kann man eindeutig, auch ohne vorherige Kenntnis des Gebietes oder hier der geologischen Karte von ROTHPLETZ (1917), die typische Eiszerfall-Landschaft ansprechen. Die verschiedenen Glazialablagerungen, wie Kamesterrassen, Oser, Kames, Drumlins und Moränen, lassen sich im allgemeinen ausgezeichnet unterscheiden. Beim Studium der Toteisformen ermöglicht die Photointerpretation in diesem Beispiel eine Genauigkeit, die mit Geländearbeit wohl kaum erreicht werden kann. Die photogeologische Analyse solcher Landschaften erlaubt, da nicht die Gesteine, sondern die Oberflächenformen maßgebend sind, eine direkte Bestimmung aus dem Luftbild. Es ist hier nicht notwendig, erst einen photogeologischen Schlüssel, der dann im Gelände kontrolliert und den lithologischen oder stratigraphischen Einheiten zugeordnet wird, aufzustellen.

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NEW ZEALAND AGRICULTURE: THE NEW FRONTIER

With 10 figures

By W. B. JOHNSTON

Zusammenfassung: Neuseelands Landwirtschaft – die neue Vorstoßfront.

Die Prozesse, die zur Ausdehnung der landwirtschaftlichen Nutzfläche geführt hatten, gehören zu den „klassischen" Themen der historischen Geographie Neuseelands. Erst kürzlich ist man sich jedoch dessen bewußt geworden, daß in den vergangenen dreißig Jahren die landwirtschaftliche Nutzfläche nur wenig vergrößert wurde. Trotzdem erfolgte eine erhebliche Zunahme der landwirtschaftlichen Erzeugung. Dieser Aufsatz behandelt einige der wesentlichen Veränderungen der Agrarproduktion seit 1930 für Neuseeland im ganzen. Besonders betont werden die Auswirkungen interner technischer Veränderungen und die Folgen der geänderten Außenhandelsbeziehungen auf die Produktion. Diese Veränderungen machen einen Teil der neuen Vorstoßfront der neuseeländischen Landwirtschaft aus und lenken ihrerseits die Aufmerksamkeit auf Gesichtspunkte, denen bisher zu wenig Beachtung geschenkt wurde. Zu diesen gehören zahlreiche sozial-ökonomische Aspekte der Landwirtschaftsstruktur, zum Beispiel Farmgrößen, Landzersplitterung, Besitzstruktur sowie Wanderungsbewegungen von landwirtschaftlichen Arbeitern und Farmern.

New Zealand is about as new as anything one can get in the "New World" in the sense that sustained European occupance extends not much over one century. The three main islands — North (44,000 square miles), South (58,000 square miles) and Stewart (700 square miles) — and minor islands cover a total area of just under 104,000 square miles. The population reached two and a half millions (including over 175,000 Maoris) in 1963; 68 per cent live in the North Island and 32 per cent in the South Island. The average annual rate of increase between the censuses of 1956 and 1961 was 2.1 per cent and natural increase is very high. For a decade now, the excess of births over deaths has been at least 17 per 1,000 population.

Much of the efforts of New Zealanders over the century of settlement has been expended on occupying and developing the land for farms. This has at times required considerable ingenuity in order to capitalise on certain favourable conditions in the natural environment and to extend the frontiers of settlement[1]). It is proposed in this paper to examine some of the more important elements of change that are now operating and which constitute the "new frontier" in New Zealand's agriculture. For this purpose New Zealand is considered as a whole, in the sense of an economic unit within the world scene. The concern is, therefore, not with the differential changes that are occurring in the various regions of New Zealand but rather with the sum of these changes.

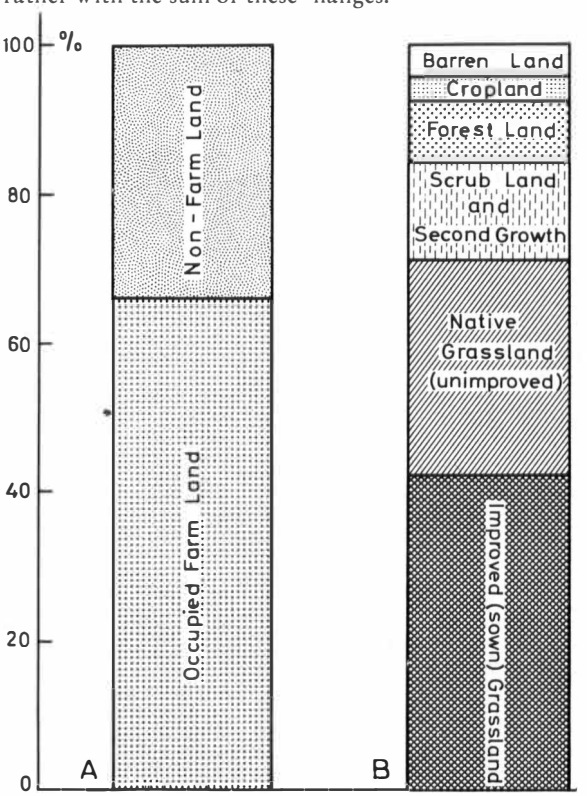

Fig. 1: Land Use in New Zealand 1960.
A Farmland as percentage of land; B Use of occupied farm land as percentage of total occupied farm land (Source: New Zealand Official Yearbook = NZ Yearbook).

