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INTEGRATION OF IRRIGATION AND DRYLAND FARMING IN THE SOUTHERN MURRAY BASIN*

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PART III: THE EVOLUTION OF INTEGRATION AND SOME LESSONS FOR THE FUTURE

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1. CONCLUSIONS

The present article provides an historical account of the development of irrigation in the southern Murray Basin and attempts to explain how the present-day patterns of integration between irrigated and non-irrigated lands evolved. A basic distinction is drawn between "on-farm" integration by which both types of lands are used by the same farmer and "off-farm" integration by which exchanges of fodder and stock occur between irriga-

* For earlier parts of this study see:

"Integration of Irrigation and Dryland Farming in the Southern Murray Basin. Part I: Need for Reappraising the Concept", this *Review*, Vol. 26, No. 4 December, 1958), pp. 227-283.

"Integration of Irrigation and Dryland Farming in the Southern Murray Basin. Part II: Results of Research in a 'Field Study Area' 1956-58," this *Review*, Vol. 27, No. 3 (September, 1959), pp. 146-233.

As mentioned in these earlier articles, the writer is indebted to the Australian National University and various Government departments in south-eastern Australia for the help they gave him during the period of research on which this study is based. However, it is stressed that the views expressed in the present article are not necessarily shared by anyone else.

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tion and dryland farmers. Fundamental to the argument also is the contrast between "intensive" irrigation projects (called Areas in New South Wales) and "partial or extensive" irrigation projects (called Districts in New South Wales).

Much of the discussion concerns the history of irrigation in Victoria, partly because of the relatively early and more significant strides made there, and partly because Victorian precepts have had a great influence on trends in New South Wales and South Australia. Both "intensive" and "extensive" irrigation projects have emerged in Victoria and they present all forms of integration characteristic of the southern Murray Basin. However, the "partial" irrigation schemes of northern Victoria are mostly legacies of the era between 1886 and 1905 when irrigation development was sponsored by locally elected Trusts which were given Government support, particularly by loans and the erection of National Headworks. Active systems of integration were features of the Trust projects because their main *raison d'être* was to assist production stability in a newly established dryland economy affected by closer-settlement for wheat-sheep production after 1860.

For various reasons, the system of Trust control of irrigation had failed by the turn of this century and, with the *Water Act* (1905), the State Water Supply Commission was inaugurated with considerable powers over water development. All projects except the First Mildura Trust were taken over by this Commission and, under the energetic leadership of Elwood Mead, it implemented a policy of "intensifying" irrigation schemes. Essential ingredients in this programme were compulsory water rights, State control over rotational water deliveries, large immigration schemes and State-sponsored closer settlements. The latter were at their peak between 1910 and 1930 and, to a lesser extent after 1945, when both immigrant and soldier settlers were catered for. During the 1930's and 1940's, there was a lull in the closer settlement of irrigation projects, but concerted attempts were made to overcome various land management and marketing problems that arose in the wake of the first flush of early closer settlement.

During this century, the policy favouring "intensive" irrigation in Victoria has had the effect of weakening the role of "on-farm" integration; at the same time it has both assisted and hindered "off-farm" integration. Where closer settlement has involved fruit growing and dairying, integration has been at a minimum; where it has involved sheep farms run on "intensive" lines and geared basically to "permanent" or summer-growing pastures, it has assisted "off-farm" integration as shown previously for the Campaspe Valley in Part II of this study. In future irrigation policy it would seem desirable, therefore, to pay more attention to this apparently conflicting effect of "intensive" irrigation schemes than has been paid in the past. Also worthy of closer study is the problem of the imbalance which occurs between irrigation and dryland areas as a result of long swings in seasonal conditions—a problem discussed earlier in Parts I and II of this study.

For present purposes, the development of irrigation in South Australia has received little attention. Group schemes in that State emerged contemporaneously with the "intensive" projects of the other two States and for similar reasons. However, authorities in South Australia have had less choice of how to develop water projects because physical conditions in the Murray-Mallee have tended to make irrigation very costly and compact

schemes evolved along "intensive" lines for fruit growing and dairying and close to the Murray have been more or less inevitable. These schemes have lacked integration with surrounding dryland areas, despite the fact that the latter experience a degree of production uncertainty unsurpassed elsewhere in the southern Murray Basin. It is the writer's opinion that more thought could be given to the problem of promoting better "off-farm" integration in the Mallee lands of South Australia, wherever suitable irrigation land can be developed to cater economically for the needs of dryland areas. This could involve spatial diversification of non-contiguous lands as stressed earlier in Part I of this study.

The first major group irrigation schemes sponsored by the State in New South Wales did not emerge until after 1906; various reasons are given to explain the lag behind Victoria as well as an initial preference for the Murrumbidgee Valley instead of the Murray lands of the southern Riverina. Both "intensive" and "extensive" development were planned at first for the Murrumbidgee Irrigation Scheme but farm settlement did not occur until after 1912. By that time, authorities in New South Wales had been persuaded by Victorian precept and the submissions of Elwood Mead and others to favour "intensive" projects. Initially, fruit growing, dairying, and fodder growing were planned for the communities emerging around the new centres at Leeton and Griffith. However, dairying came to an early demise (chiefly because of the failure of lucerne on the Murrumbidgee) and the "large area" farms, which developed around the core areas of fruit growing, gradually evolved into the rice growing and sheep fattening enterprises of to-day.

The early emphasis on "intensive" irrigation in the Murrumbidgee Irrigation Areas meant that little "on-farm" integration emerged from the outset. However, active "off-farm" integration was an early goal, particularly to provide irrigated fodder for "associations" of drylands farmers. However, this failed to develop, partly because of the decline of lucerne growing under irrigation and partly because of the early disinterest of dryland farmers in this form of integration. Many technical and economic problems arose in the Murrumbidgee Irrigation Areas during the 'twenties, as happened in comparable Victorian closer settlements. A considerable period of years was spent in overcoming these difficulties.

By the mid 1930's, irrigation authorities in New South Wales began to turn their attention towards developing the water resources of the southern Riverina. Following the Murray River Agreement in 1914 and the later completion of Hume Dam, large-scale diversions from the Murray became practicable. The encroachment westward of closer-settled patterns of dryland farming (wheat-sheep farming) and the impact of droughts on it, aroused more public interest in the need for irrigation closer to the Murray despite the proximity of Melbourne. Between 1935 and 1955, various "partial" irrigation schemes emerged in the Riverina, both in the Murrumbidgee and Murray valleys. These included Benerembah, Tabbita, and Wah Wah districts in the north, and Wakool, Berriquin, Denimein, and Denibootea districts in the south. Some of these schemes were delayed until after the 1939-45 War, but they reflected conditions operating between 1935 and 1945—a period of considerable hardship for dryland settlement in the Riverina. In some respects, these "partial" irrigation schemes had aims similar to the earlier Trusts of northern Victoria; certainly, an enhanced

production stability for dryland farming was a common aim. However, the later schemes of New South Wales were different in the degrees to which their development was State controlled.

The "partial" irrigation schemes of the Riverina involved little "off-farm" integration, chiefly because of the limited irrigation facilities afforded each farmer. However, the same factor encouraged very active "on-farm" intergration. It is misleading to argue that, because it deliberately facilitated the development of these schemes, the Water Conservation and Irrigation Commission of New South Wales had changed its policy in favour of "partial" irrigation. Due to various causes, which are discussed, the new schemes emerged by a policy of expediency. Over recent years, there has been a reversion of policy to favour "intensive" irrigation but with a new twist as exemplified in the proposed Coleambally Scheme for the Murrumbidgee Valley. Authorities have recently advanced a number of technical arguments against the desirability of more "partial" irrigation schemes. However, it is the writer's opinion that there has been an inadequate consideration of the relative economic merits of "intensive" and "partial" irrigation projects. It appears that some of the difficulties now associated with the latter are not inevitable. Also, there seems to be scope for greater consideration of the possible value of a "partial" irrigation scheme in which there is a deliberate attempt by the State to prevent increases of water use and land use intensification beyond the limits envisaged at the outset.

Arising from an assessment of technical problems of present-day "partial" irrigation schemes, together with an appraisal of the quality of riverine lands for irrigation, it is now proposed to promote systems of "intensive" irrigation to the west of Narrandera by the Coleambally Scheme. State-controlled closer settlement and stock fattening properties fundamentally wedded to irrigation land are features of this proposal. However, the new farms, with their superior water resources and soils capable of diverse uses should present much more scope for active "off-farm" integration to assist dryland areas than any farm promoted so far by group schemes in the southern Murray Basin. However, a number of problems still warrant much closer analysis.

One question of great importance is whether the new schemes along the Murrumbidgee should incorporate controls over the degree to which irrigation farms can be subdivided after initial settlement. Judging from experience in northern Victoria and the Berriquin Irrigation District, the presence of superior soil and water resources in the Coleambally area could easily encourage a process of farm subdivision for specialized dairying, should the market outlook for this industry improve. Aside from the national economic problems that this would raise, there are the problems of the reduced flexibility of farm production and complete lack of integration with non-irrigated hinterlands that this inevitably would entail. Many controls have been exercised by States over water projects during the last eighty years in Australia but additional restrictions might be needed in the interests of sound water use.

2. INTRODUCTION

In Part I of this study, published in the December, 1958, issue of this *Review*, the concept of integration between irrigated and dryland farming was discussed, with particular reference to the southern Murray Basin.

Various types of integration were listed and it was stressed that integration may have a value in Australia as a means of achieving a more rational use of limited water resources. In particular, it was suggested that the value of better integration as a means of combating production uncertainties seemed worthy of closer analysis than it has received so far. In Part II of the study (September, 1959, issue of this *Review*) the forms of integration associated with various representative irrigation schemes were examined. Marked differences in the character of integration between projects were noted and these appeared to be related to a number of physical, economic and political factors. Regional comparisons of integration highlighted contrasts of development which seem of particular significance to this State now embarking on large-scale promotion of irrigation in the Murrumbidgee Valley.

