FARMING IN SUB-HUMID AREAS.

(Concluded.)

A Study of Agricultural and Climatic Conditions on the Lower Nambucca River, mid-North Coast, New South Wales.

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(c) Butter Production.

Since the greatest source of farm income in the Macksville—Utungan district is dairy farming with its subsidiary activities—pig and cattle raising—a detailed investigation of butter production has been undertaken; the relationship between seasonal production and rainfall has also been studied.

Average butterfat production per cow in the district during recent years has been about 110 lbs. Average annual butter production per acre on twenty eight farms during the last four years has been 27 lbs. Average production per acre was distributed between the farms as follows:—

Table VI.

Average Butter Production per acre on Twenty-eight Farms.

Production per acre.	No. of Farms.	Production per acre.	No. of Farms.
lbs.		lbs.	
0– 9.9	2	50–59.9	1
10–19.9	8	60–69.9	2
20–29.9	4	70–79.9	...
30–39.9	5	80–89.9	1
40–49.9	5		

Very few farms average more than 50 lbs. of butter per acre, while the modal average is about 19 lbs. per acre.

Table VII classifies the twenty-eight farms in the district for average annual butter production and average annual income from butter. Almost half the total number of farms produce on the average between 3,500 and 6,500 lbs. of butter per year. Only one farm produces less than 1,000 lbs. and only three more than 9,500 lbs. The modal type of farm produces on the average 5,000 lbs.

TABLE VII.

Average Annual Butter Production and Income from Butter on Twenty-eight Farms (1943-46).

Butter Production.	No. of Farms.	Income from Butter.	No. of Farms.
Pounds.		£	
500– 1,499	1	50–149	1
1,500– 2,499	3	150–249	5
2,500– 3,499	2	250–349	3
3,500– 4,499	4	350–449	10
4,500– 5,499	5	450–549	2
5,500– 6,499	4	550–649	2
6,500– 7,499	2	650–749	2
7,500– 8,499	2	750–849	1
8,500– 9,499	2	850–949	2
9,500–10,499	1		
10,500–11,499	1		
11,500–12,499	1		

The most characteristic income (*i.e.*, the modal income) from butter on twenty-eight farms in the district is about £390. Only one farm receives on the average less than £100 per annum from the sale of butter, while two receive on an average between £850 and £950 per annum. More than half the farmers receive between £250 and £550 per annum from butter.

Figures from twenty-four dairy farms within the area indicate that the average number of cows milked in summer and winter and the average lactation period are as follows.—

TABLE VIII.

Cows Milked and Average Lactation Period of Herds on Twenty-four Farms.

Cows Milked in Summer Months.	No. of Farms.	Cows Milked in Winter Months.	No. of Farms.	Average Lactation Period.	No. of Farms.
No.	Per cent.	No.	Per cent.	Months.	Per cent.
Less than 30 ...	20	Less than 10	35	Less than 8 ...	20
30–50	60	10–20... ...	50	8– 9	70
50–70	20	20–30... ...	15	9–10	10

Rainfall and Butter Production.

Monthly butter production on twenty-five farms within the questionnaire district has been examined in detail over the four seasons 1942-43, 1943-44, 1944-45 and 1945-46.

Fifty per cent. of these farms were found to have exceeded a monthly production of 1,000 lbs. during the flush period of one or more of the four years; 60 per cent. reached at least 800 lbs. in some months, and only two failed in any month of the four seasons to reach 500 lbs.

Total monthly production of the twenty-five farms has been graphed in relation to the monthly rainfall during this four-year period. (See accompanying chart.) It will be seen that the total yearly production of the twenty-five farms varies considerably.

TABLE IX.

Yearly Butter Production.

(Twenty-five Farms.)

Season.	Butter Production.	Season.	Butter Production.
	lbs.		lbs.
1942–43	136,487	1944–45	122,761
1943–44	151,678	1945–46	153,846

It is reasonable to assume that rainfall has been one of the main determinants of the amount of butter produced during the last four seasons (1942-1946).