[1]) U. SCHWEINFURTH: Stewart Island (Neuseeland): Entwicklungsversuche am Rande der Ökumene in anderthalb Jahrhunderten, Die Erde, Vol. 93, 1962, pp. 279—306.

In Figure 1, the left hand bar shows that about 65 per cent of New Zealand is occupied farmland: in the right hand bar this occupied land is proportionally divided according to the area of dominant farmland uses. As can be seen, the great bulk of the occupied farmland is grassland, either relatively unimproved — native tussock (bunch grass) generally of *Poa, Festuca* and *Danthonia* species — or improved — sown, generally exotic grasses and clovers. Cropland in terms of field crops of cereals or of fodder crops such as turnips, occupies only three per cent of the farmland. The outstanding land use element is therefore pasture. The major crop in New Zealand is grass.

Extension of The Frontier of Occupation

In many ways the story of the extension of the frontier of occupation is summarised in Figure 2. During the 1840's and 1850's agriculture was essentially subsistence farming but by the end of the 1860's, the tussock grasslands of the South Island in particular had been occupied to the very margins of the snow and ice of the alpine high country, and this is represented by the gap between the lines for total occupied farmland and total cultivated land. In succeeding years much of the tussock plains of the South Island was turned over by the plough for wheat and sown pasture. Wheat and wool became basic farm exports. In the North Island dense podocarp — mixed hardwood forest, low soil fertility of open country and hostile Maori tribes confined development to more or less independent, subsistence, coastal colonies of small populations.

The successful innovation of refrigerated ocean transport in the 1880's opened New Zealand to the stimulus of a large market demand from Britain for butter and meat in particular. The stimulus of the new market hastened the transformation of the forest lands of the North Island into exotic pastures and, in the South Island, energized a mixed farming economy in which the fattening of lambs became a vital sector [2]). The consequences can be seen in Figure 2; firstly by the continued increase in occupied farmland, secondly and especially by the striking growth of cultivated land in which the outstanding element is sown pasture. This was the era of the "bush-burn" technique for replacing indigenous forest by exotic pasture grasses and clovers [3]).

The occupation of farmland continued steadily through to about 1920 but by this time it is clear that the frontier of occupation had reached its overall limit, indeed had overstepped the margin as evidenced by the decline in occupied farmland during the late 1920's and 1930's. It was during the half century after 1880 that the major components of the present farming economies of New Zealand were crystallized, tried, tested and proven highly successful.

Since 1930 there has been no significant change in the total area of occupied farmland and only a slight

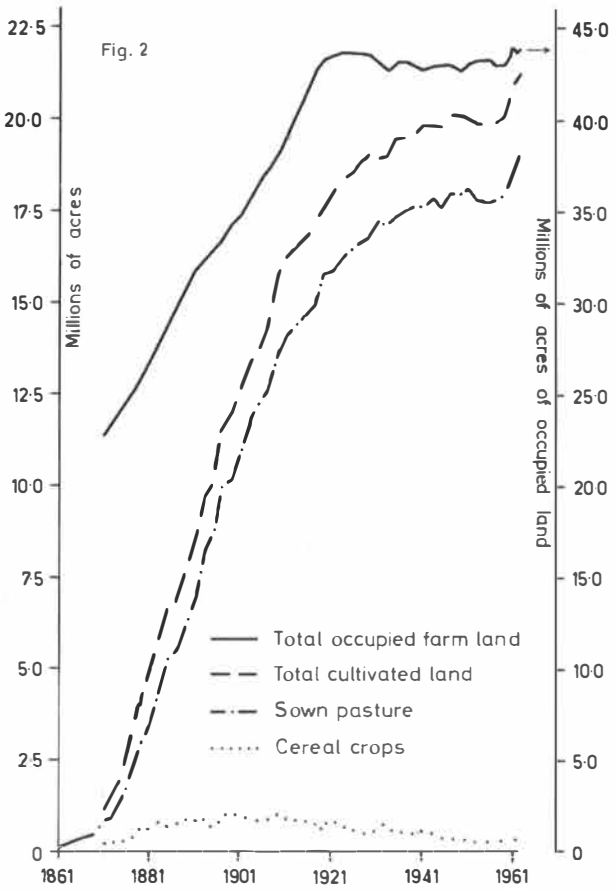

Fig. 2: Land Use in New Zealand 1861–1962.
The right hand scale relates only to the solid line (Source: Agricultural and Pastoral Statistics of New Zealand 1861–1954 = Appendix to Report on the Farm Production Statistics of New Zealand for the Season 1954–55; Report on the Farm Production Statistics of New Zealand (annual) = Rep. on Farm Prod.).