In this historical account, the aim is to examine the growth of water conservation and irrigation in the southern Murray Basin to establish how and why the previously described patterns of integration emerged. Some of the conclusions have a bearing on policy for the future.

From the earlier analysis of intergration, it appears that an historical interpretation would need to explore the following closely related questions:

- (i) Why did irrigation begin at different times in the three States?
- (ii) Why have State governments played such an important role in water projects?
- (iii) What factors influenced State developmental policy on:
 - (a) the choice of location for projects;
 - (b) the selection of types of projects, notably the emphasis given to "intensive" schemes with closer settlement in contrast to "extensive" projects without closer settlement; and
 - (c) the choice of types of irrigation farms, distinguished by types of products.

This historical interpretation aims to *describe* the kinds of factors whose influence has shaped the present-day pattern of integration; it does not pretend to measure genetic processes.

Although earlier sections of this study have examined the southern Murray Basin as a unit which transcends political divisions, it is both convenient and realistic here to examine the growth of irrigation by States. The major justification for this is that each State has controlled how its waters have been used, although joint administration exists over diversions from the Murray River through the River Murray Commission established in 1915. An Irrigation Production Advisory Committee of Commonwealth and State government representatives aims at some general co-ordination on the broad lines of irrigation research and development, particularly for products like fruit and rice with their attendant production and marketing problems. This committee was first established under the authority of the Australian Agricultural Council in 1938 and was later revived in 1946 following the 1939-45 War.

Definitions

The following are definitions of some of the terms used in this article:

Southern Murray Basin: The Murray Basin is shown in Fig. 1 and will be familiar to most readers. The "southern Murray Basin" comprises that portion of the Murray Basin (sometimes referred to as the Murray-Darling Basin) which lies *south* of the northernmost latitude of the Murrumbidgee Valley. The region is dominated by the Murray River and the country "drained" by its major tributaries in the winter-rainfall zone, i.e., the Murrumbidgee (New South Wales), Goulburn, Campaspe and Loddon (Victoria), as well as the Mallee country on both sides of the Victorian and South Australian border. Portion of the lower western lands, Lachlan River and Darling River valleys are also included in New South Wales. Some 80 per cent of the irrigated land of Australia is found within the southern Murray Basin.

Irrigated Lands: Irrigation in the southern Murray Basin tends to fall into two elements. First, most development is to be found in group settlements called "Irrigation Districts" or "Irrigation Areas" and, with few exceptions (notably at Mildura and Renmark), is under direct State control. Second, a minor but growing aspect of the development is undertaken by "private diverters" on a small scale and essentially individualistic basis. Whilst this offers much promise as a means of promoting more integration this study is concerned solely with the first type of development. All reference to irrigated land is to land watered in "Districts" or "Areas".

Integration: For the purposes of this discussion, land uses are said to be integrated if:

- (i) Irrigated and unirrigated lands are used on the same farm in a system of "*on-farm*" integration, and/or
- (ii) products of irrigated land use are sold to farms not irrigating and used as *factors of production* by them or *vice versa* in a system of "*off-farm*" integration. This study is not concerned with more indirect links between the two economies (such as the influence of institutions developed in "irrigation" towns).

Types of Irrigation: The term "intensive", "extensive" and "partial" are used in Australia to describe different systems of irrigation. In this article the last two are used as interchangeable and are distinguished from the first as follows:

"Intensive": This applies to an irrigation "district" or an irrigation "area" with a 1 in 1 or better *pro rata* water right (i.e. landholders are entitled to the supply of at least one acre-foot of water per annum for every acre considered by the supplying authority to be suitable for irrigation and commanded by the general works). Included are private group schemes or other public schemes which enjoy similar levels of water supply. In the "intensive" districts or areas most of the *productive* land is irrigated.

"Extensive or Partial": This applies to districts with lower water rights in which appreciable areas of productive land are not watered.

Dryland: This term applies to farming in country not embraced by the group irrigation projects and dependent mainly on rainfall, although some scattered irrigation is practised by "private diverters".

3. VICTORIA¹

Prior to 1920, practically all the land regularly watered in Australia was Victorian (see Fig. 3). Since then, the contribution of the other two States, but mostly New South Wales, has increased greatly, although Victoria still

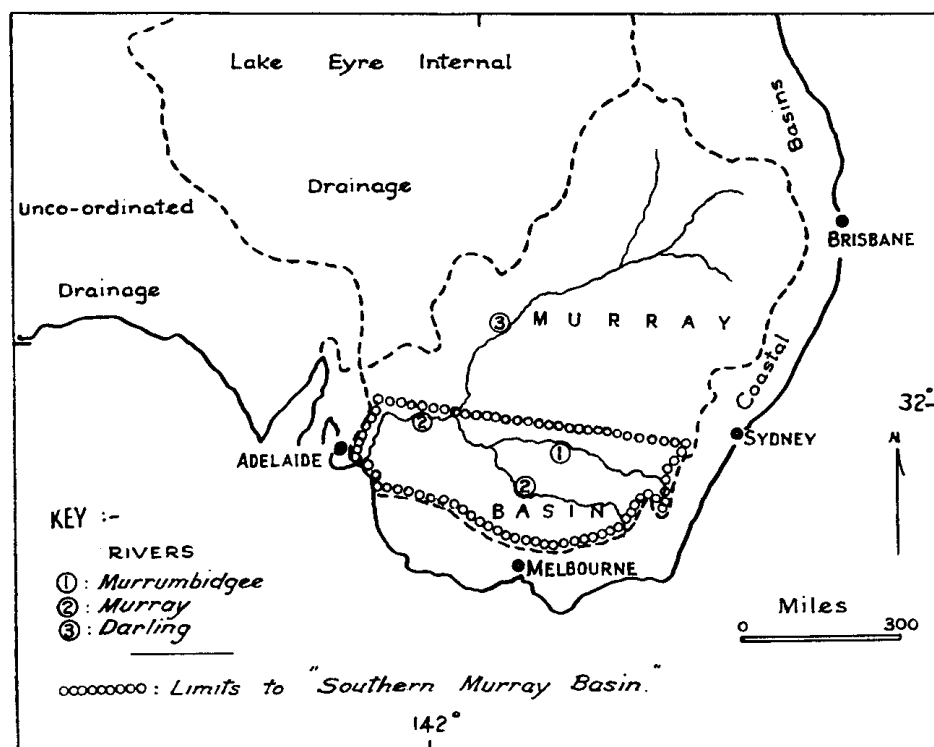


Fig. 1. Location of "Southern Murray Basin" in relation to Murray Basin and adjacent Drainage Basins

lies ahead. It is important to realize that much of Victoria's irrigation is old by Australian standards; there has been a persistent increase in irrigated acreages there over the last fifty years (see Fig. 6), but many of the broad features of her projects evolved between 1886 and 1930; developments since have largely involved consolidation behind earlier frontiers rather than extension to new areas. Major new water resources

¹ For a summary of legislation affecting water supply development in Victoria see, Lewis East, *Victorian Water Law—Riparian Rights* (Melbourne: State Rivers and Water Supply Commission, undated). For accounts of the early history of irrigation in Victoria as a whole, see L. R. East, "Irrigation in Victoria: The First Hundred Years", *Aqua*, Vol. 5, No. 10 (June, 1954), pp. 7-18. L. R. East, "The Beginning of Irrigation in Victoria", *Aqua*, Vol. 1, No. 2 (October, 1946), pp. 1-6.

Numerous other articles in *Aqua* give details on the history of Victoria.

For an account of developments in the lower Goulburn Valley, see Colin Swinburne Martin, *Irrigation and Closer Settlement in the Shepparton District, 1836-1906* (Melbourne: University Press, 1955).

are being put to use in Victoria and there are more to come (especially from the "Snowy" Scheme) but the process of consolidating behind old boundaries continues.

Many of the present-day irrigation projects of Victoria were developed between 1886 and 1930. This period can be divided into two distinct phases, 1886 to 1905 and 1906 to 1930. The first phase is important for the legacies it left, particularly the systems of "partial" irrigation. The second phase formed the first half of the modern era of "intensive" irrigation which greatly influenced trends in the other two States.

