribute to increasing operator convenience and productivity while operating the tractor (see Annexure A).

Increased convenience could thus result in longer working hours as a result of lower fatigue levels. This factor explains 4,96 per cent of the total variance.

#### Factor 6 - Ease of operation

Four statements are identified by factor 6 (see Annexure A). Statements numbers 88 - 90 clearly relate to convenient operational qualities of the tractor. Easy access to controls, a clear view to the front and back of the tractor and steps fitted to ensure safety in getting into or out of the tractor all increase the ease of operating a tractor. Statement number 2 implies that farmers require advice from sales personnel during operation of the tractor. This factor explains 4,92 per cent of the total variance.

#### Factor 7 - Cost of credit

Five statements load onto factor 7 (Annexure A). All the statements relate to the cost of buying a tractor by means of credit. This factor explains 4,81 per cent of the total variance.

#### Factor 8 - Potential savings

The statements loading to factor 8 relate to possible savings (see Annexure A). This factor explains 2,85 per cent of the total variance and is relatively unimportant in relation to the other factors.

The data set explained a total variance of 55,65 per cent. as a result other factors thus also influence the buying behaviour of farmers. Nineteen statements did not obtain the minimum required factor loading of 0,45.

It is possible from this results, or lack of results, that rational buying behaviour is not the overall consideration in purchasing a new tractor. The possibility of tax considerations, belief that a tractor is a necessity on the farm or that the luxury of owning a new tractor is a common habit which needs special considerations.

### 5. Conclusion

The identified factors provide a simple framework which could be used as a basis to partially explain farmer buying behaviour. This simplification of the initial set of data certainly reduces the number of variables. As a result a more structured and manageable framework realizes to explain purchase behaviour regarding a tractor.

From the identified factors, two global behavioural patterns could be identified, namely: Financial concerns and Product quality concerns. Most of the identified factors possess a common financial quality.

Product and service qualities of the tractor, the operative qualities which the tractor possesses and the ease where-by the tractor is operated is imperative in South Africa where unskilled workers are frequently the tractor operators.

#### H1

Farmers plan before they buy a new tractor;

Hypothesis H1 is not rejected since planning and financial concerns are clearly evident.

#### H2

Farmers consider non-price criteria before they buy a specific tractor;

Although the major behavioural pattern consists of financially orientated factors, the fact the tractor per se, the service qualities and the operational qualities are identified as factors, substantiate that farmers do consider other factors than price as important when they buy a tractor. Hypothesis H2 is thus accepted. Price is however important since Factor 7 - Cost of credit is a function of three components: price, term of financing and interest rates.

In conclusion, the most important consideration in farming buying behaviour of a new tractor is the product qualities of the tractor.

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## Annexure A

## Factor 1: Product and service qualities

Number	Statement	Factor loading
No 1	Reputation of the dealer	0,58
No 6	Guarantees and conditions	0,45
No 7	Long-term relationship with dealer	0,49
No 13	Availability of spare parts	0,72
No 18	Getting "out-of-stock" spare parts quickly	0,79
No 19	Ordering the correct spare parts with the initial order	0,74
No 22	Critical spares are kept in stock	0,79
No 23	Satisfactory service during the guarantee period	0,57
No 25	Overall effective design	0,60
No 26	Strong structural design	0,74
No 27	High quality components and materials	0,59
No 31	Limited wheelslip	0,69
No 32	Lift's ability to handle heavy implements with ease	0,68
No 34	Stable lift ensures uniform working depth	0,70
No 37	Effective kW measured at rear traction wheels	0,62
No 38	Fuel consumption of tractor	0,63
No 42	Fairly standard oil and fuel filters	0,64
No 44	Overall ruggedness of the tractor	0,48
No 45	Dependability of the tractor	0,67
No 51	Fuel consumption per available kW power	0,53
No 52	Initial purchase price	0,58
No 57	Running cost per kW power	0,62
No 58	Cost of spare parts	0,71
No 67	Own experience	0,58
No 70	Quality of workmanship during pre-delivery service	0,47
No 73	In possession of a specific power range implements	0,50
No 78	Easy to operate	0,53
No 79	Easy to perform pre-startup checks	0,66
No 81	Easy to add oils, fuel and other fluids	0,57
No 82	Compatibility to a wide range of implements	0,59

**Factor 2 - Operational qualities**

Number	Statement	Factor loading
No 28	Effective meters and gauges	0,56
No 29	Warning lights are clearly displayed	0,55
No 30	Accurate hour and speedometer	0,50
No 33	Tyre and rim width	0,62
No 35	Turbo-charged engine	0,51
No 36	Distribution of engine torque through revolution range	0,61
No 40	High ground clearance	0,67
No 41	"Extra" speed settings on gearbox	0,48
No 46	Protective bars around the cabin	0,62
No 47	Small "turn-about" circle	0,65
No 48	Effective brakes	0,52
No 50	Weight of the tractor	0,72
No 69	Planning the purchase long before delivery is expected	0,50

**Factor 3: Pre-purchase planning**

Number	Statement	Factor loading
No 63	Consultation with independent mechanics	0,58
No 64	Advice from agricultural bodies	0,66
No 65	Advice from competitive dealers	0,76
No 66	Advice from fellow consumers	0,73
No 68	Time frame between purchase and delivery date	0,55
No 71	Punctuality on delivery date	0,54

**Factor 4: After-sales service**

Number	Statement	Factor loading
No 63	Cost of repairs done by dealer	0,60
No 15	Speed of repairs done by dealer at workshop	0,87
No 16	Quality in workmanship	0,89
No 17	Speedy "on farm" repairs by dealer	0,70
No 20	Highly trained mechanics	0,82
No 21	Repair tractor at dealer after guarantee elapsed	0,53

**Factor 5: Ergonomics**

Number	Statement	Factor loading
No 83	Power steering	0,72
No 84	Air-conditioned and dust-proof cabin	0,58
No 85	Open sunroof fitted to protect operator from the sun only	0,51
No 86	Padded and shock absorbing seat	0,53

**Factor 6: Ease of operation**

Number	Statement	Factor loading
No 2	Your relationship with sales personnel	0,54
No 88	Clear view to front and back of the tractor	0,70
No 89	Easy access to all controls in cabin	0,76
No 90	Steps fitted to ensure safe embarking and disembarking of tractor	0,58

**Factor 7: Cost of credit**

Number	Statement	Factor loading
No 53	Credit supplied by the dealer	0,75
No 54	Hire purchase or lease agreement	0,79
No 55	Length of the financing period	0,84
No 56	Interest rates	0,82
No 60	Total cost of tractor after financing costs are added	0,67

**Factor 8: Potential savings**

Number	Statement	Factor loading
No 39	Traction specifications (4 X 4)	0,45
No 75	Currently owned tractor's spare parts fit the proposed new tractor	0,50
No 76	Larger tractor saves labour	0,51