AGRICULTURAL FRONTIERS IN AUSTRALIA.

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Australia is the driest of all the continents and only a small proportion of its total area receives an average annual rainfall exceeding twenty inches. According to Winterbottom* the areal distribution of the various rainfall zones is as follows:—

Area of Rainfall Zones in Australia.

Average Annual Rainfall.	Area in Square Miles.	Percentage of Total Area of Australia.
Inches.		
0—10	1,105,452	37%
10—20	942,494	32%
20—30	523,000	18%
30—40	197,033	7%
40 or more	180,388	6%
	2,948,367	100%

Area receiving *Less* than 15 inches per annum 1,697,911 square miles or 58%.
Area receiving *Less* than 20 inches per annum 2,047,946 square miles or 63%.
Area receiving *Less* than 30 inches per annum 2,570,946 square miles or 87%.

The shape and latitudinal position of the continent in the Southern Hemisphere has determined not only its extreme aridity but also its characteristic climatic pattern. Isohyets (lines of equal rainfall) run roughly parallel with the coastline except in the extreme west, and rainfall zones resemble a series of roughly concentric circles, particularly in the eastern half of the continent. The wettest region (thirty inches or more) is found along the northern, eastern and south-eastern coastlines, with a minor recurrence in south-western Australia. It resembles a narrow band with an average width of about 250 miles, and is rather wider in the northern half (tropical areas) than in the south (temperate latitudes). Beyond the well-watered coastal fringe the rainfall rapidly drops off. At any point in the interior more than 400 miles from the coast the average annual rainfall is always less than fifteen inches; in the mid-southern and north-western parts of the continent the arid core breaks through to the coastline, and the shores of the Australian desert are washed by both the Southern and Indian Oceans. As tundra and ice-cap are typical of Northern Canada, so hot desert is typical of most of Australia. In both cases agricultural boundaries have been laid down by climate, and type of farming patterns reflect the general arrangement of isohyets and, to a less extent, isotherms.

* See "Water; Australia's Problem," by D. C. Winterbottom, Australian Geographer, Vol. 5, No. 1, pps. 20-28.

Pastoralism a Predominant Activity.

Only a very small area of Australia is suitable for agriculture. The colonies first rose to prominence on account of their suitability for sheep-raising—a pastoral activity which found optimum conditions on the grass-covered, almost flat plains of the hinterland. In the early years of the Australian wool industry the well-watered coastal fringe formed the grazing nucleus from which flocks gradually spread with the progress of exploration to the more suitable areas west of the coastal highlands. Climatic conditions for sheep-ranching are peculiarly elastic in Australia, where rainfall is both erratic and unreliable. The limits to successful grazing ebb and flow with the seasons; successive good years favour flock multiplication and a movement outwards towards the arid centre. However, drought invariably follows during which stock mortality is high; desert conditions expand coastward and drastic reduction in the safe pastoral area is inevitable. A century of experience with drought cycles has gradually established the limits of the pastoral belt. In normal seasons it includes the south-eastern part of South Australia, all of Victoria and New South Wales, with the exception of the north-western corner, and most of Central Queensland. Sheep cease to be dominant in the vicinity of the Tropic of Capricorn and beef cattle replace them as the chief livestock unit of tropical Australia. There pastoralism has remained the only permanent primary utilisation. The grazing areas extend in a narrow belt from North Queensland through the Territory to the Kimberleys of Western Australia. They re-emerge in Swanland—the isolated well-watered south-western extremity of Western Australia, and sheep are predominant in that region. From the area standpoint, pastoralism is thus the predominant activity in the continent. It alone has extended beyond the fifteen inch isohyets into the arid interior. About forty per cent. of the continent is suitable for permanent grazing in one form or another.

Agriculture was much later on the scene as a force in Australia's economic development. For the first fifty years economic activity, with the exception of wool, was chiefly a subsistent activity, and even inter-colonial trade was unimportant. South Australia led the way in establishing a stable and thriving agriculture in the Gulf region—an agriculture which was to expand north beyond Goyder's climatic boundary until driven back by drought and the recurrence of the arid cycle. It was the first of many lessons Australian agriculture had to learn. Much later the ill-fated experiments in the Mallee of the three south-east States were to drive home, it is hoped once and for all, the significance of climatic barriers for Australian agriculture. When allowance is made for land unsuited topographically or pedologically for cropping only about ten per cent. of the continent is really suitable for crop farming. In 1938-39 about 1.2 per cent. of the area of the continent was under crop.