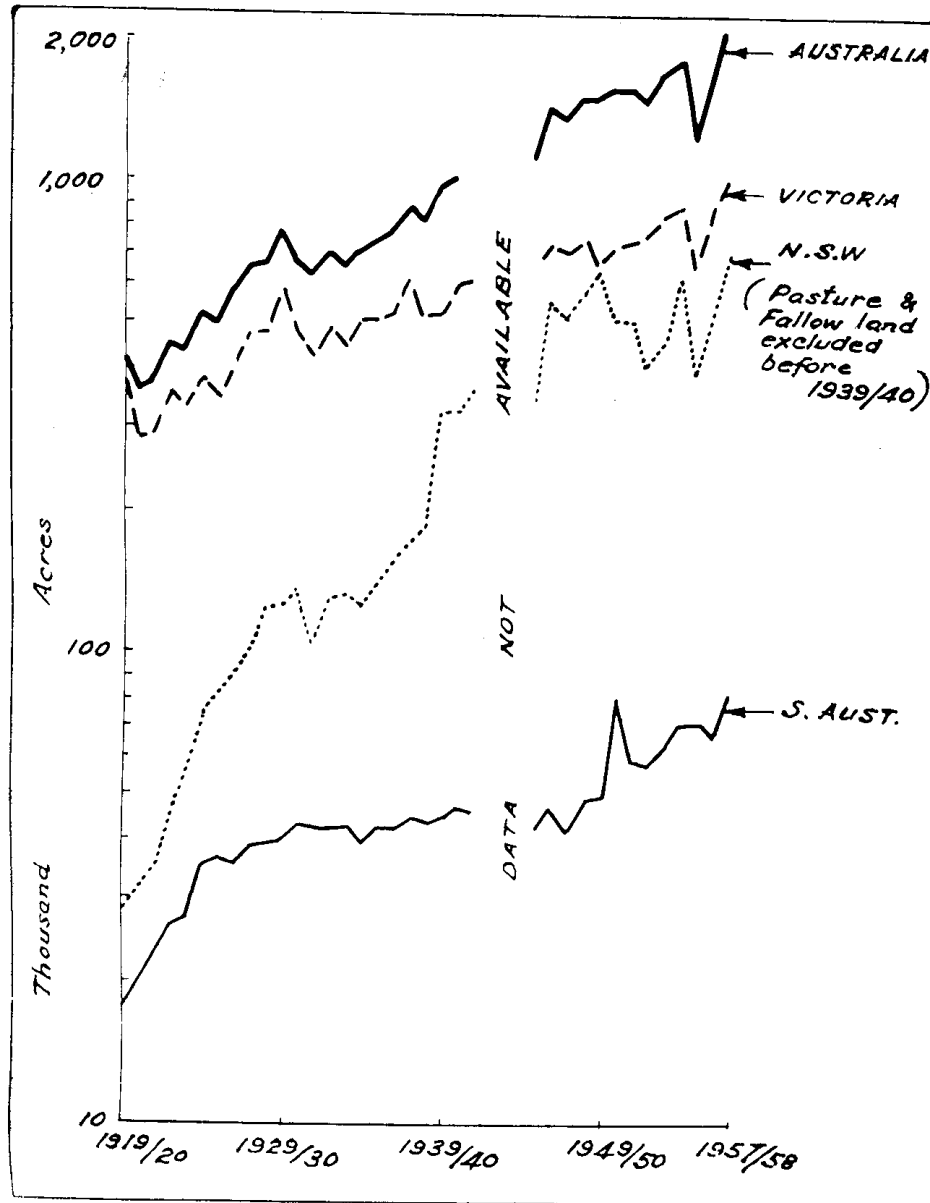


Fig. 3. Trends in Acreages Irrigated in Australia, New South Wales, Victoria, and South Australia, 1919-20 to 1957-58.

The Period 1886 to 1905

This era holds a place of major importance in the history of water development in Victoria. It marked the stage when many of the present-day irrigation districts were first evolved as locally-controlled Trusts. The ethos of the period played a much more vital role in influencing the character of water development in Victoria than it did in other States, especially in New South Wales, the main rival to Victoria. This period was notable because Victoria then concentrated greatly on "partial" irrigation to assist production stability for dryland farming. Since 1905, a completely different policy has been implemented with emphasis on "intensive" irrigation schemes often for exotic products; some have emerged in new areas, but many are modifications of parts of earlier Trust districts.

According to modern policies of development, some of the old projects would probably not be sponsored now by government authorities because their lands present adverse conditions for efficient irrigation; soils, hydrological and general geomorphic conditions are relatively poor and long distances from major sources of water reduce the efficiencies of distribution. This applies most to projects on the "end of the tap" in the Goulburn System of the riverine plain with Grey and Brown Soils of Heavy Texture, i.e., the Tragowel Plains and Boort Irrigation Districts. The present government policy to increase water allocations to these districts reflects an attempt to improve on past mistakes in the face of demands from established irrigators.

A third feature of the period 1886 to 1905 is that it marked an era when important legal principles and administrative institutions were evolved. The principles of nationalized water resources and State finance of major works with local control over district development were implemented. We shall see later that the failure of this local control led eventually to wide State powers after 1905.

Reasons for Early Start in Victoria

There are several major reasons why Victoria, with its passage of the *Irrigation Act* of 1886, became the first State to undertake major water development for irrigation. For its size, this state was affected more than others by the Gold Rushes of the 1850's and the consequent upsurge of populations;² her population grew threefold between 1851 and 1857.³ When surface gold deposits quickly ran out, thousands of "diggers" with limited resources turned their attentions to the possibilities of land settlement. Because of the proximity of many of the mining centres of the eastern highlands to the interior lowlands, these latter regions in Victoria tended to feel relatively early the impact of closer settlement. Aided by the

² L. R. East's comments in *Report of Water Conservation and Irrigation Interstate Conference Held at Sydney, New South Wales, 24th to 27th April, 1939* (Sydney: Government Printer, 1939), p. 71.

³ Alan J. Holt, *Wheat Farms of Victoria: A Sociological Survey* (Melbourne: The School of Agriculture, University of Melbourne, 1947), pp. 7-8. See also: J. Mackie, "Aspects of the Gold Rushes", *The Economic Record*, Vol. XXIII, No. 44 (June, 1947), pp. 75-89.

McPherson Grant Land Acts of 1865 and 1869,⁴ hundreds of ex-diggers took up small blocks (many 320 acres and less) for wheatgrowing in country hitherto settled by "squatters" for grazing on an extensive scale. An influx of farmers from South Australia was also important in the Wimmera and the whole process of closer settlement was aided by a run of good seasons. Specialist wheat growing was favoured by aspirant settlers with limited capital because it covered clearing costs and gave a relatively high and quick return from small acres. Outside of the heavily timbered uplands, the coastal Gippsland, and the arid Mallee, most of Victoria became closer-settled by 1880;⁵ on the interior lowlands, the pattern of a geometric grid-like settlement, with its one mile or half-mile sections, was imprinted on the land in a regular north-south alignment and is basic to all land maps to-day.

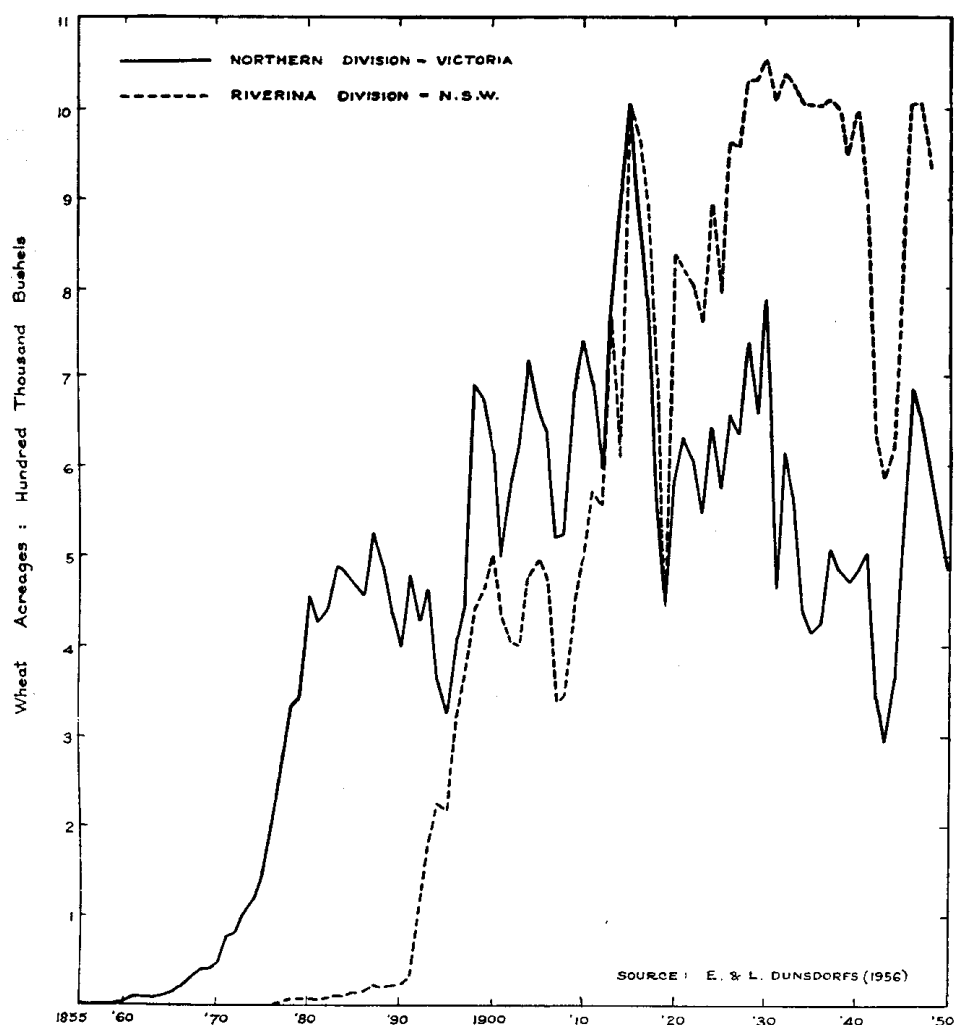


Fig. 4. Trends in Wheat Acreages in Northern Division (Victoria) and Riverina Division (New South Wales) 1855 to 1950.

⁴ East (1954), *op. cit.*, p. 9.

⁵ Holt, *op. cit.*, p. 8.

The wave of closer settlement for arable farming received its first major shock during the droughts of 1877 to 1881. Their economic impact was so severe that the Government was forced to take action.⁶ It is an outstanding feature of Australian water development that all the major plans have been triggered off by periods of great seasonal adversity, and Victoria was no exception. Before 1860, droughts had their impact on pastoral settlement and some graziers on stream frontages had experimented with minor water schemes. Even though pastoralists were hit hard by droughts, their numbers and economic importance were never sufficient to arouse much public indignation about the ravages of drought. However, with the closer settlement of the interior lowlands by wheatgrowers and numerous small-scale pastoralists, the picture changed radically. The gravity of a drought was now a function of both water shortage and serious socio-economic repercussions.