Based on statements from experienced farmers within the area, the length of dry spell which would be sufficient to reduce production by a significant amount is as follows:—

TABLE X.

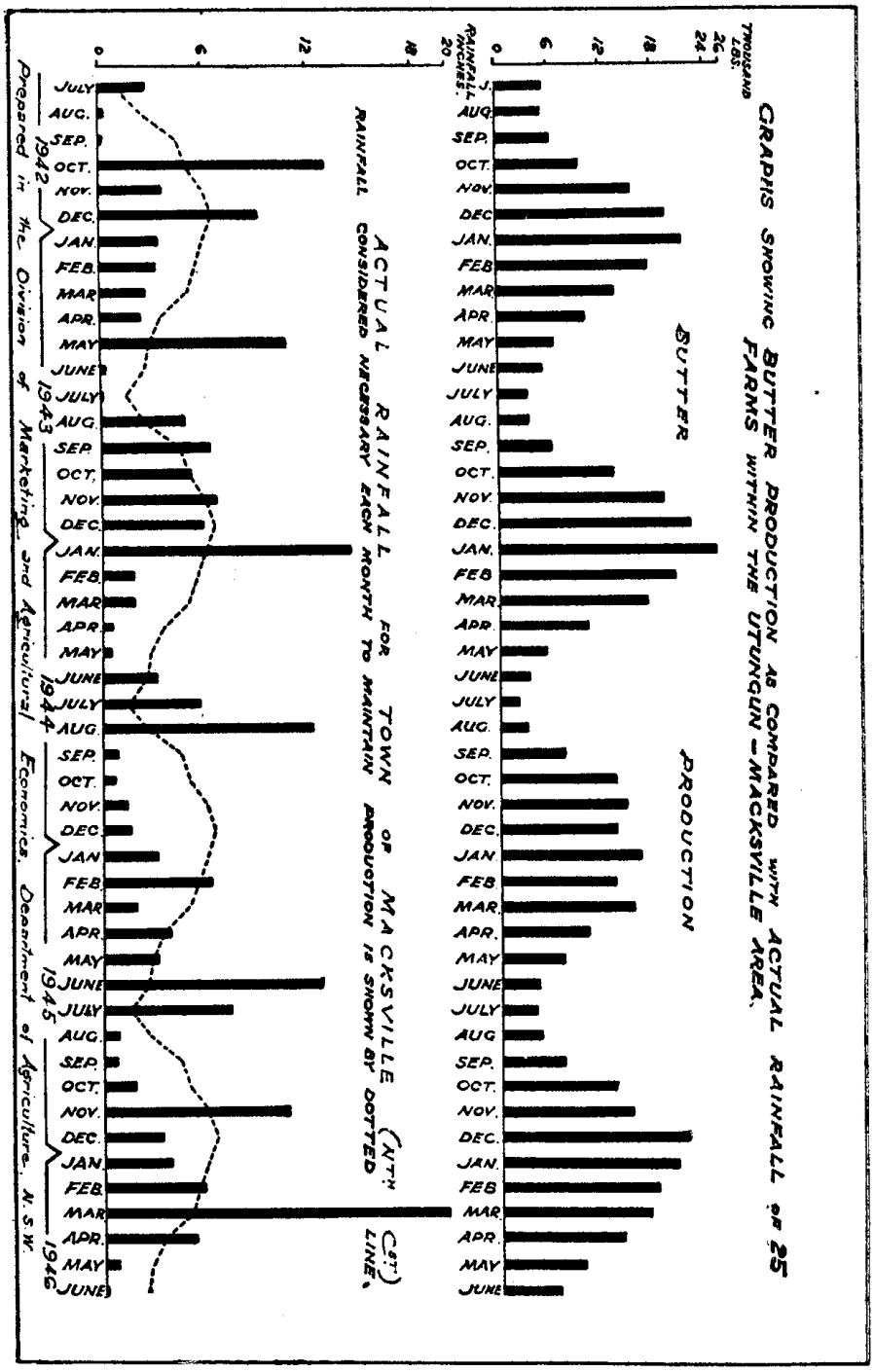
Length of Critical Dry Spell in the Macksville-Utungun District.

