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DRY SEASONS IN THE EASTERN AND NORTH-EASTERN WHEATBELT

By G. H. BURVILL, Assistant Director of Agriculture

The drought of 1969 ended an 11-year run of good seasons in the eastern and north-eastern wheatbelt. Good years usually have above average rainfall; wheat yields and pasture growth are greatly reduced if rains are well below average. Eighty years records show that half the years must be expected to be below average and about one-third could be well below. This area produces one-third of the State’s wheat and has 9 per cent. of its sheep.

1969 will be remembered as a drought year in many of the State’s agricultural districts. Rainfall was well below average in the whole of the south-western part of the State from Carnarvon to Esperance, but the effects of the prolonged period of below normal rain in the winter and spring were most drastic in the cereal and sheep belt, particularly the eastern and south-eastern sections.

Annual rainfall at Southern Cross (bottom) and wheat yield averages for the Yilgarn Shire since 1927
Before the drought

For the eastern and northeastern wheatbelt the 1969 drought came after a run of 11 years which were generally favourable or very good for wheat growing. In this period annual rainfall was above average with few exceptions and the fact that in the previous 11 years (1947-1957) there had been seven years below average was almost forgotten as agricultural development in the State forged ahead. New land in the farming areas was being opened up at a rate approaching a million acres a year; the eastern and northeastern wheatbelt shared in this expansion which seemed irresistible despite the fact that it was occurring in the "marginal areas" of the 1930-1945 era.

The eastern and northeastern wheatbelt is so called because in relation to Perth it lies in those directions. For the purposes of this article it is defined as the Shires included by running from Koorda to Kellerberrin to Kondinin on the west and the eastward sweep from these centres to Southern Cross-Yilgarn Shire.

The average annual rainfall ranges from 11 inches on the northeastern and eastern fringes to 14 inches in the western and southern parts. In this area years with above average rains are usually favourable for wheat growing; any substantial deficiency, particularly in the growing season, reduces yields. This is particularly evident at the drier margins and is shown...
Graphs of five year moving averages of annual rainfall for Kellerberrin (top) and Southern Cross. The dotted lines show the long term averages.
by the graphs of rainfall and district wheat average for Southern Cross-Yilgarn Shire.

If we ignore the period 1931-1946 when depression, rabbits, grasshoppers, war and superphosphate shortage may have depressed yields, it is quite evident that above-average rainfall has favoured wheat growing and that below average has depressed the Yilgarn Shire average below 10 bushels per acre; in the 1947-57 period there were five years when the averages were between 4.0 and 6.1 bushels per acre.

It is not the purpose of this paper to strike a pessimistic note about farming prospects in the drier parts of the wheatbelt. Our success in farming low rainfall areas is well recognised. But farming must be geared to an expectation that dry years will occur. Over a long period half the years will have below average rainfall and about one-third will be well below. This means that in the eastern and north-eastern wheatbelt the major source of income—wheat—will have seasonal fluctuations in yield which new varieties and modern machinery are unlikely to eliminate. The drier seasons are also likely to be the less favourable ones for grazing, and wool—the other major farm product—will be reduced in quantity and quality in dry years.

The only available guide to dry seasons is the records of the past. It is fortunate that Kellerberrin and Southern Cross on the western and eastern margins of the area of these discussions have respectively 77 and 80 year records of rainfall. The 77-year average at Kellerberrin is 1,336 points; for 80 years at Southern Cross it is 1,088 points.

Table 1 shows how the above and below average seasons have occurred in these periods. It also shows the years below 12 inches at Kellerberrin and below 10 inches at Southern Cross.

The four 20-year periods for which records are now available show at both places, but especially at Southern Cross, that the first period was generally dry, the second much wetter, the third dry, and the most recent (1950-1969) a wet period. Overall at least one year in three has been well below average.

Table 1 suggests that there have been dry and wet cycles and this is confirmed by the graphs, which show a plot of five year moving averages of annual rainfall for Kellerberrin and Southern Cross. Five year moving averages are obtained by calculating the average rainfall for five years from the beginning of records then dropping the first year and taking in the sixth year and so on. A series of figures is obtained, each of which is the average of five successive years. For the graph each of these figures is plotted at the mid year of the five-year period.

From these graphs the above-average period before the 1969 drought is quite evident. At Southern Cross each of the 11 years 1958-1968 was above average except 1967 which was only 3 points below. The seven years 1915-1921 were also all

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**Table 1.**—Occurrence of dry years at Kellerberrin and Southern Cross

| Average Annual Rainfall: Kellerberrin 13.36 in. (77 years) Southern Cross 10.88 in. (80 years) |
|---|---|---|---|---|---|---|
| 20-year periods | Kellerberrin—Annual Rainfall | Southern Cross—Annual Rainfall |
| | Above Average | Below Average | Below 12 in. | Above Average | Below Average | Below 10 in. |
| 1893-1909 (17 years) | 5 | 12 | 9 | | | |
| 1889-1909 (excluding 1890) | | | | | | |
| 1910-1929 | 14 | 6 | 3 | 13 | 7 | 5 |
| 1930-1949 | 9 | 11 | 9 | 6 | 14 | 8 |
| 1950-1969 | 10 | 10 | 8 | 13 | 7 | 6 |
| Totals | 38 | 39 | 37 | 43 | | |
| | 77 | 29 | 80 | 31 | | |

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above average. By contrast 1894-1903 was a 10-year period with only 1900 above average (1,129 points—1900). The eight years 1935-1942 had only one wet year, 1939 (1,542 points).

The graphs of five-year moving averages for Kellerberrin and Southern Cross are remarkably similar. Graphs drawn for other centres such as Bencubbin, Wialki, Merredin, Kondinin and Hyden show generally similar form to those for Kellerberrin and Southern Cross. The records for these centres are for shorter periods and thus do not show the dry period at the end of last century. Their general similarity suggests that the same rainfall pattern has occurred over the whole of the eastern and northeastern wheatbelt. The two most pronounced wet cycles were 40 to 45 years apart; so were the two driest cycles. About 20 years has been the time from the start of a very wet period to a run of dry years.

It is interesting to note that the early 1870's are recorded as wet seasons and that 1872—43 years before 1915 was a flood year in the Swan-Avon River system.

The future

If long range forecasting is attempted from the data available and discussed above, it might be suggested that a sustained run of wet (and favourable) seasons will not occur before the early years of the next century; a sustained run of dry seasons might occur around 1980. Where we now have 40 to 80 years records of rainfall to produce an estimate of the long term average it is certain that at least half the years ahead will have below this average rainfall and about one-third will be substantially deficient.

Until rain in mid-September of 1969 brought some relief, the drought of 1969 was comparable to those of 1914 and 1940.

What may we expect in 1970? 1915 was a very wet year, with heavy rains in January and February as well as during the winter; 1941 had favourable growing period rains but annual totals were below average.