Following the droughts of the period 1877 to 1881, and a fall in the price of wheat which made it imperative for dryland farmers to look for new forms of production like fruit growing,⁷ the Victorian Government set up the Water Conservancy Board (Messrs. Gordon and Black) to make a comprehensive investigation of water problems of the inland regions.⁸ Their reports led to the Water Acts of 1881 and 1883, which were cautious attempts to promote better water supplies, mainly for domestic and stock purposes in a dryland economy but with some limited irrigation. Gordon and Black recommended caution towards large-scale government sponsorship of irrigation because of their doubts as to its economy with relatively "sparse" populations in the inland areas. This attitude stemmed from the commonly-held belief that irrigation would only be successful in areas of high population density and relatively low wage rates, conditions which applied in some overseas countries at that date.

Deakin and Irrigation Act (1886)

During the early 1880's, public interest in irrigation grew rapidly, particularly because of the activities of a number of advocates like McColl⁹ (and associated "water leagues") who pressed for major projects under State sponsorship. The theme was soon to be taken up by Alfred Deakin¹⁰ the rising politician who was to play a vital role in Australian development. This led in 1884 to the establishment of a Royal Commission on Water Supply with Deakin as Chairman and Stuart Murray¹¹ as its Engineer; this was the "real beginning of irrigation in Australia".¹²

⁶ Hitherto, the main Government activity in water development had been concerned with supplies to urban and mining centres.

⁷ See Alfred Deakin, "Irrigation in Australia", *The Year-Book of Australia for 1892* (Sydney: Government Printer, 1892). Martin, *op cit.*, pp. 22 and 55.

⁸ Their reports are contained in Victorian Parliamentary Papers. For example, see papers for 1881, Vol. II, p. 419, and 1882 Vol. III, Section 20.

⁹ See Martin, *Irrigation and Closer Settlement in the Shepparton Districts 1886-1906*, *op. cit.*, p. 23. Also J. H. McColl, "Hugh McColl and the Water Question in Northern Victoria", *Victorian Historical Magazine*, Vol. 4 (June, 1917).

¹⁰ W. Murdock, *Alfred Deakin: A Sketch* (London: 1923).

¹¹ Later to become first chairman of the State Rivers and Water Supply Commission. For an account of his work see J. N. Churchard, "Pioneers of Irrigation in Australia; Number 3, Stuart Murray Engineer and Administrator", *Aqua*, Vol. 8, No. 3 (November, 1956), pp. 68-70.

¹² W. Murdock, *op. cit.*

The 1884 Commission (which sat for several years) had a number of vital results. First, because of a paucity of local knowledge, it led to comprehensive enquiries overseas by Deakin, particularly in western America and publication of a number of his reports on conditions there and their relevance for Australia.¹³ Second, it gave rise to the *Irrigation Act* of 1886 which was the first major legislation on irrigation in Australia. Before examining the significance of this Act, it is necessary to look first at Deakin's philosophy on water conservation and irrigation, because it was embodied in much of Victorian water law.

Deakin was not impressed with advocates of caution in water development for he was convinced that irrigation would tend to attract the required populations and that American experience proved what people on relatively high wage levels could achieve. He stressed that Australian conditions called for peculiar systems of development, although much could be learnt from overseas countries. It was argued that a local paucity and variability of water resources, coupled with the remoteness of suitable dam sites from irrigable lands and the lack of good underground waters in water-hungry areas, meant that Australia would have to embark on relatively large and expensive storages and initiate comprehensive group irrigation schemes.¹⁴ This contrasted with smaller private schemes possible in western America. For Deakin, Indian experience provided the example for large-scale public construction of water storages and channels but American precept pointed to the merits of local controls over distribution of water for irrigation.¹⁵

On the question of the kinds of agriculture to sponsor with irrigation, Deakin eloquently embraced the gamut of possibilities in Australia. He was an advocate of both measures referred to in this study as *resource development* for exotic industries and increased *production stability* for pre-irrigation farming. He was particularly impressed with the scope for promoting "colonies of small landholders with intense production and full use of labour"¹⁶ as in many projects of western America where "fruit growing is the interest to which all others, whether stock, poultry, cereal or lucerne, are subordinated".¹⁷ In his view, the creation of fruit blocks of 40 acres or less would be a much more successful and cheaper way of using irrigation water than systems then developing under "partial" irrigation in the Goulburn Valley where 320-acre wheat blocks adopted the "more expensive Italian type development".¹⁸ The new colony at Mildura (see p. 110) was the shape of things to come in Victoria and he expressed the

¹³ For example see: "Irrigation in Western America", *First Progress Report of the Royal Commission on Water Supply*, 1884 (Melbourne: Government Printer, 1884) and "Irrigation in Egypt and Italy", *Fourth Progress Report* of the same Commission (1887).

¹⁴ Deakin, "Irrigation in Western America", *op. cit.*, p. 20. For inter-continental comparisons of water storage needed per acre of irrigation see State Rivers and Water Supply Commission, *Annual Report* for 1947-48 (Melbourne: Government Printer, 1948).

¹⁵ Deakin, "Irrigation in Australia", *op. cit.*, p. 86. For comments on parallels between Australia and the United States, see L. R. East, "Parallel Irrigation Development—United States and Australia", *Aqua*, Vol. 5, No. 8 (April, 1954), pp. 3-14.

¹⁶ "Irrigation in Australia", *op. cit.*, p. 96.

¹⁷ "Irrigation in Egypt and Italy", *op. cit.*, p. 58.

¹⁸ *Ibid.*, p. 94.

conviction that,

"should the Mildura settlement succeed, we shall soon have the American type acclimatized in the Mallee."¹⁹

For Deakin, American experience provided lessons for Australia as to the "lines on which to develop the political side of our irrigation law, so as to encourage small proprietors and discourage great estates".²⁰

Deakin's comprehensive proposals for Australian water projects went much further than resource development of new industries. He advocated the promotion of "intense" plots of irrigation over wide areas in the pastoral economy so that small areas of valuable fodders (e.g., lucerne) would "transform the whole of the great Murray plain" and "furnish a safe base for a large further extension of pastoral occupation into the very heart of the continent". Although he was aware of the local problem of water scarcity, Deakin made no attempt to reconcile competing uses of scarce water resources; he did not display any awareness that resource development could only proceed at the expense of more production stability or *vice versa*.

Deakin's writings provide important clues on the prevailing concept of the respective roles to be played by the State and local bodies. He said:

"Our irrigation policy is one of State aid and not State initiative. The local land-owners can inaugurate and control each scheme."²¹

American experience of the shortcomings of English Common Law for water resource development in the New World had shown the need for nationalisation of water resources in Australia. However, Deakin led the school which advocated that the initiation of irrigation schemes should be the preserve of local bodies. This was the system of Trust development which evolved in the latter part of last century in Victoria, a system which Deakin claimed was "envied and admired by eminent Indian authorities", and which was completely "in accord with the judgment of those most competent to form an opinion in Europe, Asia and America".²² With its development of urban water supplies prior to 1869, the Crown had initiated and undertaken most major water projects in Victoria; however, from 1869, there was a marked trend toward decentralization of control. Local governments increased in strength with growing rural populations and, through the formation of State-approved and assisted trusts, they assumed control of water distribution and irrigation at the district level.²³

The *Irrigation Act* of 1886 embodied the recommendations of the Royal Commission of 1884, including many of Deakin's ideas. This Act was vital for many reasons of which the following two are important to the present discussion:

- (i) It greatly extended the principle of local controls, with State aid in the form of construction of headworks and major channels,

¹⁹ *Loc. cit.*

²⁰ *Ibid.*, p. 44.

²¹ *Irrigation in Egypt and Italy*, *op. cit.*, p. 1.

²² *Irrigation in Western America*, *op. cit.*, p. 20.

²³ *Speech of the Honourable A. Deakin, Chief Secretary of Victoria, in Submitting to the Legislative Assembly a Bill to Make Better Provision for the Supply of Water for Irrigation, and also for Mining, Manufacturing, and for Other Purposes*, June 24, 1886 (Melbourne: Government Printer, 1886), p. 6. See also Deakin, "Irrigation in Australia", *op. cit.*, p. 91.

loans of money, general supervision of proposed schemes and advice.²⁴ To aid trust development, the State undertook such *National Works* as Goulburn Weir, Laanecoorie Weir and the Kow Swamp Works (including the Macorna Channel).

- (ii) The 1886 Act also marked the first major attempt to base irrigation development on nationalized water resources, although its deficiencies in this respect were partly corrected by the *Water Act* of 1890 and more completely by the *Water Act* of 1905.

The 1886 Act paved the way for the creation of more than ninety Water Trusts in northern Victoria by the turn of the century, including twenty-one Irrigation Trusts. Some features of these are discussed later. In addition, a number of private schemes was encouraged under the *Waterworks Construction Act* of 1886. The most famous of these was initiated by the Chaffey brothers at Mildura,²⁵ a project which owes much to Alfred Deakin who had met the Chaffeyes in California and persuaded them to come to Victoria. Deakin played a major role in obtaining legislative approval for the project and he later extolled the merits of the Mildura settlement as an example to be followed in other parts of Victoria. There is no doubt that this project was an attempt "to make the desert blossom as the rose" and its eventual success was to play an important role in encouraging the emphasis on similar projects after 1905 by the State Rivers and Water Supply Commission. In the 1880's the creation of Mildura represented resource development of a relatively remote arid area well beyond the inland frontiers of closer settlement.²⁶

"Partial" Irrigation by Trust Control

The trusts that emerged in Victoria by 1900 were based chiefly on water diversions from the Goulburn and the Loddon Rivers (but also from the Murray between Cohuna and Swan Hill). The areas of development by 1904 included much of the country now affected by irrigation districts on the riverine plain, including the following areas:

- (i) West of the Goulburn River in the present Rodney Irrigation District.

²⁴ Applications for Trusts were inspected by the Department of Water Supply with Stuart Murray as Engineer-in-Chief.

²⁵ For details of this scheme, see Paper Presented to Parliament, Victoria, *Agreement Between the Government of the Colony of Victoria and George and William Benjamin Chaffey to Secure the Application of Private Capital to the Construction of Irrigation Works and the Establishment of a System of Instruction in Practical Irrigation* (1886).