increase in cultivated land. In other words, land available under the present techniques of farm management, was virtually all taken up by 1930. Up to this time the outstanding results of new markets and techniques were the opening of new areas to occupation and the extension of farmland. The processes by which the land was occupied are classic and relatively well-cultivated fields for geographical research in New Zealand [4]).

It is apparent therefore, that the last 30 years have seen New Zealand farmers concentrating their efforts on the already occupied area. In one sense the last three decades represent the entry of New Zealand into the stage of agricultural maturity. It is the analysis of changes during the last three decades that will now hold our attention and we will continue to consider New Zealand as a unit.

[2]) E. Sellenberg: Die Entwicklung der Viehwirtschaft in Neuseeland, Erdkunde, Vol. 14, 1960, pp. 115—134. The bibliography includes the important items to date of publication.

[3]) W. B. Johnston: Pioneering the Bushland of Lowland Taranaki, N. Z. Geographer, Vol. 17, 1961, pp. 1—18.

[4]) See for instance Land and Livelihood: Geographical Essays in Honour of George Jobberns, edited by M. McCaskill, N. Z. Geographical Society Miscell. Series No. 4, Christchurch, 1962.

Farm Production and Productivity

If we consider the period 1929—1962, the left-hand graph of Figure 3 shows that the volume of farm production has increased by 100 per cent and at a faster rate since 1945. As we have already shown, occupied farmland has not increased in area, and therefore, the production growth has occurred by means other than the extension of the farming frontier.

The right-hand graph of Figure 3 shows the relative movements for the three major farm economies and these are considered briefly in turn. Agricultural production essentially covers cereal and other cash crops and we have shown that this sector is of limited areal importance. There are two levels in this graph: prewar and a higher postwar one, linked by a rise in volume of production during the war years. Dairy production — poultry and bees are included in this group but are relatively of minor significance — shows a postwar recovery in volume but a tendency towards a slowing down of production increase over the last decade. Pastoral production is essentially sheep and beef cattle and it is in this sector that the volume of production has shown spectacular increases especially over the last decade.

The volume of production increase within a stable occupied farm area is not regularly distributed among the three major farm economies. Figure 4 places the last three decades in long term perspective. The significant increases in the volume of pastoral production are clearly associated with sharp rises in cattle and sheep numbers. The absolute growth of the sheep population, particularly during the last decade, is very large. In fact there are now something like 20 sheep for every person in New Zealand. However, the growth of sheep numbers should not obscure the increase in beef cattle which is largely the difference between the diverging graphs for cattle and dairy cows in Figure 4 and which is a reflection not only of the greater recognition of their role in pasture management but also of the overseas market demand and revenue value.

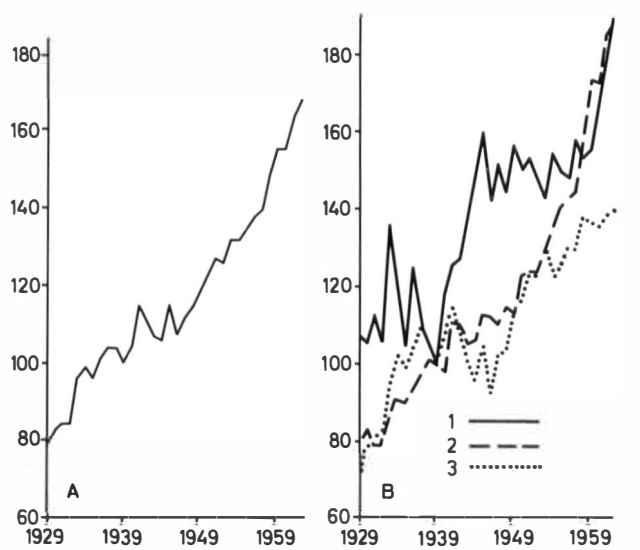

Fig. 3: Volume of Farm Production in New Zealand 1929–1962.

