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LAND RENTS AS INDICATORS OF PROFITABILITY IN MAIZE AND WHEAT PRODUCTION

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ABSTRACT

Land rents can be used to monitor anticipated changes in farm profitability of a long-run nature. Rents also provide information on the relative profitability of various enterprises (opportunity cost principle) i.e. maize versus livestock.

During 1983/84 rents on grazing land in the Maize Triangle averaged at R6,85 per ha, maize land R31,28 while wheat land in the Eastern Free State rented at R24,14. Data show that the expected profitability of maize was substantially higher than livestock during the period studied. Using the concepts of economic rent and transfer earnings, data indicate that the comparative advantage of maize versus livestock production in the three principal maize producing areas is the same.

As rents are determined by market forces they could provide insight into the dynamic and anticipated changes in farming profitability.

INTRODUCTION

According to economic theory, land rent is the net surplus produced on land. The surplus is the purest form of profit, since all costs are taken into account an allowance for managerial return is considered and the farmer's aversion risk is incorporated. The comprehensive surveys on land rents carried out by the Division of Agricultural Production Economics of the Department of Agriculture during 1979[1], 1980[2], 1981[3] and 1982[4] not only study the situation regarding the leasing of land in South Africa but provide additional and objective information regarding farming profitability in the various production areas.

The surveys also provide important information on production, such as the opportunity cost of maize production relative to beef in the Maize Triangle. In this paper it is suggested that rent data be used to monitor profitability changes in South African agriculture on a regional basis.

The rent concept is the least understood concept[5] in economic theory and one of the most powerful concepts. The main attractiveness of the rent concept is that it is an objective indicator of profitability.

This paper suggests that the Division of Agricultural Production Economics should, as an additional source of information, use the land rent survey data on a time series and cross-sectional basis to monitor profitability changes in the South African economy. The cost of compiling such a series would be almost zero since the data are available; the benefits would be immeasurable in policy decision making.

Rents are based on anticipated profits which may for various reasons diverge from actual profits in any year. As a long-term indicator, however, trends in farm profitability can be monitored regionally, nationally and for specific enterprises. The rent figure is determined by market forces and as such is an objective measurement.

LAND RENTS AS AN INDICATOR OF PROFITABILITY

While various factors may influence the level of rent for agricultural land[6], profitability in relative terms is likely to be the most important[7]. The more profitable an enterprise the more rent a prospective tenant will pay for the use of the land, and the higher will be the rental required by the landowner to induce him to part with the use of his land.

The demand for rented land is essentially a derived demand in that the price of rented land depends on the price of the product produced. In a free market situation the price of the product and rent are simultaneously determined[8].

The modern approach to rent theory is in agreement with the views that returns in the case of prices determined by the industry are economic rents, and that total unit cost of production is calculated by valuing resources at their opportunity cost for efficient profit maximising[9], and as such rent is a cost of production of the individual firm (farm)[10]. From the point of view of an industry, e.g. the maize industry, returns to land are rents but from the point of view of a specific farmer, these rents are a cost to him, if only in an opportunity cost context[11].

Because land rents are price-determined (Whetham[12], Smith[13], Ricardo[14], the inclusion of such rents in costs of production may result in a higher support price increasing rents further. The Euler theorem states that if the amount paid for factors is equal to their value in terms of marginal products the total product will be exhausted or, in

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simple language, in an equilibrium economy total costs including rents are equal to total income. Should the maize price increase while costs are constant, then rents per ha (cost side of equation) increase to the same extent as the increase in total income per ha, so that all costs are again equal to all income.