Spring:	4–5 weeks.	Autumn:	5–6 weeks.
Summer:	3–4 weeks.	Winter:	6–7 weeks.

Keeping these figures in mind, an examination of data plotted on the accompanying chart seems to emphasise the following correlations:—

(i) *For the* 1942-43 *season.*—Rainfall in June (3 inches) and July was well above the required amount; accordingly winter production this year was comparatively high. Following low rainfall in August and September, however, the October production was lower than in any of the other three years, but a marked recovery during the early summer corresponded with good rains in October and December. The low total production (136,000 lbs.) is largely attributable to the fairly rapid falling-off of production in the late summer. This corresponds with inadequate rainfall in the four months, January to April.

[*See Graph illustration overleaf.*


GRAPHS SHOWING BUTTER PRODUCTION AS COMPARED WITH ACTUAL RAINFALL OF 25 FARMS WITHIN THE UTUNQUN - MACKSVILLE AREA.
BUTTER PRODUCTION
THOUSANDS LBS.
RAINFALL INCHES.
0 6 12 18 20 24
J. AUG. SEP. OCT. NOV. DEC JAN. FEB MAR APR MAY JUNE JULY AUG. SEP. OCT. NOV. DEC. JAN. FEB MAR. APR. MAY JUNE JULY AUG. SEP. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG SEP. OCT. NOV. DEC. JAN. FEB MAR. APR. MAY JUNE
ACTUAL RAINFALL FOR TOWN OF MACKSVILLE (WITH CST) LINE.
RAINFALL CONSIDERED NECESSARY EACH MONTH TO MAINTAIN PRODUCTION IS SHOWN BY DOTTED
0 6 12 18
JULY AUG. SEP. OCT. NOV. DEC. JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEP. OCT. NOV. DEC JAN FEB MAR APR. MAY JUNE JULY AUG. SEP. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE
1942 1943 1944 1945 1946
Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture, N. S. W.

(ii) *For the* 1943-44 *season.*—This was a year of high production (152,000 lbs.) with a non-interrupted record rise in the spring and early summer. High production shows a noticeable correlation with very favourable rain during the same period. However, late summer and early winter rains were below the necessary amount, a fact which is reflected in the rapid drop in production from March onwards (compare 1945-46).

(iii) *For the* 1944-45 *season.*—In 1944-45 after good winter rains production rose well in September and October; from August to February, however, rainfall was inadequate. Production during this period was very erratic; it did not develop the usual summer peak and was reflected in a low total production (122,000 lbs). March production exceeded February (compare other years), and then continued at a fairly high level into the autumn. Again rainfall seems to have been the chief cause, having been adequate in February, April and May.

(iv) *For the* 1945-46 *season.*—This was the record production year of the four. While production in September and October was not unlike that of the previous year, the comparatively dry spring seems to have been reflected in a somewhat below-average November production. Production recovered swiftly, however, following exceptionally good rains in November. December and January, on the other hand, were fairly dry months (rain below the needed amount), and production failed to reach the heights it had touched in 1943-44 following the good rains of that year in October, November, December and January. On the other hand, above-average falls in February, March and April, 1946, held production at record levels in the late summer and early autumn months; in this respect 1946 was in contrast with 1944, when dry conditions in late summer and autumn had brought about a rapid falling-off in butter production.

Assuming the average price of butter to be 1s. 7d. per pound, the value of the four years' production was as follows:—

TABLE XI.

Value of Butter Production.

(Questionnaire District.)

Year.	Value.	Year.	Value.
	£		£
1942–43	10,804	1944–45	9,718
1943–44	12,057	1945–46	12,179

The difference in the value of production in the two years 1944-45 (a "good" year) and 1945-46 (a "bad" year) was thus £2,460, or £98 per farm.

Table XII groups the high and low production months of the two best producing years 1943-44 and 1945-46, and in so doing also groups fairly consistently periods of adequate and inadequate monthly rainfall.

