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REQUIREMENTS FOR CONTRIBUTIONS

Articles in the field of agricultural economics, suitable for publication in the journal, will be welcomed.

Articles should have a maximum length of 10 folio pages (including tables, graphs, etc.) typed in double spacing. Contributions, in the language preferred by the writer, should be submitted in triplicate to the Editor, c/o Department of Agricultural Economics and Marketing, Pretoria, and should reach him at least one month prior to date of publication.

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Contents

THE RISK FACTOR IN MAIZE PRODUCTION*

by

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1. INTRODUCTION

The risk factor in maize production is important to the insurer in determining whether maize crops are insurable and to the farmer in deciding whether insurance cover is necessary. The object of this article is therefore twofold.

The first object is to compare the risk factor in maize production in the so-called recognised and marginal crop-farming districts in the Highveld Region.

The second is to determine the scope of the risk factor in maize production in the so-called recognised crop-farming regions.

A. The risk factor in maize production in various areas in the Highveld Region

An analysis of the physical-biological factors in dryland crop production shows that the western sections of the Highveld Region have a higher degree of risk for dryland crop production than the eastern areas of the Region. In order to determine whether the physical-biological indications are supported by economic analyses, maize yields in six districts in the Highveld Region were analysed. The districts are: Delmas and Nigel, situated in agro-economic region B1, Brandfort and Winburg, situated in agro-economic region C5, and Pietersburg and Soutpansberg, situated in agro-economic region M6. The agro-economic survey of South Africa[1] classifies B as the inland plateau suitable for intensive dryland crop production, C as a mixed farming region, not suitable for intensive dryland crop production, and M as an extensive large-stock region, entirely unsuitable for dryland crop production.

(i) *Adapted farming systems* – Farming systems that are adapted to the natural environmental factors ensure that the degree of risk in production is limited. The introduction of dryland crop production in farming systems in regions where the natural environmental factors dictate extensive or semi-extensive farming systems increases the element of risk in the income of such farming systems and can give rise to uneconomic farm units because the potential of such regions is then overestimated.[2]

An economic farm unit may be defined as a unit which should be able to produce a net farm income of at least R4 000,00 per annum if the farming system indicated by the natural environmental factors is applied. Assessed against these requirements, the estimated percentage of uneconomic farm units in the six districts is as follows:

TABLE 1[3] —Estimated percentage of uneconomic farm units per district

Agro-economic region and district	Estimated percentage of uneconomic farm units per district
B1: **Transvaal Highveld**	
Delmas	30
Nigel	24
C5: **South-Western Free State**	
Brandfort	37
Winburg	39
M6: **North-Western Transvaal**	
Pietersburg	72
Soutpansberg	72

The higher percentage of uneconomic farm units in agro-economic regions M, in particular, and C, to a lesser degree, may be attributed, among other things, to the fact that dryland crop production is practised in these regions. The unrealistic approach to the farming

* Based on an M.Sc. (Agric.) thesis by A. de Villiers, University of Pretoria, 1974.

1. Division of Economics and Markets. Agro-economic survey of the Union. Pamphlet No. 270, Government Printer, Pretoria, 1974.
2. Coetzee, J.J. Die landboupotensiaal van die Noordwes-Transvaalse Bosveld. D. Agric. (Inst. Agrar.) thesis, University of Pretoria, 1971, p. 9.
3. De Villiers, A. Beraamde persentasie onekonomiese boerderyeenhede per distrik. Unpublished report, Division of Agricultural Production Economics, September 1972.

potential has in the course of time resulted in farms being subdivided into smaller farm units than are justified.

(ii) *Maize yields* — With unfavourable physical-biological factors for dryland crop production, maize yields are low and show great variations in level, as is shown by the table below.

Table 2 shows that lower yields are associated with higher variations in yields, as is demonstrated by the coefficient of variation and risk factor. The table indicates that the highest degree of risk and therefore the lowest production potential for maize production appears in the four districts of agro-economic regions C and M.

TABLE 2[4] — The risk factor in maize production measured against various economic standards, 1960/61 to 1970/71

Agro-economic region and district	Average yield	Coefficient of variation about line of regression	Risk factor below line of regression[a]	Required yield to cover total production costs	Ratio of required yield to risk factor[b]
	kg/ha	%	%	kg/ha	
B1: **Transvaal Highveld**					
Delmas	2 100	21,5	9,3	1 418	153
Nigel	1 601	24,9	9,7	1 418	146
C5: **South-Western Free State**					
Brandfort	680	59,3	26,7	1 143	43
Windburg	848	60,7	24,6	1 143	46
M6: **North-Western Transvaal**					
Pietersburg	763	67,3	28,8	773	27
Soutpansberg	772	64,2	28,3	773	27

(a) Risk factor: $R = \frac{\sum (x_i^t - x_i)}{\sum x_j}$

x_i^t = theoretical value of fitted line of regression

x_i = value of deviations about line of regression

x_j = value of real yields

(b) The ratio of required level of yield to risk factor is an indication of the production potential of maize production, because it relates the uncertainty of production and the required level of yield to cover total production costs.

