**PRESENTED BY -**

- **Agricultural Economics Association of South Africa**
- **Co-ordinating Committee of Control Boards**
- **Department of Agriculture and Fisheries**

# CSIR - Conference Centre

# Meiring Naude Road

# Pretoria

**JANUARY 13 AND 14, 1982**

AGRICULTURAL OUTLOOK CONFERENCE 1986

# AGROCON
# LANVOKON

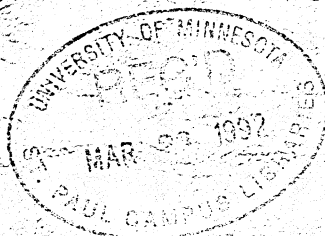LANDBOUVOORUITSKOUINGSKONFERENSIE 1986

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- Agricultural Economics Association of South Africa
- Co-ordinating Committee of Agricultural Marketing Boards
- Department of Agricultural Economics and Marketing
- Department of Agriculture and Water Supply
- National Marketing Council
- SA Agricultural Union

# CSIR CONFERENCE CENTRE
## Pretoria

10 AND 11 FEBRUARY 1986

AGROCON '82

MAIZE

1. INTRODUCTION

The Maize Board's paper delivered at AGROCON '81 emphasised the develop=
ment of the maize industry over the past 10 years as well as the factors
that would influence the future of the industry. In the nature of the
case the road ahead will not be without problems, and this paper will
therefore place greater stress on the future of the industry and we
shall look at a few of the problems already identified and also at
others that may arise in the future.

2. PRODUCTION

(1) Previous production

The production of white and yellow maize, the area planted and the
gross value of this production over the past 10 years are shown in
Table 1.

TABLE 1: PRODUCTION OF MAIZE, AREA PLANTED AND GROSS VALUE OF PRODUCTION
IN WHITE AREAS, 1971/72 TO 1980/81

| Marketing season | White maize | Yellow maize | Total | Area planted | Yield | Gross value of produc= tion |
|---|---|---|---|---|---|---|
| | kt | kt | kt | '000 ha | t/ha | R million |
| 1971/72 | 4 500 | 3 730 | 8 230 | 4 403 | 1,869 | 312 |
| 1972/73 | 4 940 | 4 163 | 9 103 | 4 578 | 1,988 | 345 |
| 1973/74 | 1 806 | 2 154 | 3 960 | 3 611 | 1,097 | 180 |
| 1974/75 | 5 555 | 5 055 | 10 610 | 4 463 | 2,377 | 531 |
| 1975/76 | 4 656 | 4 144 | 8 800 | 4 488 | 1,961 | 493 |
| 1976/77 | 3 573 | 3 551 | 7 124 | 4 548 | 1,566 | 463 |
| 1977/78 | 4 828 | 4 657 | 9 485 | 4 453 | 2,130 | 702 |
| 1978/79 | 4 721 | 5 180 | 9 901 | 4 499 | 2,201 | 837 |
| 1979/80 | 3 496 | 4 673 | 8 169 | 4 598 | 1,777 | 833 |
| 1980/81 | 4 017 | 6 657 | 10 674 | 4 618 | 2,311 | 1 308 |

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(2) Production in the 1981/82 season

During the current marketing season ending on 30 April 1982, maize
producers in South Africa broke all previous production records.
According to the final estimate of the maize crop made by the
Department of Agriculture and Fisheries in September 1981, the
maize crop on white-owned farms amounts to 13,965 million tons, but
indications are that it will exceed 14 million tons.  This crop was
produced on an area of 4,716 million hectares, which is only 2 % more
than in 1980/81 and represents an average yield level of nearly
3 t/ha.  The gross value of this crop amounts to more than R1 800
million.

This excellent maize crop may be attributed to the coincidental
occurrence of different factors, the most important of which is
probably the very favourable weather conditions which prevailed
throughout the production season.  Other factors such as improved
cultivation and fertilisation practices, the higher production
potential of new seed cultivars, etc., naturally also contributed
to this result.

(3) Production in the 1982/83 season

At the time of writing this paper in November 1981 it was of course
impossible to comment about the crop prospects for the 1982/83
season.  A better indication of the crop expectations on the basis
of weather conditions will be available at the conference, when a
more detailed discussion will be possible.

(4) Production potential over the medium and long term

The production potential of the maize industry is a subject about
which much has been said in the past.  As a result of the extensive
variations in the weather from year to year, large fluctuations are
also found in the crop sizes.  For this reason it is difficult to
make reliable forecasts about maize production over the long term
and even over the medium term.