The Settlement Belt.

Present day crop and livestock belts in Australia closely reflect the broad patterns of rainfall and temperature. Irrigation has introduced an exoticism in the south-eastern hinterland, allowing intensive agricultural uses in otherwise inadequately watered areas. But such exceptions are geographically small, if economically important. In the main, the arable areas are confined to what is known as the east-south-eastern settlement belt—a crescent-shaped region beginning on the Atherton Plateau in North Queensland and sweeping south in a gradually widening belt through New South Wales and on to the west coast of the Gulf regions of South Australia. Swanland, beyond the Great Australian Bight and the Nullabor Desert, is an isolated fragment of the main settlement belt of the continent.

The belt—flanked on one side by desert and on the other by ocean—is for all economic intents, Australia. At its broadest it is less than 450 miles, and at each end, tapering off crescent fashion, but a few miles. In the north it is swallowed up by the tropical savannah laterites of north-central Queensland and, in the south, by the limestone desert of South Australia. Longitudinally, it extends for about 2,500 miles; from the cane-fields of the Queensland sugar coast to the cool potato lands of southern Victoria. It is served laterally by the Australian railway network which gathers in a diversity of farm products for distribution at a few centrally-placed coastal ports. The agriculture of the continent is confined entirely to the belt; the entire Australian population lives within its boundaries.

Australian agriculture is a product of the commercial era and farming as a business is its essential characteristic. Peasant economy and subsistent conditions have never thrived. As with America, production for the market has been the driving force in the advance to the frontier.

Although the pastoral regions of Australia spill well beyond the agricultural frontier, optimum conditions for all kinds of livestock are found on the humid side of the twenty-inch isohyet. The best wool, beef and mutton are grown within 300 miles of the coast. The chief livestock and crop belts of the States thus overlap and there is competition by the various activities for the limited areas available. Market and price are the ultimate arbiters. It must be remembered also that dissecting the settlement belt are the chief mountains of the continent. Topography has thus further diminished an agricultural area already reduced to a fragment by climate.

Diagram Map of Crop and Livestock Associations.

In the diagram map attached, seven crop and livestock associations have been set down. Further sub-divisions readily suggested themselves, but clarity in mapping forbade too much detail. Overlapping of belts and mixed enterprises, however, would seem to demand a more detailed classification, particularly in the relationship between crops and livestock. Mixed farms are becoming very numerous in the less specialised belts of the Highlands and

Slopes. Similarly, in the zones of intensive farming around the larger cities, farms themselves are not only mixed, but types of farming are highly diversified. It is impossible, however, to represent a land-use microcosm on the scale presented. Reality will not be sacrificed if the groups are regarded as general rather than species.

Dairying, intensive horticulture, and fodder crops compete for the humid coastal fringe of east and south-east Australia and a similar association is found in Swanlands. In sub-tropical and tropical latitudes, sugar-cane replaces dairying as the most important activity on the coast. Australia's tropical agriculture has been built almost exclusively around sugar-cane. With the exception of bananas and pineapples there has been little development of tropical plantation crops in Northern Australia. Climate and economics have worked against the expansion of coffee, cotton, tea, tobacco, and rubber. Moreover, only limited areas along the Queensland coast are amenable to tropical agriculture and on these sugar has remained predominant. Climate has given an unequivocal denial to such crops anywhere in the tropical hinterland.

Dairying is of considerable importance along the Queensland coast and at selected districts on the adjacent plateau; it reaches its greatest extent and output, however, in the south-eastern corner of the State, extending into the coastal valleys of northern New South Wales. The coastal belt of New South Wales is a great dairying region. In Victoria the richest dairy pastures of the Commonwealth are found along the south coast from Gippsland to Portland in Australia Felix. South Australia has a small dairy belt, chiefly confined to the Adelaide plains and in Swanlands a limited area of thirty-inch rainfall country is favourable for intensive grazing. Apart from beef cattle—the expected subsidiary of an intensively developed dairy belt—pigs are the chief livestock side-line on coastal farms. The chief non-irrigated citrus orchards of Australia are located in the coastal belt. Since all the chief ports, the capitals and industrial cities have a coastal location, the zones of most intensive agriculture, including such activities as vegetable farming, market gardening, poultry farming and orcharding are found in the best rainfall zone of the continent. The chief fodder crops of the coastal dairy belt are maize in the tropical and sub-tropical latitudes and oats and lucerne in the cooler winter rainfall areas of the south.