TABLE XII.

Grouping of High- and Low-Production Months of the Seasons 1943-44 and 1945-46.

	1943–44.	1945–46.	12 months' production.
			lbs.
High production months ...	Oct.–Feb. ...	July–Sept. and March–June.	166,329
Low production months ...	July–Sept. and March–June.	Oct.–Feb. ...	139,195

If rainfall conditions were adequate in every month of the year, or in other words, if sufficient pasture and fodder growth could be maintained throughout the district, then 166,000 pounds of butter could perhaps be taken as the maximum possible production of the twenty-five farms under the present system of farming.

Maximum possible production, however, under existing conditions is hardly more than a theoretical consideration. On the other hand, if average production could be maintained, for instance, at the 1945-46 level, it would represent a substantial increase in output throughout the district. On this basis it has been estimated that for the four years each of the twenty-five farms on an average would have increased its income by no less than £158, or by about £40 per farm per annum.

Under existing conditions there is considerable variation in the yearly income from butter production, and this would appear to be chiefly a reflection of the effects of variable rainfall on pasture and fodder growth. Dry summer conditions tended to reduce production in the 1945-46 season somewhat, although a more favourable distribution of rain in that season brought about an average per farm increase of £98 from butter over the 1944-45 season. Rain was distributed in such a way during 1945-46 as to maintain pastures, and hence herd production, at a level not greatly below the maximum for the district under existing conditions.

Reliability of rain for the Macksville-Utungun district is at its lowest from July to January. It is thus to be expected that in a majority of years the natural spring and summer pastures will be checked because of dry conditions. Statistics have strikingly demonstrated that not only is a dry spell quickly reflected in decreased butter production, but a considerable lag in recovery is to be expected if the dry spell is at all prolonged.

It is significant that during periods of drought the proportion of second-quality butter received from the area tends to increase; more important, the problem of second quality tends to be limited to farms in the more easterly parts of the district, where permanent fresh-water streams are absent, and conservation of stock water is limited to dams or wells. The condition of the water in

dams on such farms is most unsatisfactory during periods of drought. On one farm, second-quality butter during 1944 amounted to 25 per cent. of production and represented a loss to the farmer of over £20. This farm would be representative of approximately ten farms which have completely unsatisfactory stock water in dry periods.

The total number of pigs in the area increased by approximately 150 between 31st March, 1945, and 31st March, 1946. This may have been a reflection of greater milk production. On one farm income from pigs during 1945 (£189) was double that of 1944. That particular farmer considered the difference to be due entirely to shortage of feed on the farm in 1944.

The Problem of Permanent Water Supplies.

Because of tidal influence on Taylor's Arm, irrigation in the questionnaire district is only possible from the main stream above Utungun. Irrigated land in the past has not exceeded 8 acres and has been limited to about six farms; experience with irrigation throughout the district is thus almost negligible.

Only about 20 per cent. of farmers in the area have a completely satisfactory stock water supply. It is difficult to estimate what this disadvantage means to farmers in terms of income, although second-grade cream, lowered production, cost of carting water, and the more ready transmission of disease can be attributed to inadequate water supplies. There are limited opportunities for further conservation of water by means of dams; but in drought periods such supplies are very unsatisfactory for dairy stock.

About 50 per cent, of farmers in the district consider they have an inadequate domestic water supply. Tank water is the general rule, well water being too highly mineralised for domestic use. Well water is also unsatisfactory for use in the dairy because of its highly-corrosive effects on metal equipment.

The district would therefore obviously benefit from the introduction of a permanent irrigation scheme. Irrigation would not only assist in stabilising butter production throughout the district and hence farm incomes; it would also mean an assured water supply for domestic and agricultural purposes.

Conclusions.