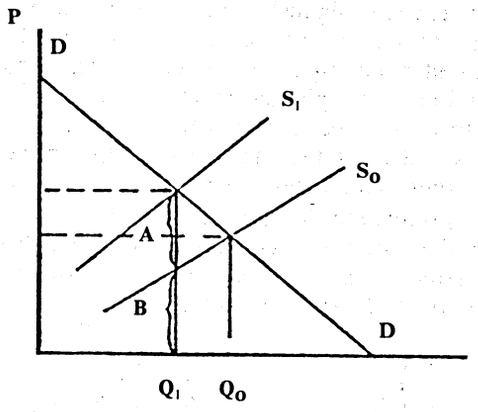
Budgets prepared by the United States Department of Agriculture for the United States Senate Subcommittee also report land rents in the production costs[15]. These rents can provide a kind of check on costs of production reported in the sense that income per ha for say soybeans should be more or less of the same magnitude as costs per ha if all costs are considered, including rents. South African policy-makers would fall into a trap if land rents were included in costs of production for products where prices are determined by marketing boards or by statutory schemes. It would be far wiser to be led by international supply and demand conditions where products are exported.

Economic theory states that no maize farmer, for instance, will produce maize in the long run if his expected income per ha from maize does not exceed his expected cost per ha *plus* his opportunity income (cost) of producing the second best crop. In the case of maize farming it has been argued that there are no alternative crops. In that case the opportunity cost is the use of the land for livestock farming, which is measured by rents of grazing land. In this study it will be shown that rents on arable land are substantially higher than those on grazing land, implying that maize is more profitable than livestock on a per ha basis. Because crop production is so risky in South Africa farmers make losses in some years. This uncertainty is, however, reflected in the rent agreed upon where land is rented.

It may be appropriate to restate the identity equation. Income per ha from say maize = production costs (fertilisers, depreciation of machinery, et cetera) + management return + risk aversion factor + rent. The rent factor provides greater insight into farming than can be gained by casual observation in that it allows for a managerial return as dictated by market forces although it does not specify what the return is. It allows for the cost that producers attach to risk, which depends not only on the actual risk as reflected by variances and covariances of crops produced but on the way farmers perceive this risk (risk aversion coefficient). It would thus be correct to say that rents of farm land per ha as obtained from surveys understate the anticipated profits per ha of the individuals who rent the land.

PRESENCE OF RENTS LEADS TO OVERESTIMATION OF PRODUCTION COSTS

In a paper published in the American Journal of Agricultural Economics[16] Nieuwoudt demonstrated that misleading conclusions may be arrived at by using official costs of production data, owing to the presence of quota rents. The effect of this is that production costs are over-estimated. In South Africa quota rents are reflected in the production costs of fresh milk, sugar-cane, beef, wattle, eggs, wine, etcetera. Production cost data obtained from surveys and used in policy decision-making can seriously misrepresent the actual situation, especially where quotas prevail that are *not* transferable or saleable. The principle is explained in the following diagram where the quota (say beef) shifts the free market supply from Q_0 to Q_1.



The cost of producing the quantity Q_1 is really B but survey data will measure the cost of A + B. In a situation such as this a lower product price (say for fresh milk) would not lead to lower production but only to a reduction in rents.

Production costs are considered in the determination of the prices of several agricultural commodities in South Africa.

THE RELATIVE IMPORTANCE OF THE RENT OF FARM LAND IN SOUTH AFRICA

The emergence of modern technology and the increase in the capabilities of lumpy inputs (specifically tractors and implements) increases the demand for land owing to increased capacity [17]. Johnson believes that "as the tradition of full ownership weakens under the strain of controlling a usable resource base the role of leasing will undoubtedly expand". Ownership has always been the most important form of tenure in South Africa; nevertheless leasing has accounted for between 13% and 22% of the total agricultural area occupied by Whites in the Republic (Table 1)[18].