In those parts of the undulating plateau which lend themselves to agriculture, many kinds of crops are raised. Climatically, the eastern highlands of Australia are regarded as safe, but climatic reliability is not the only consideration in an elevated region where soils and slopes are frequently unfavourable for crop farming. Wheat farming in its early stages was widely spread on the plateau following its migration from the central coastal fringe. In South Australia, wheat is still the chief crop of the hilly Mount Lofty counties and the southern Flinders Upland, but in the south-east it has long since moved on to the drier slopes further west. With a rainfall varying from seventeen to thirty inches, it has found there optimum conditions of soil and

climate. The plateau has remained an important grazing belt, steep slopes and well-watered natural pastures making excellent grazing lands. The Atherton Tableland, the Darling Downs, New England, Monaro and the Grampians have become the centres of stud-stock raising. Tableland wool is still the finest of the Australian clip.

But for irrigation, land-use could never have been intensified on the drier side of the coastal Highlands. However, conservation schemes in the Murray Valley and its southern tributaries, the Murrumbidgee, and to a less extent the Lachlan, during the last thirty years have extended the agricultural frontier well into the dry belt. Deciduous, citrus and vine fruits and vegetable farming have been greatly developed. An "inland dairy belt" has begun to show signs of appearing on the irrigated pastures of the Upper Murray and the Murrumbidgee Valleys, and there are other signs of further agricultural development. Provision of adequate irrigation water is the *sine qua non*.

Wheat, the Cardinal Crop.

Wheat, however, is Australia's cardinal crop. It alone has carried agriculture out to the arid frontier and established the boundary of permanent non-irrigated cropping in this continent. Beyond the wheat belt are the sparse grazing steppe lands of the arid fringe. In 1939, wheat accounted for 60 per cent. of the area cropped in Australia. In no other country of comparable standards was there a single crop of such importance in the agricultural regimen.

The wheat belt is a fairly continuous feature of the agricultural landscape. It begins in the Downs district of south-eastern Queensland where rainfall, although influenced by tropical conditions, is still suitable in most areas for early maturing wheats. In New South Wales the belt lies on the western slopes of the plateau and the eastern margins of the Darling Plains. Summer rainfall conditions give place to a uniform or winter maximum in the centre of the State, and in the south-west and Riverina the belt reaches its greatest width (150 miles).

In Victoria it continues on the southern side of the Murray Valley, broadening out in the west into the Wimmera and Mallee districts, the chief producing regions of Victoria. The northern Mallee and its extension into South Australia have proved marginal for wheat and the agricultural frontier receded during the 1930's. In South Australia the Counties of Newcastle, Granville and Herbert mark the northern boundaries of the wheat belt. The Gulf Counties of Yorke and Eyre's Peninsula extend it to the south and west. On Eyre's Peninsula, the belt's most westerly extension, its boundary is roughly the fifteen-inch isohyet.

Wheat reappears in Western Australia, the producing districts lying along the eastern side of the Darling Ranges in the south-east and merging into the desert. Like South Australia, Swanlands has a definite winter rainfall maximum with hot, dry summers.

In Australia, the wheat belt is not only part of the sheep belt but also the hay belt. Although oats are grown for fodder in the cooler portions of the coastal fringe and on the plateau, the largest portion of the hay crop comes from the drier wheat belt across the mountains. In Australia there is nothing comparable with the cool, moist hay-dairy belt of the American Lake States or New England. Natural pasture sparsely supplemented by ensilage is the basis of the Australian coastal dairying industry.

THE N.S.W. FARM MECHANISATION SCHEME.
ITS HISTORY AND FUTURE POSSIBILITIES.

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The New South Wales Government's Farm Mechanisation Scheme or, as it was originally called, the Food Production Scheme, was officially openel at Nowra an June 15th, 1943, and since that date it has expanded rapidly so that now there are over 70 societies throughout the State operating mechanised units.