A Total Volume of Farm Production; B Volume of Farm Production by Major Groups: 1 Agricultural production; 2 Pastoral; 3 Dairying, Poultry and Bees.
(Source: NZ Yearbook; Base of index numbers 1939 = 100)

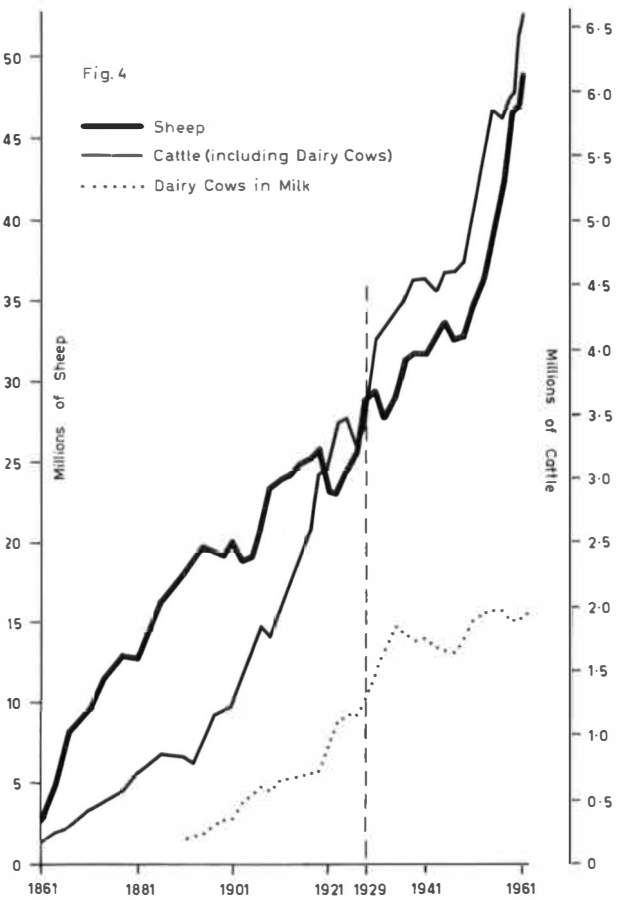

Fig. 4: Livestock Numbers in New Zealand 1861–1962
(Source: vide Fig. 2)

An outstanding element in Figure 4 is the relative stability in the number of dairy cows in milk throughout almost all of the last 30 years. The earlier spectacular rise in dairy cows, associated with the clearing of forest land, was not continued long after the definite close of that era.

The growth in livestock numbers on a stable occupied farm area might be explained in terms of a robber economy, of mining the soil. This hypothesis is however not supported by productivity figures as plotted in Figure 5 in which the annual data is smoothed into five year running averages. Over the last 30 years, butterfat production per cow in milk has increased by over 20 per cent: wheat yields have risen by 50 per cent. These figures indicate that experiments with new strains and their introductions into farm management routines have been successful, and that the land is in good heart. Soil fertility has continued to improve and pasture production is at a high level.

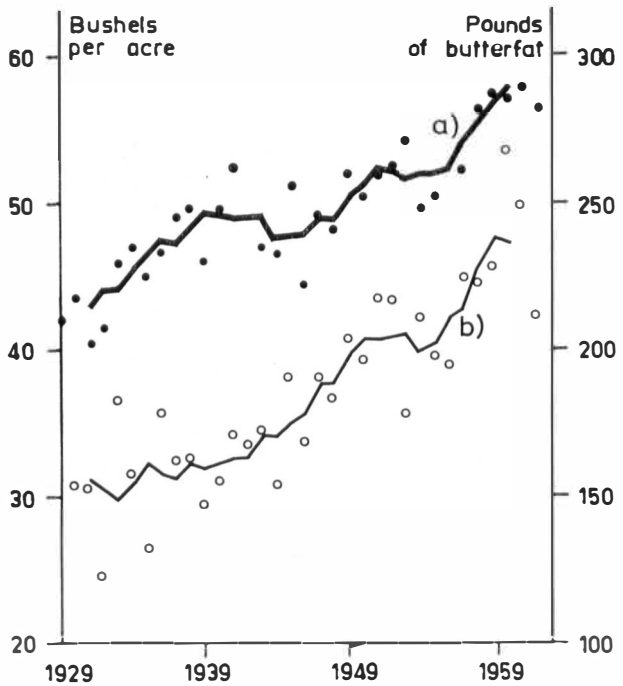

Fig. 5: Butterfat Production per Cow (a) and Wheat Yield per Acre (b) in New Zealand 1929–1962.
The solid lines are five year running averages (Source: Rep. on Farm Prod.; NZ Yearbook).