TABLE 1 - Leased land as a percentage of total agricultural area occupied by Whites in the Republic

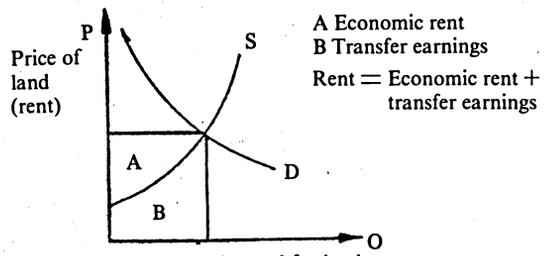
1937	1946	1950	1960	1964	1965	1971	1972	1973	1974	1975	1976	1977
							%					
22	20	15	14	15	13	17	17	18	18	18	18	17

Land rented in 1976 amounted to 15 429 420 ha; the area for 1977, using a land area of 85 573 000 ha; was 14 547 410 ha. While the surveys conducted by various bodies considered do not nearly approach a sample area of 14 547 410 ha the samples cover a reasonable land area and over 550 farmers have been included in the areas sampled.

TRANSFER EARNINGS OF MAIZE RELATIVE TO LIVESTOCK

Rental rates of farm land as observed in South Africa can further be divided into transfer earnings and economic rent. Both transfer earnings and economic rent are rent in the economic sense but this subdivision can provide further insight.

The distinction between transfer earnings and economic rent is explained in the diagram where the S curve is the supply of maize land in South Africa. The area under this supply is the opportunity income of the land currently planted to maize and as such is referred to as transfer earnings by Goodwin[19]. The area above the supply and below the price is economic rent. This shows that the supply of land for maize production depends on the level of income from the alternative crops and that if income from the alternative crop, say beef, increases (decreases) the supply of land for maize will decrease (increase).



Supply of and demand for land

The difference between rents on maize land (i.e. total rent) and rents on grazing land (transfer income) represents economic rent.

Relative profitability of maize and livestock enterprises will vary, thereby affecting rents paid. Comparative rent figures will therefore reveal the transfer earnings of maize relative to livestock in the maize-producing areas.

Data for 1981 and 1982 are considered in the comparison. Unfortunately no data for the previous period are available. Furthermore, the questionnaire format for 1981 made it impossible accurately to gauge the actual grazing land involved, and an inflated rent price may result because livestock are run with maize and not as separate enterprises.

Grazing rents for the maize production areas are tabulated in Table 2.

TABLE 2 - Relative grazing rents for livestock grazing during 1981 and 1982 (R/ha)

	1981	1982
Western Transvaal	3,15	6,17
North-Western Free State	3,88	5,85
Transvaal Highveld	13,10	8,17
Weighted average for Maize Triangle	**3,96**	**6,85**

When grazing rents and arable rents are compared, it is evident that transfer earnings reveal interesting results (Table 3).

If transfer earnings per ha are divided by average yield this shows how much the maize price needs to fall before maize production would disappear in that area.

Transfer earnings divided by average yield (recent seven years) were as follows for 1982/83:

Western Transvaal	9,5
North-Western Free State	10,4
Transvaal Highveld	9,2

This shows that the comparative advantage of maize relative to livestock appears to be more or less the same for the three areas. It shows that should the maize price fall by as much as R10 per ton *ceteris paribus* (all other things remaining constant) then maize and livestock may have equal profitability according to rents observed. According to Table 3 the comparative advantage of maize improved in the Transvaal Highveld whereas it worsened in the North-Western Free State. Because of inadequate data, we are not comparing maize to wheat and other crops in this case. The opportunity income of the latter crops is more than that of beef.

TABLE 3 - Arable and grazing rents and transfer earnings for the maize triangle subregions (R/ha)

	1981/82		1982/83	
	Grazing	Arable	Grazing	Arable
Western Transvaal	3,15		6,17	
Rent		28,63		32,14
Transfer earnings		25,48		25,97
Transfer earnings ÷ Av. yield		9,28		9,46
North-Western Free State	3,88		5,85	
Rent		34,43		30,83
Transfer earnings		30,55		24,98
Transfer earnings ÷ Av. yield		12,72		10,40
Transvaal Highveld	13,10		8,17	
Rent		27,10		30,58
Transfer earnings		14,00		22,41
Transfer earnings ÷ Av. yield		5,75		9,20
Maize Triangle	3,96		6,85	
Rent*		28,84		31,28
Transfer earnings*		24,88		24,43

*Weighted mean

Transfer earnings are virtually identical for the Western Transvaal for the two years under consideration. The stability is made even more remarkable by the increases in rent charged for both grazing and arable land. The 1982 rent figure is well within the level quoted by the Noord-Westelike Koöperatiewe Landboumaatskappy Bpk[20].