For the purpose of this paper, maize production is divided into two main segments, namely on the one hand the production on White-owned farms and on the other hand the production in the Black states which, in the nature of the case, differs completely from the farmer. It is necessary, however, to look at both segments as the two segments are supplying a single local market with maize and maize products. The effect of an integrated domestic market for maize and maize products is that any increase in the maize produc= tion in the Black states will have a material influence on the marketing of the crop produced by Whites.

An expansion in production may take place in two ways, namely hori= zontally and vertically. According to all indications there has been little horizontal expansion in the production of maize on White-owned farms. It is true that there is at present a trend among Natal and Eastern Transvaal farmers to plant more maize, but naturally this expansion in area cannot continue without restriction.

So far as the situation in the Black states is concerned, i.e. the independent states such as Transkei, Bophuthatswana, Venda and Ciskei as well as the self-governing states such as Lebowa, Gazan= kulu, etc., the picture is quite different. Dr James Howard, former American agricultural attaché in South Africa, undertook an extensive study in 1980 to determine to what extent the Republic and the Black states would be able to expand maize production if the world were to experience a critical food shortage in the future[1]. Dr Howard's findings in connection with the Black states were illuminating and he estimated for instance that it would be possible to plant approximately 1,4 million hectares of maize in those states if the same degree of expertise and motivation could be developed as was currently found among White farmers. Together with the average area at present planted annually to maize on White-owned farms, it would mean that Southern Africa would be able to plant 6 million hectares to maize annually.

[1] South Africa's Potential for Expanding Corn Production, Dr James O. Howard, Pretoria, July 1980.

In regard to the possible vertical expansion of maize production, the situation is again much different among the White farmers as against the Black farmers. In the case of the White farmers, great progress has been made in recent years in connection with the development and implementation of new technologies. This process is continuing, and there is considerable difference of opinion about the degree of benefit that may arise from such developments in the future. In the United States there are already a number of experts who allege that maize production has reached a stage where the Law of Dimnishing Returns is beginning to apply. Although the average South African may not yet have reached quite the same level as the average farmer in the United States so far as the implemen= tation of new technologies is concerned, it should be borne in mind that there is a vast difference between production conditions in the respective countries. It can therefore be assumed that the average maize production of the next few decades on White-owned farms in the Republic will continue to increase, but whether the rate of increase in this period will continue is an open question. What is true, however, is that the higher the movement is on the yield curve, the higher become the annual fluctuations in production, with the result that it becomes increasingly difficult to make reliable estimates over the longer term.

An attempt has nevertheless been made to make a projection, according to a scientifically based method, of the average expected maize production on White-owned farms for the next decade until 1991/92. It has also been determined statistically that the actual crop, based on the historical data, may deviate by as much as 20 % from this average projection in one out of every six years. The following table shows the average expected maize production on White-owned farms, together with the maximum and minimum crops based on this deviation of 20 % above or below the average. (A brief expostion of the problems incountered and the method ultimately used is given in the Annexure.)

TABLE 2:   ESTIMATE OF PRODUCTION ON WHITE-OWNED FARMS, 1982/83 TO 1991/92

| Marketing season | Expected production | | |
|---|---|---|---|
| | Average | 20 % above | 20 % below |
| | .................... kt .................... | | |
| 1982/83 | 10 634 | 12 760 | 8 507 |
| 1983/84 | 10 992 | 13 190 | 8 794 |
| 1984/85 | 11 357 | 13 628 | 9 086 |
| 1985/86 | 11 727 | 14 072 | 9 382 |
| 1986/87 | 12 104 | 14 525 | 9 683 |
| 1987/88 | 12 487 | 14 984 | 9 990 |
| 1988/89 | 12 876 | 15 451 | 10 301 |
| 1989/90 | 13 271 | 15 925 | 10 617 |
| 1990/91 | 13 672 | 16 406 | 10 938 |
| 1991/92 | 14 079 | 16 895 | 11 263 |

Theoretically, the production potential in the Black states is very high.  The Black states are mostly situated in the eastern parts of South Africa where the rainfall generally is higher than in the west.  It has been estimated that 76 % of the total area in these states has a rainfall above 500 mm per annum.  Whereas about 27 % of South Africa's area is regarded as semi-desert regions, only 1 % of the area of the Black states falls in this category.  In this regard the statement was made by experts a few years ago that the average production potential in the Black states was 45 % higher than in the country as a whole.  Despite this larger potential production, the average maize production in 1970 in Bophuthatswana was only 300 kg/ha, 1,64 kg/ha in Lebowa and 64 kg/ha in Venda, compared with an average of 1,4 t/ha on White owned farms in 1970/71.  From this it will be clear that the opportunities for vertical expansion of maize production in the Black states is enormous.  Although considerable progress has been made in this connection in Bophuthatswana and Venda and to some extent also in Lebowa, much can still be doen to increase the yields.  According to Dr. Howard's estimate[2], the Black states are able, poten= tially, to produce 3,4 million tons of maize at an average yield rate of 2 t/ha and a 25 % expansion in the area planted to maize.