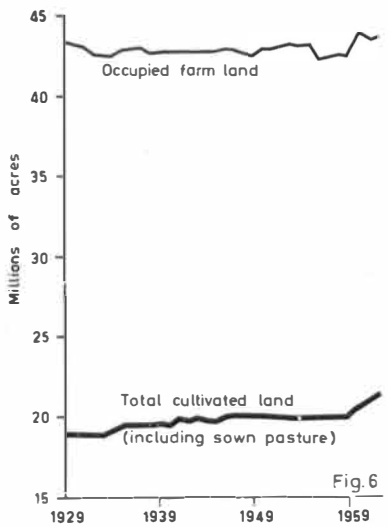

Fig. 6: Occupied Farmland and Total Cultivated Land in New Zealand 1929–1962 (Source: Rep. on Farm Prod.).

At this stage it is worth recalling that these production and productivity increases have not primarily occurred through the extension of the farming frontier (Figure 6). The total area occupied by farms has remained very steady at around 43 million acres. The total cultivated area has also been fairly steady at about 20 million acres; the slight increase over the last two decades reflects the Government's policy of land development, of both Crown and underdeveloped private land, for the settlement on farms of ex-servicemen in the first instance and later of civilians. From the inception of the scheme in 1941, to 1962, some 1,500,000 acres have been redeveloped and disposed of to new farmers. Thus the increases in overall volume of production, in livestock numbers and in production per unit have come primarily by means other than that of breaking in new land for farming.

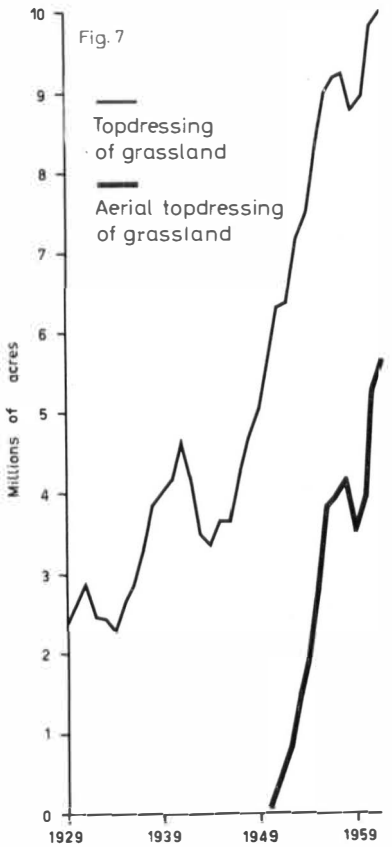

Fig. 7: Topdressing of Grassland in New Zealand 1929–1962 (Source: Rep. on Farm Prod.)

The New Frontier

The intensification of farming which accounts for the rises in production during the last three decades, is the essence of the new frontier in rural New Zealand and it contains many interesting elements of change. One significant item is the expansion of the annual area of grassland that is topdressed with fertilisers to some ten million acres (Figure 7). The introduction in 1949 and subsequent development of aerial topdressing form a critical factor in the rejuvenation of hill and high country which includes some of New Zealand's major problem areas. It is estimated that by the end of 1962 a total of some 10 million flights had spread a total of over four million tons of superphosphate on a total area of 40 million acres. Associated with this technique is aerial seeding with improved