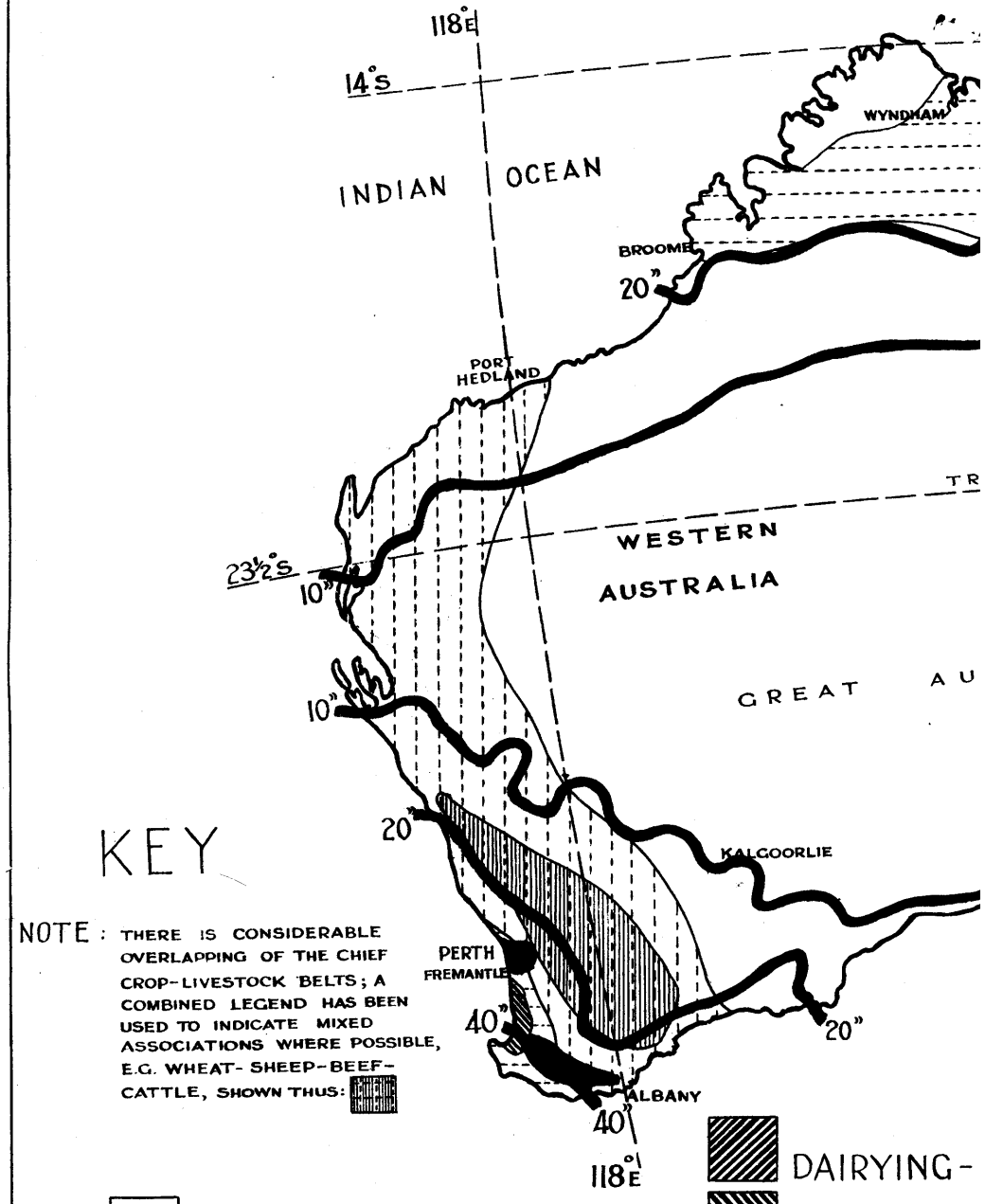
Despite this expansion, however, and notwithstanding the undoubted success with which the Scheme has achieved its original objective of increased fodder production and conservation, it is doubtful whether it will become, as was originally hoped, a permanent feature of the State's agriculture. In any case it appears that some changes are desirable if the Scheme is to function successfully in the future, and reference will be made to these in the following pages.

With the end of the war, the attitude of many persons responsible for the management of societies operating the Scheme has shown a significant change; much of their enthusiasm has waned, and already several dairy societies have withdrawn or notified their intention of withdrawing from the Scheme in the near future—it is expected others will follow.

Because it is considered that co-operative mechanisation on lines similar to, but not identical with, those of the present Scheme can be of great benefit to Australian agriculture and the dairying industry in particular, it is important that the present Scheme be reviewed and its weaknesses be examined before it fails altogether, so that out of it can be built a new and more satisfactory scheme which will not require the stimulus of a war emergency to make it function and which will reduce the possibility of heavy financial losses on the part of the Government to a minimum.