[2] Ibid.

3. CONSUMPTION

(1) Domestic

The domestic consumption of maize during the past 10 year is shown in Table 3.

TABLE 3: DOMESTIC CONSUMPTION OF MAIZE 1971/72 TO 1980/81

| Marketing season | Human con= sumption | Animal con= sumption | Industrial consumption | Seed | Losses | Total |
|---|---|---|---|---|---|---|
| | ..................... kt ............................ | | | | | |
| 1971/72 | 2 709 | 2 007 | 75 | 66 | 11 | 4 868 |
| 1972/73 | 2 746 | 2 308 | 80 | 66 | 6 | 5 206 |
| 1973/74 | 2 569 | 2 494 | 83 | 50 | 3 | 5 199 |
| 1974/75 | 2 879 | 2 739 | 91 | 52 | 15 | 5 776 |
| 1975/76 | 2 871 | 2 799 | 90 | 47 | 12 | 5 819 |
| 1976/77 | 2 906 | 2 793 | 92 | 50 | – | 5 841 |
| 1977/78 | 2 960 | 2 821 | 99 | 50 | 11 | 5 941 |
| 1978/79 | 3 027 | 2 640 | 103 | 55 | 15 | 5 840 |
| 1979/80 | 3 031 | 2 769 | 123 | 56 | 10 | 5 989 |
| 1980/81 | 2 794 | 2 829 | 133 | 68 | 7 | 5 831 |

The South African market for maize is unique in that a very great portion of the crop is used annually as human food. In most overseas countries, maize is used mainly as stock feed, while a limited amount is also processed industrially. The Black population groups in South Africa have a definite taste preference for white maize products and although the urbanisation of the Blacks is contributing to the fact that white maize is encountering strong competition especially from wheaten products, rice and other sources of energy in this group of consumers, this trend is not yet so strong in the rural districts.

The direct per-capita consumption will continue to decline in the future as the real income of Blacks increases and they can afford a diet with greater variation, but it may be expected that this changed eating pattern will bring about an increase in the demand for animal products such as milk, meat, eggs, etc., which in turn will cause the demand for maize as stock feed to increase. As maize

is an essential part of most balanced stock feeds, this market has a
great potential for the future.  The rate at which this market will
grow in the future will, however, be intimately related to the eco=
nomic growth of the Republic as a whole.

Relatively little maize is used at present for industrial purposes
in the Republic.  This market, however, presents the possibility of
large expansion, especially if projects such as the conversion of
maize into ethanol and the manufacture of high-fructose maize syrup
can be tackled.  In the United States the manufacture of sweeteners
from maize starch has already developed into an important industry
while more and more alcohol for admixing with motor fuel is also
manufactured.  In Brazil, alcohol from maize is already being used
on a very large scale as motor fuel, and it is contended that in 15
to 20 years' time the country will be completely independent of
imported fuel.

(2)  Overseas markets

The United States delivers about 80 % of the total world supply of
maize, whereas Russia is the largest single importer of feed grain.
The size of the grain crops in the respective countries therefore
plays a decisive role in the international grain trade.  The United
States' maize crop of the past season was the largest on record,
namely 205,7 million tons compared with 168,9 million tons in 1980.
Russia on the other hand had a poor grain crop for the third succes=
sive year which is placed at 175 million tons by the latest esti=
mates.  These factors together with Argentina's record maize crop,
most of which was sold to Russia, resulted in international maize
prices dropping in recent months to a level where the international
grain market is certainly not attractive.

As a result of the large maize crop in the United States and the
expected increase in the world's end-of-season stocks of almost all
grains, it is doubtful whether the international maize prices will
show much response in the short term.  In this framework the world-
wide recession currently experienced in practically all the develop=
ed countries will not really contribute much to relieve the situa=
tion.  Depending on crop expectations of grain crops in the northern
hemisphere which will only be planted in the period March to May

1982, it is doubtful whether international grain prices will show
appreciable changes before the end of the first quarter of 1982,
unless political disturbances and/or relevant events occur in the
meantime.  There will, however, be more clarity in regard to these
aspects at the time of Agrocon in January 1982.