A R5,57 fall in transfer income shown in the North-Western Free State results from the R1,97/ha increase in grazing rent and the R3,60/ha decrease in arable rent.

The decrease in the transfer income may in part be due to the high percentage of short-term leases encountered in the area. Of the different tenure lengths 65% are for periods of between one and three years. A lagged reduction, a carryover from the poor season experienced during 1979/80, may therefore be explained.

It appears as if the 1982 grazing rent for the Transvaal Highveld may be slightly optimistic, but the figure is well within the R6,00 to R20,00/ha figure obtained from the Oostelike Transvaalse Koöperasie Bpk[21]. The fact that correspondence refers to the 1982 season still allows acceptance of the R13,10/ha figure quoted. The 1982 figure of R8,17 is still well within Van Niekerk's quoted range.

The comparative advantage principle is thus well illustrated in this case. The decrease in the maize price would result in a drift to livestock production, the degree of change being dependent on the drop in the maize price.

The main maize-producing area of South Africa is fairly homogeneous and has long been known as the Maize Triangle. Using weighted means of the grazing and arable rents a transfer income figure for the Maize Triangle may be formulated.

Comparing the increases in grazing rental (R2,89/ha) and arable land (R2,44) it is evident that the change in the transfer income is extremely small (R0,45/ha), so small that the 1981/82 inflation rate is not even covered.

The mean transfer income difference between livestock grazing and maize farming for the 1981/82 and 1982/83 season is R24,66.

The value of stubble grazing should be taken into consideration and be subtracted from the rent paid to maize land. The value of stubble has been said to be between R8,00 and R10,00/ha for stubble grazing in the Standerton district[22]. While the price seems to be exorbitant, the quantity and quality of this roughage, said to be the second most important source of roughage for grazing animals in South Africa, makes the consideration of stubble important. Unfortunately the inclusion of this feed source was not considered in the surveys studied.

MAIZE PROFITABILITY

Land rent date for four years are available, but the latest data relating to costs of production, maize price and projected yield eliminate the inclusion of the 1982/83 season from calculations. The land rent data for this season are included for interest's sake (Table 4).

TABLE 4 - Rental figures for main production areas over a 4-year period (R/ha)

	1979/80	1980/81	1981/82	1982/83
Highveld	16,99	18,28	27,21	30,58
Western Transvaal	18,28		28,63	32,14
North-Western Free State	28,97		34,43	30,83

Land rents show that an upward trend which may be construed to show greater profitability in the main maize production areas is evident. While Nampo shows profits of R166 million and R348 million for the 1979/80 and 1980/81 production years respectively, it shows a loss of R639 million for the 1981/82 production year; rent figures show a steady increase for the three years mentioned. The length of the rent period, if greater than one production season, will show a definite lagged response to changes in the fortunes of maize farmers. In the event of poor crops, a decrease will be seen in short-term leases, and longer term leases will show a lagged response. Considering good seasons, a similar increase will be seen in short duration leases, and longer term leases may again exhibit a lagged response. In both cases the response to either a good or a poor season will show changes that are relatively smaller than expected. The rent data for the 1982/83 season show increases for two of the three production areas.

The calculated profit margin (R/ha) shows wide variation (Table 5) for the corresponding period.

TABLE 5 - Calculated profit margin for maize production (R/ha)

	1979/80	1980/81	1981/82
Highveld	121,05	143,21	54,64
Western Transvaal	146,75	285,94	146,85
North-Western Free State	75,98	116,89	141,37

Profit figures quoted are higher than rents because other costs are not considered. Should risk and management be considered this figure would be lower.