Irrigation of sub-humid areas is a new field in Australia, and little or no information is to be had as to its effect on production.* It is impossible to say, for instance, what precise effects three acre-feet of irrigation water per farm per annum would have on production in the Macksville-Utungun district. From a short-term angle its advantages would be considerable; the recent prolonged dry spell from April to September, 1946, led to an almost complete crop failure throughout the district; in addition, stock did severe damage to improved pastures. There is no doubt that irrigation at such a time would have been an immense boon

* For recent investigations in the U.S., see article by A. Joss, "Benefits from Irrigation under Sub-Humid Conditions," Journal of Farm Economics, V. XXVIII, No. 2, May, 1946, pp. 543-559.

to dairy farmers. The long-term effect of sub-humid irrigation, however, is harder to measure. Probably it would lead to an increase over present levels of crop and livestock production, but it is difficult to say by how much. For regions not unlike Macksville-Utungun, United States investigators have suggested that irrigation would probably result in a 12 to 33 per cent. increase in the production of clover hay.

Speaking generally then in the case of Macksville-Utungun, irrigation would probably have the following effects on land-use and production:—

(*a*) It is not likely that there would be any large-scale immediate change in land-use. Only four farmers for instance would look upon an irrigation scheme as a means of converting their enterprise entirely to vegetable production. The majority sees it is a scheme primarily intended to irrigate pasture and fodder crops.

(*b*) It does not follow, however, for sub-humid areas that irrigation would lead to a substantial increase in the production of fodder crops and pastures. The purpose of sub-humid irrigation is to stabilise existing activities rather than to conjure up new production where formerly there has been little or nothing. In the case of Macksville-Utungun, dairying is the chief activity, with cream the main product. Irrigation would tend to create added production in so far as it could eliminate the depressing effect of drought on cream output; naturally it would achieve this by maintaining adequate supplies of fodder and pasture on the irrigated area of each farm.

It is not improbable that three acre-feet of water per farm per annum used on pastures and fodder crops might increase annual output even above the high level of 1945-46, in which year below-average spring rains were experienced. However, the greatest gain to farmers would be forthcoming in seasons like 1942-43 and 1944-45, when rainfall over the greater part of the year was insufficient to maintain maximum pasture growth. Having in mind the incidence of good and bad seasons, it is probable that three acre-feet of irrigation water per annum per farm might mean at least £20 to £30 more to the great majority of farmers in the district. Moreover, since no season seems to escape some period of dry spell during the normal lactation period, it is likely that irrigation of pastures and fodder crops would quickly become an annual practice.

New South Wales has had little or no experience of sub-humid irrigation up-to-date, although recent developments in the Hunter Valley and rather longer experience in the Sydney rural-urban fringe mark the beginnings of large scale coastal irrigation in this State. It has already been realised, however, that coastal irrigation schemes—particularly where they depend upon pipe rather than channel systems of reticulation—will be likely to involve high capital costs in relation to the probable returns from increased

production. This will be particularly true in the case of dairy-grazing, and less true where irrigation has brought about entirely new and hitherto impossible forms of land-use, such as vegetable production on former grazing land. Assuming continued predominance of dairying, however, increased production potentialities arising from an assured water supply would to some extent be offset by higher costs. While the farmer's gross income would undoubtedly rise, so would his expenses. His greatest benefit from irrigation in the coastal belt would undoubtedly be stabilisation rather than substantially higher net returns.

It must not be overlooked, however, that irrigation schemes in the coastal dairy belt may have—probably would have—long-range developmental significance. Long-range benefits to the district in particular and the dairy belt in general are not necessarily reflected in the existing capacity of dairy farmers to meet unaided the full cost of irrigation schemes; nor are they reflected in estimates of probable short-term increases in production. Irrigation may well bring about a substantial change in land-use in the direction of more intensive farming. Any raising of the production potential would probably stimulate a reorganisation of existing farm units and the adoption of better farming practices. At the same time, rising gross income would be partly absorbed by increased labour costs arising from the additional labour needed in the district.

In a word, these advantages would be developmental. State-sponsored irrigation in the sub-humid coastal belt would undoubtedly be capable not only of going a long way towards stabilising dairy production at a substantially higher level, but also of raising the settlement potential of the belt well above its present level of equilibrium.