J. A. Alexander, *The Life of George Chaffey: A Story of Irrigation Beginnings in California and Australia* (Melbourne: MacMillan and Co., 1928).

Ernestine Hill, *Water Into Gold* (Melbourne: Robertson and Mullens, 1946).

For a stimulating study of the significance of the Chaffey settlements and comparisons between Australia and American developments, see Frederick D. Kershner, "George Chaffey and the Irrigation Frontier", *Agricultural History*, Vol. 27 (1953), pp. 115-122.

²⁶ Pre-irrigation settlement involved very extensive sheep raising. According to Kershner, the contribution of George Chaffey in creating Mildura (and Renmark) "was to introduce modern, large-scale engineering methods by means of which apparent deserts could be made to blossom". See Kershner, *op. cit.*, p. 117.

- (ii) Around Rochester covering portions of the present Rochester Irrigation District and the Campaspe Irrigation District.
- (iii) In the central Loddon Valley covering practically all of the present Tragowel Plains and Boort Irrigation Districts.
- (iv) In the lower Loddon Valley and adjacent Murray Valley affecting much of the present Torrumbarry Irrigation System east of the Loddon River and at Swan Hill.
- (v) The Mildura Settlement in the far north-west.

This development was based on an uncontrolled Murray River, and Kow Swamp storage, the Loddon River with the small Laanecoorie Weir, and the Goulburn controlled by the relatively small Goulburn Weir plus Waranga storage. As shown by East,²⁷ much was done by the Trusts to develop channels and small local diversional structures but little was achieved in the vital task of headwater storage.

The financial position of the Trusts deteriorated seriously by the end of the last century and was not even rehabilitated when the State wrote off about three-quarters of their debts under the *Water Supply Advances Relief Act* of 1889.²⁸ The situation had declined so much by 1904 that the Victorian Government commissioned Stuart Murray (then Chief Engineer of Water Supply) to make a comprehensive assessment of the problems of water development in Victoria and draw up draft legislation which was finally embodied in the revolutionary *Water Act* of 1905. By this Act—

“all semblance of local control was removed and complete centralization effected under the State Rivers and Water Supply Commission, probably the first corporate body of its kind in the world, given the task of developing natural resources of a large area.”²⁹

The final demise of local Trust control of farm water supply and irrigation has been attributed by experts to the following factors:³⁰

- (i) Inadequate headwater storages causing failure of water supplies during periods of the greatest need, particularly the national droughts of 1897 to 1902.
- (ii) Divided control over water supply.
- (iii) Inefficient local controls over water deliveries.
- (iv) Dryland farmers' ignorance of “efficient” irrigation techniques.
- (v) Disagreement between various Trusts sharing a common water supply.

²⁷ “Irrigation in Victoria—The First Hundred Years”, *op. cit.*, p. 13. See also *Report of Royal Commission: Finances of All Water Supply Schemes* (Melbourne: Government Printer, 1896). F. W. Eggleston, *State Socialism in Victoria* (London: King and Son, 1932).

²⁸ See Martin *op. cit.*, Chapters V, VI and VII for an account of the financial difficulties of the Trusts. By the time the State Rivers and Water Supply Commission came into being, the State had written off £2.6 millions of Trust debts.

²⁹ East, “Irrigation in Victoria: The First Hundred Years”, *op. cit.*, p. 13.

³⁰ Evidence submitted to the Rural Reconstruction Commission.

Also *Water Conservation and Rural Development in Victoria*, Vol. 1, *Water Supply Legislation and Utilization of Water Resources* (1943), prepared by L. R. East and T. A. Lang submitted as evidence to the Rural Reconstruction Commission.

- (vi) The inability of local management to face up to their financial position and an unwillingness to impose necessary charges for water, both to pay for the costs of its delivery and to act as an economic incentive to effective water use.
- (vii) The fact that a large number of Trusts was hastily set up during a period of booming optimism and Government officials had inadequate time to check plans and the technical and economic feasibility of each proposal.

Elwood Mead, who greatly shaped the destiny of irrigation in south-eastern Australia after 1906, maintained that the failure of the Trusts was not due to faulty engineering but to *faulty land settlement*.³¹ Irrigation was used mainly in a scattered system of "partial" irrigation with sporadic use of water as an ancillary to dryland production. There was a general aversion by dryland settlers towards more intensive forms of farming with greater dependence on constant irrigation.

"It was a common expression that the small farm was for the Chinese. The Australian farmer was accustomed to broad acres. He felt that a change to smaller fields was not progress but the reverse."³²

In Mead's view, Deakin's advocacy of irrigation on his return from America had placed unbalanced emphasis on engineering problems and had overlooked or begged economic and agricultural issues. A perusal of the submissions made to the Victorian Parliament during the 1890's in reference to numerous proposals to establish Trusts shows Mead to be correct in this view; the imbalance of treatment runs through both official and unofficial submissions.

Mead stressed that successful irrigation has to be based squarely on a policy of State-sponsored settlement (see later discussion on pp. 115-122). Commenting on the position that had been reached under Trust development by 1905, he said:

"At the end of two decades only one acre in five, of the land commanded by the channels, was being irrigated. The waste of water and revenue to the State was enormous. There were less people in some districts than when the canals were built and less acres of irrigated crops than before. The prejudice against irrigation in the meantime had increased."³³

Data published by the Victorian Statistician in 1903 graphically portrays the poor state of development in the twenty-one Trusts for irrigation.³⁴ Of a total of 1,611,551 acres of "irrigable" land in these Trusts (almost all in the southern Murray Basin), only 149,506 acres or 9.3 per cent was being irrigated. The latter comprised 52,907 acres of cereals (35.39 per cent of irrigated land), 35,320 acres of fodder crops (23.62 per cent), 7,123½ acres of vines and fruits (4.76 per cent), and 54,156 acres of pastures, mostly "natural" (36.22 per cent of irrigated land).

³¹ Elwood Mead, *Helping Men to Own Farms. A Practical Discussion of Government Aid in Land Settlement* (New York: Macmillan, 1920).

³² *Ibid.*, p. 30.

³³ *Ibid.*, p. 35.

³⁴ Victorian Parliamentary Paper (1903). Relatively intense culture had been promoted at Mildura and in the Goulburn Valley in parts of the present Rodney Irrigation District. See Martin, *op. cit.*, p. 68.

Most of the farms with irrigation in 1904 were those that had evolved by the dryland closer settlement after 1860, i.e., farms comprising one or several basic 320 acre units for wheatgrowing. However, as a result of the continuance of some larger grazing properties (e.g. Torrumbarry Estate) and "dummying" and other practices in closer settlement, some properties greatly exceeded 320 acres. On dryland properties, the trend was for the "cheapest types of crops to be watered in the crudest possible way", with wide variations from year to year in demand for water and areas of irrigated land as a result of fluctuations in rainfall. This meant an extremely vacillating interest in irrigation and its financial obligations, which imposed extreme difficulties on supplying authorities.

The economic crash of the 1890's and the accompanying serious droughts of 1902 helped to seal the fate of Trust development of farm water supplies in Victoria. The failure of supplies from small storages and the poor increases in rural productivity with indifferent irrigation methods hardened the growing conviction that large public investment in water storage and more intense forms of production were necessary. Even after the establishment of the State Rivers and Water Supply Commission in 1906, poor irrigation practices persisted for a number of years until the Commission could carry out the better engineering works and promote a degree of closer settlement essential for any drastic change. As late as 1908, the Commission commented that—

"wide fluctuations in the use of water, and in the income from State works, are fatal to the best results either in irrigated agriculture, or in canal management. . . . The success of irrigation in this State depends on the thoroughness of the irrigators' conversion from relying mainly on the clouds to relying mainly on the canal."³⁵

The success, despite initial problems, of the Mildura Trust did not shake the authorities in their belief that group irrigation schemes "should be conducted under the authority and with the resources of a government agency, and should not be left to the speculative efforts of private investors".³⁶

Location of Projects in 1905

The location of irrigation projects under Trust development requires some comment. On the riverine plain, progress was much more marked than in the Mallee because of the presence of a number of surface streams and their effluents occupying shallow beds which made water diversion by gravity fairly easy. Another factor was that the plain had been affected much more by the droughts of 1877 to 1881, since it had been closer settled for wheatgrowing, whereas the drier Murray Mallee had not.

The positioning of the Trust projects on the riverine plain tended to occur fairly well out from the eastern highlands where gravity diversion to easily commanded "low" plain was possible, using braided stream courses as water carriers and relatively small diversion weirs plus small artificial channels. The areas now within the Boort and Tragowel Plains Districts were good examples of the trend in the Loddon Valley. This relatively crude system of water supply was developed to cater for rudimentary works of "partial"

³⁵ State Rivers and Water Supply Commission, *Annual Report for 1907-08*.

³⁶ John Andrews, "Irrigation in Eastern Australia", *The Australian Geographer*, Vol. III, No. 6 (May, 1939), pp. 14-15.

irrigation with watering of relatively heavy Red and Grey Soils that were easily commanded, and an emphasis on cereals, fodder crops and "natural" pastures.

The policy of intensifying irrigated land uses since 1905 has meant that the State has since concentrated its efforts, not on the easily watered "low" elements of the inner riverine plain, as in earlier periods of Trust control, but on the outer or "high" elements of the plain in the south and east with the advantages of proximity to good water supplies and soils presenting diverse production possibilities but requiring expensive artificial supply channels that only the State has been able to finance and construct. In other words, since 1905, there has been a tendency for core areas of most active development to contract away from the inner plain towards the eastern highlands. Parts of the Torrumbarry Irrigation System are notable exceptions to this because of their proximity to the Murray, the best water line in the southern Murray Basin, and the good soils there.