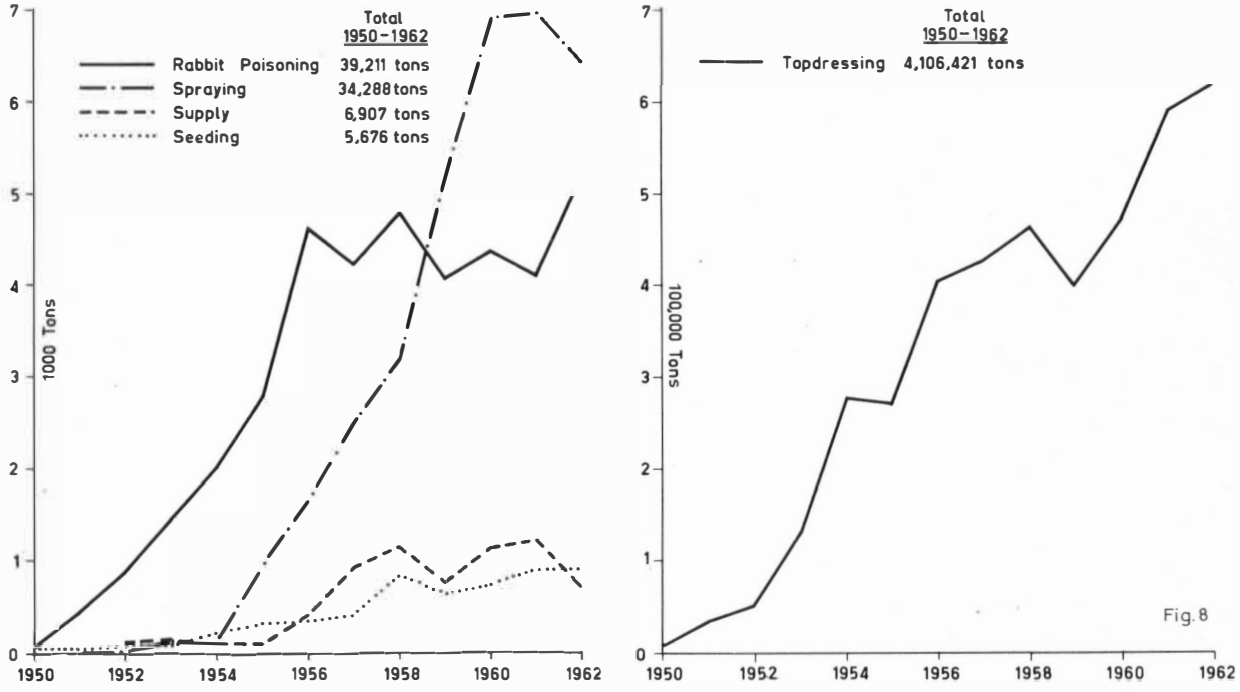

Fig. 8: Aerial Farming in New Zealand 1950–1962
(Source: Rep. on Farm Prod.; Report of the Soil Conservation and Rivers Control Council for the year ended 31 March 1962)

grasses and clovers to give pastures of higher yield and, in addition, thousands of tons of lime have been sown, poisons spread, weedicides and pesticides sprayed, and fencing and other materials dropped from the air (Figure 8). The cumulative product is pastures of higher yield and greater control of scrub and weed infestation by grazing. It is estimated that the equivalent of some 10 million man-days of work have supplemented normal farm labour[5]. Aerial farming has been a major contributor to the 50 per cent increase in sheep and cattle numbers since 1948.

The mechanisation of farming operations has released land for alternative, productive uses because of the decline in feed crops for horses as their number rapidly decreased. Mechanisation has also released available labour for other aspects of farm management and permits greater efficiency in the use of labour. Similarly the use of machines has offset the movement of labour to the urban areas. The most striking feature is the growth in the number of agricultural tractors (Figure 9). Initially the replacement of horse power by the wheel tractor led to a withdrawal of the limit of cultivation because of the lesser degree of slope that this type of tractor can handle. More recently however, the introduction of the caterpillar tractor has permitted the boundary to move back up the slope.

The application of manpower, as of horse power, has declined. Strictly comparable figures for farm employment are available since 1950 (Figure 9) but data collected on a different basis for previous years supports the contention that employment in farming has fallen steadily through the last three decades. The latest figures sustain the downward trend. In 1963 and out of a total employed population of over 900,000, those employed in farming numbered only 127,000 equalling less than 14 per cent of the employed population: manufacturing employed double that number.

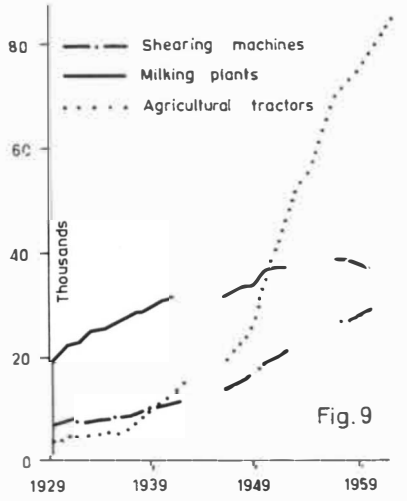

Fig. 9: Employment and Use of Machines in Farming in New Zealand 1929–1962 (Source: Rep. on Farm Prod.; The Monthly Abstract of Statistics)

[5]) Report of the Soil Conservation and Rivers Control Council for the year ended 31 March 1962, Appendix to the Journals of the House of Representatives of New Zealand Session 1962, Vol. 2, D. 1 A, p. 13.

The impact of internal technological changes during the last thirty years constitutes part of the new frontier which has produced increasing production within the occupied area, a greater concentration on land that can be worked by tractors, and a very recent improvement in the steeper country through the advent of aerial farming. There has been increasing development of already dominant grassland farming with sharp growth in sheep and cattle populations, and greater yields per unit of pasture, field crops and butterfat. New strains of grasses and clovers and improved stud stock have gone hand in hand with the greater concentration on a narrow range of pastoral items and a high degree of specialisation within farm economies. The modern trend of farming away from being a traditional art to an up-to-date science is also apparent in the rapid increase of knowledge about New Zealand soils and a new approach to land use. Up until 1930 the use of land depended very largely on the art of judging its capabilities from external characteristics and local knowledge. Although this method was widely successful, there were disastrous failures in some parts of the country where pastures could not be maintained and farms were abandoned or neglected [6]). Nowadays land use is guided very often by the capabilities of the soil type as revealed by careful investigations and tests. The reliability of these forecasts has stimulated the conversion of large areas of difficult land into good farms and has helped to reach a higher level of efficiency in land use. This advance has a close association with the extension of soil conservation and river control programmes in which, among other things, the capacity of badly eroded high country to respond to conservation treatment has been amply shown [7]).