The following four periods of rent tenure have been considered for the 1982 rent data; less than one year (i.e. one production season), one to three years, three to five years and longer than five years. Land rents for maize production areas for different rental periods are analysed, as are the proportions of rents in that rent period (Table 6).

Longer term rents are higher for North-Western Free State, a reflection of farmers' optimism about more favourable future conditions, as well as possible inflationary trends.

Long-term rents in the Transvaal Highveld do not exhibit the same trend but show a greater demand for shorter term rents.

Western Transvaal rents show comparatively little variation between the different periods of tenure, but reveal a large decrease in seasonal to short-term (one-to-three year) leases. Increases in the rents as the leasing term increases from one to three years are a mark of the confidence already mentioned.

A steady increase in rents for the

TABLE 6 - Land rents (R/ha) for different tenure lengths and relative proportions of rents in that period

	Tenure length (yrs)			
	<1	1-3	3-5	>5
Transvaal Highveld				
Rent (R/ha)	34,43	25,77	22,73	22,14
% Rents during time period	9	53	31	7
Western Transvaal				
Rent (R/ha)	54,35	17,58	22,03	25,73
% Rents during time period	16	33	33	18
North-Western Free State				
Rent (R/ha)	13,33	28,49	37,61	38,45
% Rents during time period	5	65	25	5
Mean rents for Maize Triangle (R/ha)*	**37,04**	**23,95**	**27,46**	**28,77**
% Rent during time period	10	49	31	10

*Weighted mean

North-Western Free State shows large increases up to the three-to-five year lease period, with intermediate length rents (one-to-three years and three-to-five years) accounting for 90% of all rents. One-to-three year rents are by far the most popular. A shortage of rentable land may account for the high long-term rents; security of tenure would be assured at high rent figures.

High short-term rents (one-to-three years) in the Highveld and Western Transvaal could be partly attributed to surplus (machinery) capacity in the short term.

WHEAT PRODUCTION

Wheat production, especially in the Winter Rainfall Region is structured slightly differently in that the high degree of specialisation encountered on maize farms is absent. Sheep and wheat have long complemented each other very well, and for this reason transfer income calculations have not been made.

Rent data have been obtained for the Rûens and Swartland areas of the Cape and for the North-Eastern Orange Free State (Table 7).

TABLE 7 - Land rents for wheat-producing areas in South Africa (R/ha)

	1979	1980	1981	1982
Swartland	17,75	11,02	12,95	13,47
Rûens	20,82	18,66	13,14	14,82
Eastern Free State	13,32		18,74	24,15

Judging from rents of the Eastern Free State the profitability of wheat improved there whereas wheat profitability declined in the winter rainfall area during 1979-1982.

From statistics it is evident that a very poor yield was obtained in 1980, the yield being 63,5% down from the 1979 season. This would affect the rent for the following season, i.e. 1981. The 1981 season proved to be good showing a 45,7% increase on the 1980 season. Table 8 shows net income figures for wheat. As may be expected, a large variation over the period is shown.

TABLE 8 - Net income for wheat production (R/ha)

	1979	1980	1981
Swartland	92,25	143,24	239,07
Rûens	159,38	47,80	225,18
Eastern Free State	122,04	33,74	133,82

It is clear that rents are not sensitive to yearly variations in farm fortunes (Tables 7 and 8), but are still the best indicator of anticipated profit at present. Anticipated profits depend on past profits and can be seen as a weighted average of past years' profits with the immediate past year carrying the greater weight and the weight attached to the other years declining as we move farther into the past.

CONCLUSION

Rents on farm land can be used to monitor anticipated profitability changes in farming. Rents can also provide opportunity cost data on current established crops. For instance the profitability of maize relative to grazing can be monitored on a regional basis.

Rents for maize land improved in all areas between 1979/80 and 1982/83, although in the North-Western Free State they declined from 1981/82 to 1982/83.

Rents for wheat land in the winter rainfall area declined from 1979 to 1982, showing declining expected profitability. The profitability of wheat production in the Eastern Free State appears to be increasing.