4.  PRODUCER AND CONSUMER PRICES

Producer and consumer prices for maize in the past ten years are shown in
Table 4.

TABLE 4:  PRODUCER AND CONSUMER PRICES FOR MAIZE, 1972/73 TO 1981/82

| Marketing season | Gross producer price | | Net producer price | | Board's minimum selling price | |
|---|---|---|---|---|---|---|
| | White | Yellow | White | Yellow | White | Yellow |
| | ..............................R/t.............................. | | | | | |
| 1972/73 | 37,70 | 37,70 | 34,60 | 34,60 | 39,00 | 37,65 |
| 1973/74 | 45,50 | 45,50 | 45,50 | 45,50 | 43,50 | 43,50 |
| 1974/75 | 50,00 | 50,00 | 50,00 | 50,00 | 47,00 | 47,00 |
| 1975/76 | 56,00 | 56,00 | 56,00 | 56,00 | 50,00 | 50,00 |
| 1976/77 | 65,00 | 65,00 | 65,00 | 65,00 | 59,00 | 59,00 |
| 1977/78 | 74,00 | 74,00 | 73,60 | 73,60 | 71,50 | 71,50 |
| 1978/79 | 84,00 | 84,00 | 79,95 | 79,95 | 83,10 | 83,10 |
| 1979/80 | 102,15 | 102,00 | 100,15 | 100,00 | 102,15 | 102,00 |
| 1980/81 | 122,65 | 122,40 | 118,25 | 115,00 | 122,65 | 122,40 |
| 1981/82 | 134,15 | 134,00 | 118,25 | 115,00 | 134,15 | 134,00 |

5.  FUTURE OF THE INDUSTRY

From this analysis of the maize industry it will be clear that on the
production side it may be expected that crops will ever increase while
the domestic demand for maize will grow relatively slowly.  When the ex=
pected development of the Black states is read together with this, one
aspect emerges at once.  If the necessary facilities are to be provided
for efficient receipt, storage and distribution of the larger crops, the
necessary planning in that direction will have to start now.  Although
the Black states are not self-supporting at present so far as maize is
concerned, it is not impossible that some of them will have to contend
with surpluses in the future.  Naturally, these surpluses will further
test the facilities within the Republic's borders, and any planning un=
dertaken at this moment will be obliged to have a built-in factor for
this purpose.

In conclusion it should be pointed out that up to now the maize industry has made excellent progress. With the necessary vigilance so as not to lapse into a state of complacency, and with the same degree of determina= tion always present which prevailed in the industry in the past three decades, the maize industry should be able in future to solve these pro= blems. To achieve this goal, it will, however be necessary to co-operate and consuet in the future with all interested parties to an even greater extent than in the past on a micro as well as macro-level.

ANNEXURE

## METHOD USED FOR PROJECTION OF MAIZE PRODUCTION

The general method of making a projection of future expectations is to fit a regression line to the historical data and then project further ahead. As a rule, several regression lines are fitted to the data, and the accuracy of the fit is then measured statistically by calculating the standard error of esti= mate of each regression line. The regression line with the smallest error of estimate is then usually regarded as the best projection line and used to make the forward estimate.

Maize production in the Republic shows large fluctuations from one season to the other as illustrated in Table 1. These large deviations from one year to the next give rise to serious problems when projections of future expected production have to be made. It has been found that the standard error of es= timate is not a reliable norm in this case to indicate the regression line with the best fit because there is little difference between the errors of estimate for the different regression lines, and even more sophisticated statistical methods of indicating the best fit for the data were unsatisfac= tory. The following table shows how small the difference is between the errors of estimate of a few completely divergent regression lines –

| Regression line | Projection 1985/86 | Production of 1990/91 | Error of estimate | b coeffi= cient |
|---|---|---|---|---|
| | kt | kt | kt | |
| Exponential growth curve | 12 921 | 16 076 | 1 505,8 | 0,661 |
| Logistical curve | 12 567 | 15 258 | 1 503,9 | 0,686 |
| Parabola | 11 727 | 13 672 | 1 500,1 | 0,777 |
| 3rd power function | 12 214 | 14 853 | 1 499,5 | 0,746 |

With such a small difference between the errors of estimate of the respective regression lines, it is difficult to decide which of the regression lines will give the best projection. Moreover, the error of estimate only indicates which regression line will best fit the historical data without to some extent considering the direction of the projection.

It was therefore tried to develop a method that will not only take the fit of the regression line into consideration but also the direction in which the regression will move if it is projected forward. The last part of the