The high efficiency of the New Zealand farmer and the high productivity per man in the 1930's were given international recognition by COLIN CLARK who has more recently stated:

"New Zealand has by far the most productive rural economy in the world. When these comparisons were first made, in respect of the period about 1934—35, New Zealand had a substantial lead over the rest of the world; she has now greatly increased it [8])."

This position has occurred within a framework of clearly-defined, mature, farm economies, the development of which has created a very great deal of vested interest in the present systems and places important barriers to fundamental changes.

There is however another element of change and it lies in developing external relationships: in other words, the market situation introduced at the end of the nineteenth century is giving way to a new situation. The two most important factors are firstly, the evolution of the Common Market and the relationship of the United Kingdom to it, and secondly, the changing postwar significance of the geographical location of New Zealand and the drive to export to Asia and to North America. The importance of the external relationships can be seen in Figure 10. It is apparent that the agricultural farm group is insignificant; that gross farming income is essentially composed of dairying and pastoral products, and that 60 to 80 per cent of the farm income of these groups comes from the sale of products — meat, wool, butter and cheese in particular — on overseas markets. There are two other facts of high significance: the first is that over 90 per cent of the total value of all exports of all kinds from New Zealand is derived from wool, meat and dairy produce; the second is that external trade (imports and exports) is fundamental to the New Zealand economy and forms 50 per cent of the gross national product. The total external trade per head of population in 1961 was £st 250 for New Zealand: in comparison, for West Germany the figure was £st 156, for the United Kingdom and for Australia the figure was £st 150 [9]).

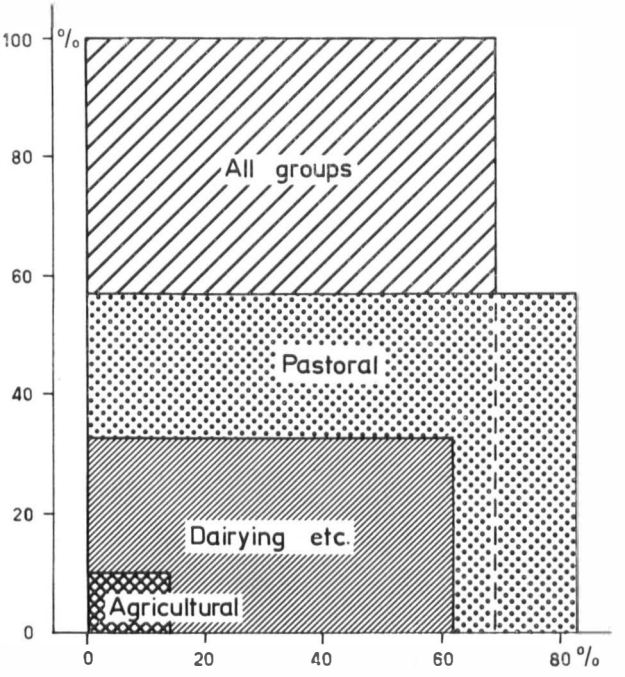

Fig. 10: Gross Farming Income of New Zealand by Farm Groups and from Exports 1952–1962. Vertically: Percentage of National gross farming income; horizontally: Exports as percentage of gross farming income of each group (Source: NZ Yearbook)

Conclusion: It is now time to make a few summary comments. The first is that within the foreseeable future New Zealand must continue to place prime emphasis on her farm economies because of their role in the national economy and as earners of overseas revenue upon which New Zealand's secondary industries depend for the importation of raw materials or

[6]) K. B. CUMBERLAND: Soil Erosion in New Zealand, Christchurch, 1944.

[7]) See for instance various papers in: Transactions of Joint Meeting of Commissions IV and V, International Society of Soil Science held at Palmerston North, New Zealand, Nov., 1962; Wellington, 1963.

[8]) C. CLARK: The Conditions of Economic Progress, First Edition London, 1940. The quotation is from the Third Edition, 1960, p. 275.