Prior to 1906, development from the Murray River on the riverine plain was not as marked as from the Goulburn and Loddon rivers because the Murray was uncontrolled and inter-State disagreement on its use had not been overcome. Because of the presence of several effluents like Taylor's and Gunbower creeks and the Little Murray River, as well as the nearness of good irrigable land to be commanded by small pumps on the Murray, Victoria concentrated her Murray development in the area now covered by the Torrumbarry Irrigation System between Cohuna, Kerang and Swan Hill. In the latter part of last century and ever since, the closer proximity of these lands to the metropolis of Victoria has meant much more active development there than over the river in New South Wales. This contrast has persisted even after agreement on the Murray was reached in 1915 and the necessary headwater storages and diversion weirs have been installed.

The development of Mildura in a remote and poorly populated part of Victoria was due to:

- (i) The interest in Victorian development by the Chaffeys with their Californian background of intensive projects for fruit growing.
- (ii) The climatic, soil and water supply conditions in the Mallee which were suited to farms like those that the Chaffeys had promoted in western America.
- (iii) The presence of cheap Crown land close to an apparently dependable water supply.

The Period of State Control Since 1905

The growth of "State socialism" for water development in Victoria was not simply the outcome of the failure of Trust control but part of a wider process of State interference in resource allocation for rural development.³⁷ The momentum of closer settlement for wheatgrowing after 1860 greatly abated by the mid-1880's (see Fig. 4);³⁸ because of the economic depression of the early 1890's and national droughts which followed, economic pro-

³⁷ Part of what Kershner describes as "the nascent welfare state ideology of Australia", *op. cit.*, p. 115.

³⁸ See Martin, *Irrigation and Closer Settlement in the Shepparton District, 1836-1906*, *op. cit.*, p. 77 (reference to Shaun).

gress was greatly retarded and, following depopulation of parts of the riverine plain, a great amount of property amalgamation occurred. The feeling became widespread in Victoria that the State should provide a major impetus to further closer settlement.

"Most politicians agreed that something was required to stimulate agricultural use of the land held in large areas for pastoral production. . . . There was little agreement as to methods of reform. . . . The pressure of the problem and the differences of opinion as to the solution led to the idea that the State must repurchase alienated land which had aggregated into large holdings, and resettle this land for agricultural purposes in smaller areas. Such a policy was the line of least resistance and most members of the Legislative Assembly favoured it."³⁹

The small size of Victoria and her competitive position in relation to other States hardened the urge for State assisted programmes of development and it was widely held that large water projects should be central to this. However, the failure of Deakin's approach emphasised the need for a wholesale reorganization and the application of completely new principles in water development.

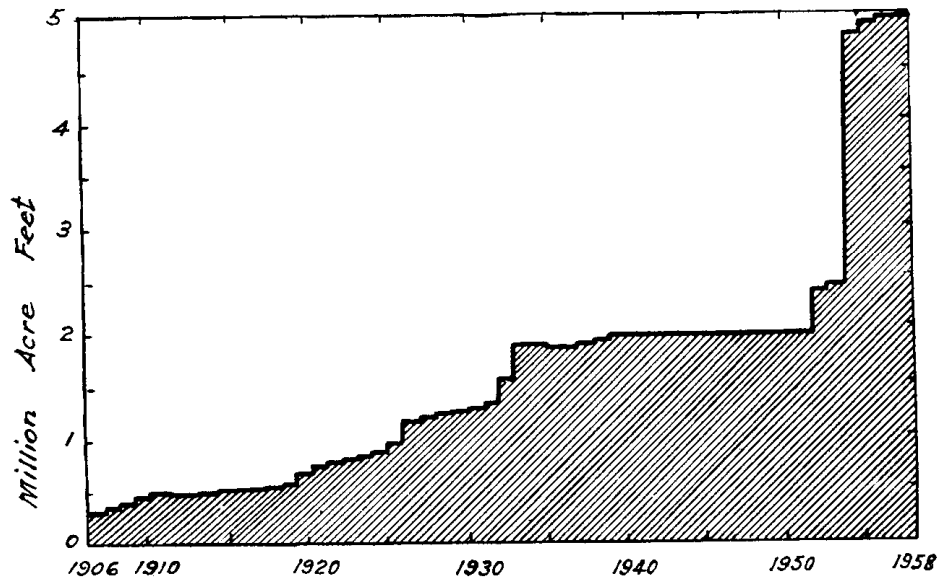


Fig. 5. Trends in Total Capacity of State Reservoirs in Victoria, 1906-1958. Source: Annual Reports of the State Rivers and Water Supply Commission, Victoria.

New Closer Settlement Policy

By a series of legislation beginning tentatively in 1898 and culminating in the more positive *Closer Settlement Act* of 1904, the State set in train measures to encourage settlement. The latter Act gave a Lands Purchase and Management Board the power to acquire and subdivide land for closer settlement purposes in all parts of the State at a time when official concern was being expressed for the small amount of cultivation in Victoria.⁴⁰ It

³⁹ E. H. Sugden and F. W. Eggleston, *George Swinburne: A Biography* (Sydney: Angus and Robertson, 1931), pp. 48-49.

⁴⁰ *Victorian Year-Book* 1904 (Melbourne: Government Printer, 1904), p. 435.

was emphasised that there was great need to speed up population growth, particularly to arrest the temporary decline that had taken place—157,462 persons between 1891 and 1904.⁴¹ The State was urged to give direct assistance to aspirant settlers, and to aid development by better research and education and the promotion of markets. Belief in the economic future of industries allied with closer settlement, like dairying and fruit growing, and the ability of the United Kingdom market to absorb any surplus that might develop was publicized.⁴² At that stage, Victoria was a net importer of fruits and this helped to encourage expansion of the industry.

Following the passage of the *Water Act* of 1905 and the creation of the State Rivers and Water Supply Commission, active steps were taken to make an accurate recording of the 105,000 acres of irrigated land throughout the State.⁴³ Important provisions of the 1905 Act were⁴⁴:

- (i) The Common Law principles relating to riparian rights were greatly amended. The right to use and control any stream affecting more than one property was vested in the Crown.

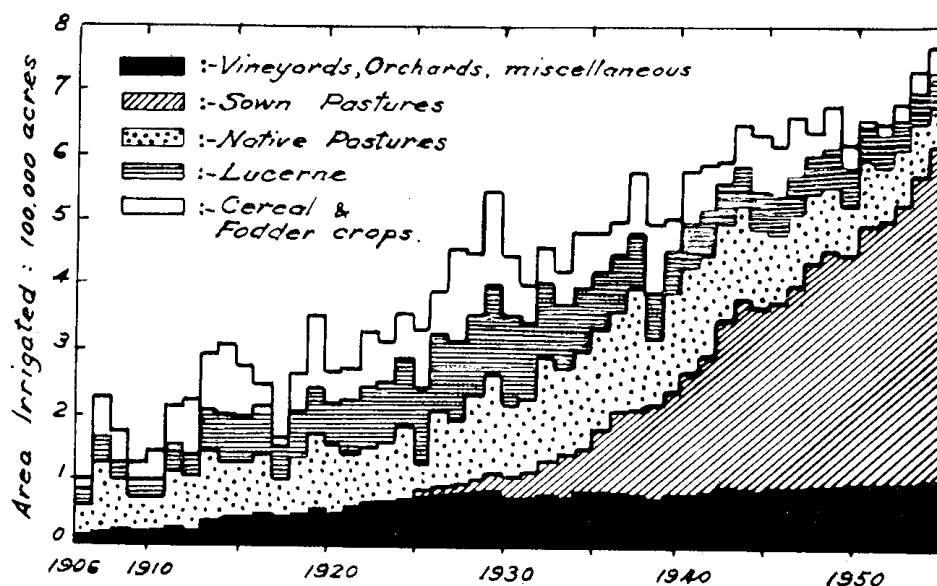


Fig. 6. Trends in Areas Watered in Victoria 1906-1957, Excluding Private Diverters.

Source: **Annual Reports** of the State Rivers and Water Supply Commission, Victoria.

- (ii) The necessity for government licences for private water diversions was stipulated.
- (iii) The State Rivers and Water Supply Commission was required to produce a Register of Lands for irrigation districts setting out for each holding the acreage of land classified as "commanded and suitable to irrigation" and stating the *pro rata* water rights attached to each holding on the basis of this assessment.

⁴¹ *Victorian Yearbook* 1905 (Melbourne: Government Printer, 1905), p. 451.

⁴² For example, see F. W. Ward, *The English Market for Australian Fruit* (Melbourne: Government Printer, 1891).

⁴³ *Victorian Year-Book*, *op. cit.*, p. 451.

⁴⁴ Lewis R. East, "Victorian Water Law: Riparian Rights", *op. cit.*, pp. 12-15.

- (iv) The application of a compulsory charge on all irrigators granted water rights, irrespective of whether or not they used the water allotted to them. The total charge was to be based on fixed general rates for domestic and stock supply and, for irrigation, according to the Register of Lands based on *pro rata* water rights.

The first of these provisions overcame legal issues about rights to water and there has been no litigation on this subject in Victoria since.⁴⁵ The principle of compulsory water rights required a comprehensive organization to define and administer the new rights and establish the obligations of the State and landholders alike.⁴⁶ The aim was to apply economic pressure on landholders not willing to use water with reasonable consistency and effectiveness to sell their land to people who would be prepared to do so.⁴⁷

Notwithstanding the important progress achieved by the *Water Act* of 1905, the vexed problem of encouraging appropriate land settlement to effectively use water still persisted. Two authorities have since stated:

"There was still another principle which was not clearly seen at first. Irrigation is essentially an intensive and not extensive problem; it is suitable for large irrigation settlements but not for isolated farms. This means that the irrigation authority should be a settlement authority purchasing irrigable land and selling it to irrigators. If it had been realized in 1904 that the scheme would have to be loaded in this way there might have been greater resistance to it."⁴⁸

However, George Swinburne, the Minister for Water Supply who was mainly responsible for getting Parliamentary approval for the 1905 *Water Act*, quickly realized the need for a more concrete policy on land settlement and persuaded Elwood Mead, a distinguished American irrigation engineer, to become the second Chairman of the State Rivers and Water Supply Commission.⁴⁹ Mead largely shaped the pattern of water development since 1907. After surveying the position in Victoria, he quickly recommended an active policy of State-sponsored closer settlement. The following quotation from his recommendations to the Victorian Government is significant for the present discussion:

"The Commission recommends:

1. That in every irrigation district provision be made for the closer settlement of a large part of such district.
2. That for such purpose the State acquire suitable properties and subdivide them into holdings of from, say, 20 to 200 acres, having due regard to quality of soil, proximity to markets, and character of crops to be grown; and that, as far as practicable, such properties be acquired before the construction of distributary channels or works.