B. The scope of the risk factor in maize production in recognised crop-farming areas in the Highveld Region

The next point to be investigated is the scope of the risk factor in maize production in the recognised crop-farming districts, that is to say, in agro-economic region B, which is classified as suitable for intensive dryland crop production. For this purpose the maize yields of agro-economic regions B1 (Transvaal Highveld), B4 (Western Transvaal) and B5 (North-Western Free State) over a number of periods are compared.

(i) *Profit margin* — A shrinking profit margin indicates that the risk of production is increasing, in that lower levels of yield result in losses faster.

4. Original data supplied by Du Plessis, S.J. Werklikhede met betrekking tot die mieliebedryf. National Maize Conference, Nigel, August 1972. Amended calculations were made with the aid of a computer programme supplied by the Biometry Division, Department of Agricultural Technical Services.

TABLE 3[5] — Comparative profit margins of maize production over four periods, measured in absolute terms

Agro-economic region and periods	Gross farm income (G.F.I.)[a]	Total production Cost[b]	Net farm income (N.F.I.)	N.F.I. as a percentage of G.F.I.
	R/ha	R/ha	R/ha	%
B1: **Transvaal Highveld**				
1943/44 — 1947/48	19,45	17,03	2,42	2,4
1950/51 — 1954/55	37,52	31,51	6,11	16,2
1965/66 — 1969/70	74,15	57,58	16,57	22,3
1968/69 — 1972/73	79,80	60,30	19,50	24,4
B4: **Western Transvaal**				
1944/45 — 1948/49	14,00	11,99	2,01	14,3
1949/50 — 1953/54	30,03	23,53	6,50	21,6
1965/66 — 1969/70	60,05	40,22	19,83	33,0
1968/69 — 1972/73	68,40	47,03	21,37	31,24
B5: **North-Western Free State**				
1944/45 — 1948/49	14,64	11,52	3,12	21,3
1949/50 — 1953/54	28,32	20,74	7,58	26,8
1965/66 — 1969/70	57,22	41,10	16,12	28,2
1968/69 — 1972/73	66,12	46,62	19,50	29,5

(a) The farm income is the average income for the period.
(b) The production cost applies to the last year of the period and includes a calculated debt burden element.

Table 3 shows that the profit margin, measured in absolute terms, has increased in all three cases. Rising levels of yield have, therefore, more than compensated for rising production costs.

TABLE 4[6] — Composition of average maize production costs over four periods, measured in absolute terms

Agro-economic region and periods	Cash before-crop production cost		Total before-crop production cost		Total after-crop production cost		Total production cost[a]	
	R/ha	%	R/ha	%	R/ha	%	R/ha	%
B1: **Transvaal Highveld**								
1947/48	5,68	33,3	10,55	61,9	6,48	38,1	17,03	100,0
1954/55	13,60	43,2	21,78	69,1	9,73	30,9	31,51	100,0
1969/70	31,30	54,4	42,21	73,3	15,37	36,7	57,58	100,0
1972/73	35,80	59,4	45,82	76,0	14,48	24,0	60,30	100,0
B4: **Western Transvaal**								
1948/49	3,38	28,2	7,43	62,0	4,56	38,0	11,99	100,0
1953/54	8,82	37,5	14,91	63,4	8,62	36,6	23,53	100,0
1969/70	20,58	51,1	29,81	74,1	10,41	25,9	40,22	100,0
1972/73	25,24	53,7	35,74	76,0	11,29	24,0	47,03	100,0
B5: **North-Western Free State**								
1948/49	3,45	30,9	6,71	60,2	4,44	39,8	11,15	100,0
1953/54	8,05	38,8	13,11	63,2	7,63	36,8	20,74	100,0
1969/70	21,32	51,9	30,68	74,6	10,42	25,4	41,10	100,0
1972/73	26,43	56,7	36,93	79,2	9,69	20,8	46,62	100,0

(a) Includes a debt burden element.

5. Maize production cost surveys by the Division of Agricultural Production Economics.
6. *Ibid.*

(ii) *Composition of production costs* — A shift in the composition of production costs is an indication of the changed risk factor of production.

Table 4 shows that before-crop production costs and, in particular, cash before-crop production costs, as a percentage of the total production cost, have increased over the four periods. The producer's risk lies to a large extent in the possibility that the cash production expenditure, incurred before the crop is harvested will not be covered by the value of the crop.

2. CONCLUSION

The physical-biological indications that the westerly areas of the Highveld Region have a higher degree of risk for dryland crop production than the eastern areas is confirmed by economic analyses. This provides an indication for the insurer of which areas in the Highveld Region are not suitable for maize insurance. The risk factor in maize production in the so-called recognised good crop-farming districts lies in the changed composition of production costs rather than in smaller profit margins. This fact is an indication that the need for crop insurance coverage is increasing in these regions.