[9]) *New Zealand Official Yearbook 1963,* Wellington, 1963, p. 642.

partly processed products. Secondly, greater recognition and encouragement must be given to the intensification of farming activities principally through the greater application of knowledge to land which yields the maximum return on investment of finance, energy and skills. And thirdly and in the interests of greater efficiency and productivity, attention needs to be directed to some neglected aspects of the new frontier and these include many socio-economic aspects of the agrarian geography, for example fragmentation of farmland, land tenure, movements of farm workers and farm owners, size of farms.

The new frontier requires clearer recognition by a people now so dominantly urban in numbers, if not in economy, that the political factor looms increasingly large. During the last decade the New Zealand economy has had an average annual rise in total output of between three and four per cent, a rate that is no worse than in a number of other advanced countries. However New Zealand's labour force has grown comparatively rapidly at nearly two per cent a year and this has accounted for over half the overall annual growth. Productivity, defined as the output per head of labour force, has been at one of the slowest, annual rates of growth among all the advanced countries of the world [10]). Recent governmental measures to stimulate investment in farming are only a slight public recognition of the need to increase the rate of farm output in the interests of faster economic growth [11]). The direction of this stimulus must be in those farm products for which the external market situation is most favourable for expansion and in which New Zealand farmers have the greatest comparative advantage — pastoral products from grassland farming.

[10]) Economic Survey 1963, Appendix to the Journals of the House of Representatives of New Zealand Session 1963, Vol. 1, B. 5.

[11]) Report on the Economic Position of the Farming Industry, Appendix to the Journals of the House of Representatives of New Zealand, Session 1963, Vol. 1, B. 4. This Report notes that between 1957—58 and 1961—62 net farming income declined despite production and productivity increases and while the income of other sections of the community generally continued to rise.

LITERATURBERICHTE

THE DIVISION OF GERMANY — BASED ON HISTORICAL GEOGRAPHY?

A reply to N. J. G. Pounds': Divided Germany and Berlin [1])

Peter Schöller

The partition of Germany and the situation of Berlin its divided capital is a major problem of world politics which, owing to its weight in the global discussion of the Power Blocs, has already resulted in a flood of publications which can scarcely be surveyed and continuously incites further attempts at interpretation. It appears that political geography will have to sift and discuss post-war literature on the "German Question" even more carefully and thoroughly from its standpoint than before, especially where publications are concerned which are scientifically committed or claim to be so, for here misjudgements may obtain a footing which in their course through universities, political advisers and reviews in influential periodicals can have a worse effect than many direct means of influence.

It follows therefore that a forthright statement should be made on Norman J. G. Pounds' new monograph " Divided Germany and Berlin". This pocket book opens the Van Nostrand Series on problems of world politics and has enjoyed many editions and a wide circulation in the U.S.A., Great Britain and Canada. The series is edited by Professor George W. Hoffmann, University of Texas, and G. Etzel Pearcy, United States Department of State. The author is internationally recognised as a scholar formerly at the universities of Cambridge, Wisconsin and Kansas and now holds a post as Professor of Geography at Indiana University. His books on the historical and political geography of Europe, on heavy industry and the Ruhr District, have established him as a specialist on central European *Raumprobleme* [2]). In the U.S.A. he is bound to be considered the expert on the historical and political geography of Germany.

Thus the serious qualifications levied against the book from the German side are not so much directed against details and individual evaluations on the historico-geographical and politico-geographical presentation, although numerous points require correction and many discussion. Even in most pointed judgements and miscalculations the author cannot be denied knowledge and scholarship. The book is fluently and interestingly written. He is not sparing with his punch lines and evaluations. He frequently connects historical events with present facts. With few sentances he leaps across the centuries in order to return eventually to the case in hand.

This method of compression and combination involves a degree of risk. It induces Pounds' to simplify matters frequently; what is more it connects incompatible facts and leads to untenable constructions which do not stand up to critical examination. If historical condensation is accompanied by regional uncertainties the entire disposition and possibility of statements become altogether doubtful.

The basic conception of the book is in fact untenable. Pounds maintains the thesis that the present divided status of Germany is based on the historical development during the middle ages and early modern period: "The theme of this little book is that the present divided condition of Germany was in fact anticipated during the middle ages and earlier modern times. Then, Germany was politically fragmented a great deal more than it is today, and superimposed upon this division was a contrast in economic growth and social attitudes between the West and the East" [3]).

[1]) N. J. G. Pounds: Divided Germany and Berlin. Van Nostrand Searchlight Book 1. Princeton, New York, Toronto, London 1962. 128 pp., 5 maps. $ 1.45.

[2]) N. J. G. Pounds: An Historical and Political Geography of Europe. London 1947. (German translation: Historische und Politische Geographie von Europa, Braunschweig 1950.)

[3]) Foreword, p. III.