⁴⁵ Lewis R. East, "Victorian Water Law: Riparian Rights", pp. 12-15. Also J. A. Aird, "Water Rights", *Aqua*, Vol. 8, No. 5 (January, 1957), p. 100.

⁴⁶ Eggleston, *op. cit.*, p. 82.

⁴⁷ East, "Parallel Irrigation Development—United States and Australia", *op. cit.*, p. 11.

⁴⁸ Sudgen and Eggleston, *op. cit.*, p. 136.

⁴⁹ For a brief account of the influence of Elwood Mead on Victorian developments see I. G. Baker, "Elwood Mead in Australia: An Historical Survey", *Aqua*, Vol. 2, No. 6 (February, 1951), pp. 3-11.

3. That, on the lands having been acquired, immediate and comprehensive steps be taken to secure suitable settlers for them, preference being given to local residents; but if sufficient applications be not received within a reasonable time from State residents that steps be taken for the introduction of settlers from the best farming districts of Europe and America.
4. That, while the price charged for the blocks shall be such as to reimburse the State for its outlay, liberal conditions should be made as to payments.
5. That, with a view to fostering a sounder and safer irrigation development and a more regular economic and profitable use of water in irrigation, the construction of works in new districts, other than those for which contracts are already let, be suspended until closer settlements have been established or provision has been made therefore.⁵⁰

The State-sponsored closer settlements were to be "islands" of model development mainly *within* existing areas of "undesirable" and more extensive development, but with some in new areas. Mead later argued that this direct State action probably would not have been attempted had it not been for the considerable and continuing financial losses suffered by the ineffective measures of the Trusts in the previous twenty-five years. This called for "drastic" action.⁵¹

The policy of compulsory water rights and charges laid down in the Act of 1905 were not applied for several years and, in 1908, Mead submitted that they should be levied on the basis of a delivery of one acre-foot of water for every acre of commanded and suitable land (the system of "intensive" irrigation in vogue today in closer settlements). At first, this met with considerable opposition from many dryland farmers and

"a compromise was reached under which the compulsory charge was reduced in non-closer settlement areas to one-fourth or one-fifth of an acre-foot and the water right reduced accordingly. Provision was, however, made that persons who desired it could be granted extra water rights if their land was under intense culture."⁵²

Of course, over the past forty years, farmers in "partially" irrigated areas around the "islands" of closer settlement have come gradually to realise the benefits of irrigation, particularly during the major droughts between 1938 and 1945, and the Commission has met their increased demands for water, partly by increasing *pro rata* water rights and partly by allotting "sales" quotas. This process is still going on.⁵³

During its early phase, the programme of general closer settlement was hampered by shortages of applicants. After 1910, the State took concerted action to overcome this, particularly by encouraging immigration. An official delegation, led by Elwood Mead, went overseas to seek settlers and advertise the merits of farming in Victoria. This delegation later stressed to the Government the need to assist settlement by:

- (i) Improving measures to attract immigration.⁵⁴

⁵⁰ Quoted by Baker (1951), *op. cit.*

⁵¹ Mead, *Helping Men to Own Farms*, *op. cit.*, p. 31.

⁵² J. A. Aird, "Water Rights", *op. cit.*, p. 101.

⁵³ *Ibid.*, p. 102.

⁵⁴ Many pamphlets were prepared by experts like Arndt (fruits) and Crowe (dairying) as well as the Victorian Advertising and Intelligence Bureau for this purpose. These are represented in the collections of the Public Library, Melbourne. A very full statement of advice given to settlers is contained in Anon., *Land Settlement in Victoria: State of Victoria Land Settlement Scheme* (Melbourne: Government Printer, 1925).

- (ii) Selecting the best lands for "intensive" irrigation.
- (iii) By improving rail facilities.
- (iv) Giving scholarships for overseas study on irrigation problems.
- (v) By improving stud stock.
- (vi) Improving marketing arrangements.

The process of development by immigration and early success of closer settlements greatly encouraged interest among Australians in farming opportunities throughout the irrigation areas immediately prior to the 1914-18 war and in the early 1920's. After the war, settlement of returned servicemen was paramount. As a result of all these schemes, between 1909 and 1928 a large number of closer settlements was set up by the State in the irrigation districts of northern Victoria.⁵⁵ Details of the areas developed between 1910 and 1931 are given in Table 1, and Fig. 7 shows their approximate location.⁵⁶

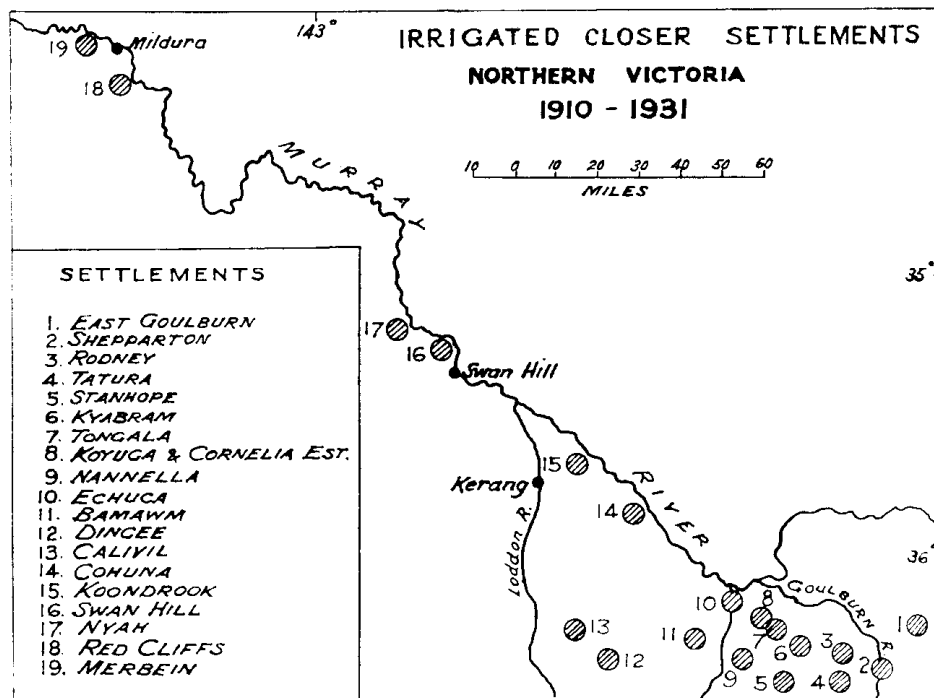


Fig. 7.

⁵⁵ A good account of the process of closer settlement and the help afforded settlers by the State is given by Mead in *Helping Men to Own Farms*, op. cit., chapter on "The Practical Teaching of Australian State Aided Settlement".

See also: *Annual Reports of the State Rivers and Water Supply Commission between 1910 and 1933*. *Report of the Royal Commission on Soldier Settlement, Victoria*, 1925, Vic. Parl. paper (1925). J. A. Aird, *Soldier Settlement in Victoria After 1914-18 War*, undated report in the Library of the State Rivers and Water Supply Commission.

⁵⁶ Closer settlements were established over most parts of non-mountainous Victoria, but, beyond the isohyet for 15 inches average annual rainfall, they were in irrigation projects. See map showing "Estates Acquired for Closer Settlement" in *Report of the Lands Purchase and Management Board for Year Ended 30th June, 1916* (Melbourne: Government Printer, 1916).

TABLE 1—*Details of Closer Settlement Subdivisions in Irrigation*

		1910-11	1912-13	1914-15	1916-17
Cohuna	A	8,220	11,500	11,500	11,500
	B	100	131	133	130
Nanneelea	A	4,245	8,600	8,600	8,600
	B	87	106	106	112
Bamawm	A	8,680	13,400	13,400	13,400
	B	138	178	173	173
Koyuga and Cornelia Creek.	A	4,350	6,700	6,700	6,700
	B	45	75	76	76
Tongala	A	330	15,200	15,200	15,200
	B	13	240	248	242
Swan Hill	A	3,300	5,400	6,900	7,400
	B	48	84	141	153
Shepparton	A	2,770	9,200	9,200	9,200
	B	96	248	251	269
Nyah	A	2,719	2,719	3,000	2,900
	B	67	100	129	141
White Cliffs (Merbein)	A	5,595	5,595	6,000	6,400
	B	163	186	202	239
Kyabram	A	..	1,000	1,000	1,000
	B	..	35	31	31
Werribee†	A	..	6,200	6,200	6,700
	B	..	152	148	145
Koondrook	A	..	..	2,400	3,400
	B	..	..	33	41
Echuca	A	..	..	3,000	3,200
	B	..	..	26	26
Dingee	A	..	..	470	500
	B	..	..	17	18
Stanhope	A	..	..	1,400	8,200
	B	..	..	23	153
Tatura	A	..	..	..	..
	B	..	..	..	..
Maffra†	A	..	..	..	..
	B	..	..	..	..
Red Cliffs	A	..	..	..	..
	B	..	..	..	..
Rodney	A	..	..	..	..
	B	..	..	..	..
Bacchus Marsh† ..	A	..	..	..	..
	B	..	..	..	..
E. Goulburn	A	..	..	..	..
	B	..	..	..	..
Hallam†	A	..	..	..	..
	B	..	..	..	..
Calivil	A	..	..	..	..
	B	..	..	..	..
TOTALS	A	40,209	85,514	94,970	104,300
	B	757	1,535	1,737	1,949

* Compiled from data published in *Annual Reports* of State Rivers and Water Supply Commission. In the early period, data were published only for alternate years.