With this end in view, the history of the present Scheme will be outlined in the following pages, the difficulties which have confronted it will be examined and, finally, some suggestions will be offered as to how it can best be adapted to meet the future needs of farm mechanisation in this State.

THE CHIEF CROP - LIVE



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IEF CROP - LIVESTOCK BELTS

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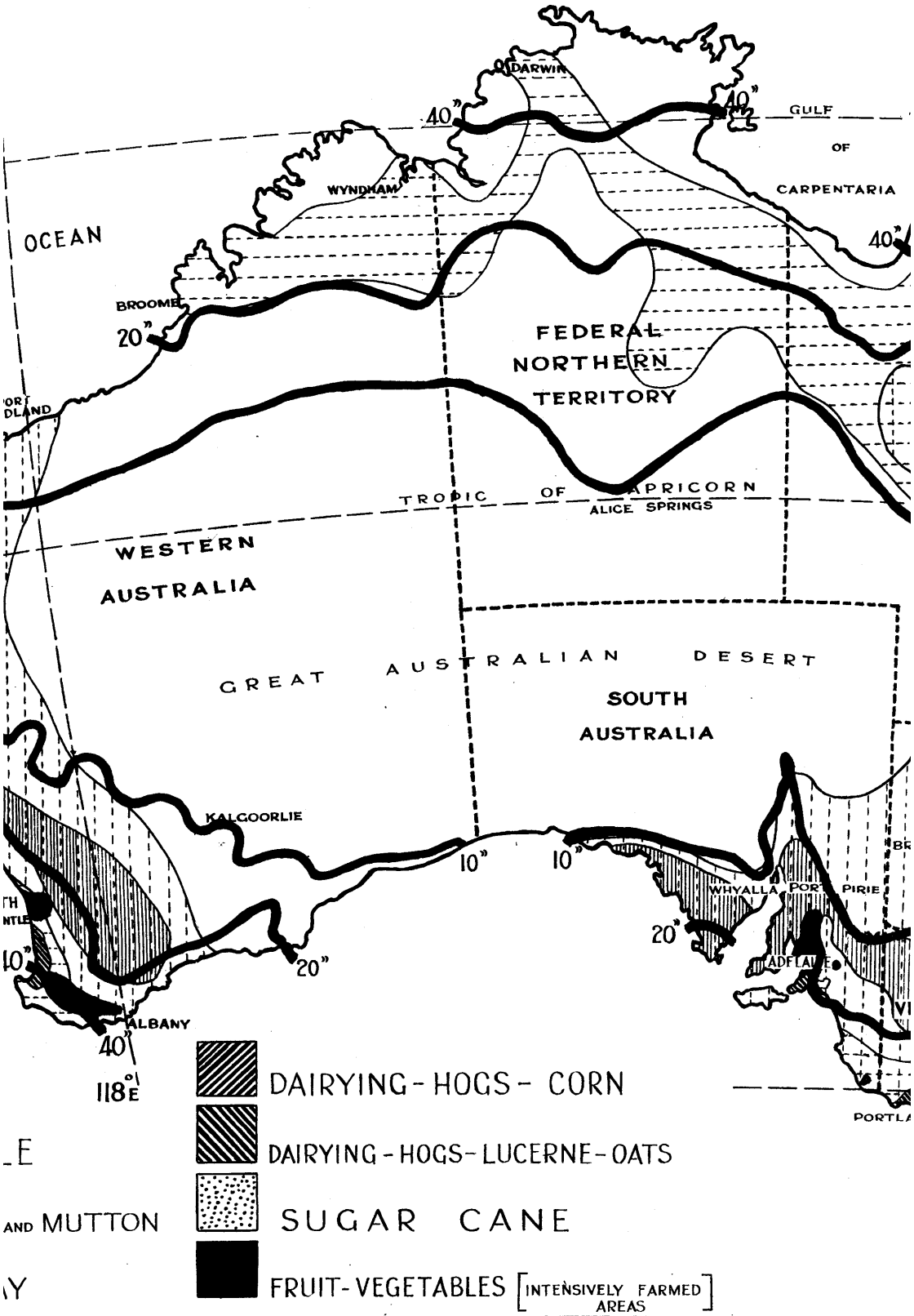

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