According to Table 3 the relative profitability of maize versus livestock appears to have remained more or less the same between 1981/82 and 1982/83 in the Maize Triangle, although in the North-Western Free State maize profitability fell relative to that of grazing.

Transfer earnings divided by average yield (recent seven years) were as follows for 1982/83:

Western Transvaal	9,46
North-Western Free State	10,4
Transvaal Highveld	9,20

This shows that the comparative advantage of maize relative to livestock appears to be more or less the same for the three areas. It shows that should the maize price fall by as much as R10,00 per ton *ceteris paribus* (all other things remaining constant) maize and livestock may have equal profitability according to rents observed.

According to Table 3 the comparative advantage of maize improved in the Transvaal Highveld but worsened in the North-Western Free State.

Maize and wheat profits reveal that both farming types are profitable but that profit margins vary widely. Wheat production was particularly profitable in 1981 with all areas showing a net income of over R100,00/ha.

No farmer will produce a crop if cost is greater than income plus the opportunity cost of the next

best crop. The fact that farmers persist in producing both maize and wheat in the respective areas is grounds enough to believe that production is possible.

Rents of farm land are determined by market forces and as such are an objective indicator of anticipated profits in agriculture. It is hoped that in future years data on land rents will be used for this purpose. Because of the controversy that accompanies cost of production calculations, farm rents should be considered as an additional source of information for this purpose.

REFERENCES

1. HERZBERG, A. *Huur en Verhuring van Landbougrond in R.S.A.*, 1979
2. Division of Agricultural Production Economics Survey, 1980
3. PORAY, A. Renting and Leasing of Agricultural Land, Division of Agricultural Production Economics, unpublished data, 1981
4. PORAY, A. Division of Agricultural Production Economics, unpublished data, 1982
5. BULLOCK, J.B., NIEUWOUDT, W.L. and Pasour, E.C. Jr. *Land Values and Allotment Rents, Amer. J. Agric. Econ.* 59 (1977): 380-384
6. These may include topography, edaphic, infrastructure and socio-economic considerations.
7. CURRIE, J.M. *Property Rights and Agricultural Land; An Examination of the Economics of Agricultural Land Tenure in England and Wales,* 1976. Unpublished Ph.D. dissertation p. 179
8. IBID, p. 179
9. TEIGEN, L.D. *Linear Programming Quality and Cost of Production,* 1982. Agricultural Economics Research Vol. 34, No. 1. p. 22
10. NIEUWOUDT, W.L. *Production Quotas with Specific Reference to Meat: Reply.* S. Afr. J. Econ. 47 (1979): 175
11. BULLOCK *et al.* op. cit.
12. WHETHAM, E. *The Theory of Rent in Practice,* Farm Economist Vol. VII Nos 11-12. 434-435
13. SMITH, A. *The Wealth of Nations.* ed. Cannon Modern Library. p. 146
14. BARLOWE, R. *Land Resource Economics,* 3rd ed. Prentice Hall
15. Economics, Statistics and Co-operative Service, U.S. Department of Agriculture Costs of Producing selected crops in the United States - 1976, 1977, and projections for 1978
16. NIEUWOUDT, W.L. *An Economic Evaluation of Alternative Peanut Policies:* Delayed Reply. Amer. J. Agr. Econ. 63 (1981) No. 2: 305-307
17. JOHNSON, B.B. *The Farmland Rental Market - a case analysis of selected cornbelt areas.* Unpublished report, 1971, University of Nebraska
18. HATTINGH, H.S. & HERZBERG, A. *Ownership or Leasing of Agricultural Land: Production Economic Aspects.* Agrekor., 19 (1980), No. 2: 1-7
19. GOODWIN J.W. *Agricultural Economics,* Restow Publishing Company, 1977
20. DAVEL A.T. (Agricultural Economist) quotes figures of between R6,00 and R12,00/ha, depending on quality of the grazing
21. VAN NIEKERK A.J., O.T.K., personal communication
22. KERSLAKE, R.J. & REYNOLDS, R. (personal communication)