† Projects outside Southern Murray Basin.

A Corresponds to total acreage subdivided for closer settlement.

B Corresponds to number of blocks established by closer settlement.

*Projects Victoria 1910-11 to 1930-31**

1918-19	1920-21	1922-23	1924-25	1926-27	1928-29	1930-31
11,500	11,800	12,000	12,000	12,000	12,000	12,000
128	131	134	137	142	142	142
8,600	9,000	9,000	9,000	9,040	9,040	9,040
109	105	105	119	125	124	124
13,400	13,400	13,400	13,400	13,400	13,400	13,400
174	178	179	180	192	192	191
6,700	6,700	6,700	6,700	6,700	6,700	6,700
69	67	66	69	73	73	73
15,800	16,300	18,100	18,820	18,930	19,090	19,090
247	255	294	314	317	309	305
7,400	9,900	12,500	12,500	12,500	12,500	12,500
142	226	295	303	329	325	324
9,600	10,700	11,200	14,170	14,170	14,170	14,170
280	325	337	388	389	384	375
3,300	3,800	3,800	3,800	3,800	3,800	3,800
188	208	208	237	237	236	234
7,700	8,300	8,300	8,300	8,300	8,300	8,300
334	384	384	410	423	418	417
1,000	3,000	3,000	3,000	4,420	4,600	4,600
28	56	56	57	69	69	68
8,000	8,900	10,000	10,000	10,000	10,000	10,000
170	198	238	233	233	229	227
3,400	3,400	3,900	9,060	9,060	9,060	9,060
35	34	51	135	132	129	124
3,200	3,200	3,600	3,600	3,600	3,600	3,600
26	27	30	31	30	30	30
500	500	500	500	500	500	500
16	15	15	17	20	20	20
15,800	20,900	{ 21,500	{ 21,500	{ 21,500	{ 21,500	{ 21,500
276	309	315	330	290	279	272
100	100	..	..	..	..	..
4	4	..	..	..	..	..
..	4,900	4,900	4,900	7,000	8,970	8,970
..	107	107	107	142	175	175
..	9,500	17,700	18,000	18,000	18,000	18,000
..	446	701	706	706	689	680
..	..	900	2,750	3,230	3,230	3,230
..	..	10	40	55	55	54
..	..	70	70	70	70	70
..	..	2	2	2	2	2
..	..	..	960	9,780	13,400	13,400
..	..	..	13	111	162	162
..	..	..	280	1,000	1,860	1,860
..	..	..	16	59	96	93
..	..	..	..	..	3,860	3,860
..	..	..	..	..	26	26
116,000	144,300	161,070	173,310	187,000	197,650	197,650
2,226	3,075	3,527	3,844	4,076	4,164	4,128

TABLE 2
Location of Irrigation Closer Settlements in Northern Victoria—1909 to 1928

Localities	Present Irrigation District
1. Between Beverford and Swan Hill on the Swan Hill Flats	Swan Hill.
2. Nyah	Nyah.
3. Woorinen, Murrawee and other Mallee fringe areas near Swan Hill	Swan Hill.
4. Tresco	Tresco
5. Murrabit and Koondrook	Koondrook.
6. Leitchville, Gunbower, Meade and McMillans	Cohuna.
7. Calivil	Calivil.
8. Dingee	Dingee.
9. Bamawm, Echuca, and Nanneella	Rochester.
10. Tongala, Kyabram, and Stanhope	Tongala-Stanhope.
11. Tatura and Ardmona	Rodney.
12. Shepparton	Shepparton.
13. North Shepparton	North Shepparton.
14. Katandra	Katandra.
15. Red Cliffs	Red Cliffs.
16. Merbein (White Cliffs)	Merbein.

Types of Closer Settlements

During the period 1909 to 1928, closer settlements for fruit growing, dairying and some mixed farming (sheep and dairying) were established in the areas shown in Table 2.

In the early phase of closer settlement between 1909 and 1921, both fruit growing and dairying were emphasised. Between 1921 and 1928, with the decline in the market for dried vine fruits, the emphasis was on dairying and mixed dairying and sheep raising; both were aided by the active spread of improved pastures. The sizes of closer-settled blocks varied mainly according to type of production, each farmer being granted a "living" area according to expected returns per acre for the type of land use adopted. For dried vine fruits (at centres like Nyah, Swan Hill, Merbein and Red Cliffs) blocks averaged 18 acres with 16 bearing. For canned fruits (in the Goulburn Valley) the majority of the blocks were about 35 acres with 25 acres planted and 10 for development. Dairy blocks (scattered over plain) ranged between 20 and 100 acres but averaged about 60. Mixed blocks were 100 to 200 acres.⁵⁷

⁵⁷ Details of closer settlement blocks are given in:

Statement by J. Aird in *Report of Water Conservation and Irrigation Interstate Conference held at Sydney, New South Wales, 24th to 27th April, 1939* (Sydney: Government Printer, 1939), p. 71.

Development and Migration Commission, *Report on the Dried Fruits Industry of Australia* (Melbourne: Government Printer, 1927) pp. 19-21.

_____, *Report Relating to the Canned Fruits Industry of Australia (Apricots, Peaches, and Pears)* (Canberra: Government Printer, 1929), p. 9.

Bureau of Agricultural Economics, *Farm Size and Water Usage in the Tongala-Stanhope Irrigation District* (Canberra: Bureau of Agricultural Economics, 1954), pp. 1-28.

Report from the Parliamentary Standing Committee on Railways on the Stanhope Closer Settlement Area Connecting Railway, July, 1914, Victorian Parliamentary Paper (1914), pp. 525-533.

Development Branch, Prime Minister's Department, *Report on the Economic Aspects of Mixed Farming in the Murray Valley* (Canberra: Government Printer, 1930), pp. 15-16.

Land Settlement in Victoria: State of Victoria Land Settlement Scheme (circa., 1925), op. cit.

Location of "Intensive" Irrigation

Various factors affected the location of the closer settlements. Merbein and Red Cliffs arose largely because of the precept of Mildura and were located close to the latter to exploit a similar environment. On the riverine plain, two major locational factors were:

- (i) Proximity to good water supplies, i.e., the Murray River or major channels.
- (ii) The presence of "loamy" soils particularly those near "pine" ridges, i.e., along the levees of "prior" streams.

This applied both to the settlements of the developing Torrumbarry Irrigation System at Cohuna, Koondrook, Murrabit, and Swan Hill, and those of the Goulburn System, east and west of the Goulburn River and fed by the East Goulburn Main Channel and the Waranga Western Main Channel. Whilst some of the closer settlements were shown by later experience to be well located, others proved to be badly located, especially where heavier Grey Soils were used or where old wheat lands on Red Soils of the plain were developed,⁵⁸ i.e., areas where soil structures were prone to deteriorate rapidly and where "plough soles" reduced permeability. Many of the riverine plain settlements evolved in areas with relatively good rainfalls (yearly average of 15-20 inches) rather than in drier areas (12-15 inches) and this was subject to early criticism.⁵⁹ It was clear that selection of positions on good soils and near good water supplies was regarded as more important than sponsoring schemes in zones further inland with the greatest aridity.

The era of State-sponsored closer settlement saw a rapid increase in the population of areas affected in contrast to slower development or absolute declines in adjacent areas. For example, between 1910 to 1933, the population of the closer-settled irrigation shires of Shepparton and Deakin increased by 44 per cent and 65 per cent respectively, in sharp contrast to decreases of 22 per cent and 28 per cent in the nearby non-irrigated shires of Tungumah and Numurkah.⁶⁰

There is no doubt that the closer settlements acted as an incentive for private subdivisions in country near and distant from them. This was facilitated by amendments to the *Water Act* in 1916, which permitted private subdivisions subject to control by the State Rivers and Water Supply Commission to ensure that effective water supplies and "living" areas were obtained without prejudice to other settlers. However, the process of private closer settlement was very slow and did not reach its peak until after 1939-45 when increases in the demand for land caused rising land values and made this subdivision profitable. More assured water supplies have helped this.

It is important to realize that Mead was opposed to the State sponsoring *all* closer settlement. He saw the need for direct State action only in the initial phase of overcoming dryland farmers' opposition to subdividing their

⁵⁸ See *Final Report of the Royal Commission on Closer Settlement as to the Workings of the Closer Settlement Acts in the Irrigable Districts*, Victorian Parliamentary Paper (1916). Also: *Report on Standing Committee on Railways* (1914), *op. cit.*

⁵⁹ Royal Commission (1916), *ibid.*

⁶⁰ State Rivers and Water Supply Commission, *Memorandum on Irrigation Development* (1933) held in Library of Commission.

lands for more "intense" culture. The "islands" of State closer settlement were to serve as models for more widespread subdivisions on private lines and compulsory water rights were to act as a lever. Even in 1916, Mead expressed the view that the State had gone far enough in its closer settlement programme.⁶¹ The fact that the policy was carried into the post-war years and into the late 1920's⁶² was due largely to the need for creating settlement opportunities for returned soldiers as well as to give effect to migration agreements with the United Kingdom.

We have seen that the upsurge of closer settlement that took place in Victoria between 1909 and 1928 was based very largely on the development of fruit growing and dairying plus some fat lamb raising. This was greatly encouraged by a buoyant economy with rising price levels for the relevant products until the early or late 1920's and a rapidly expanding export trade. However, in the late 'twenties and early 'thirties, a serious world-wide depression affected the entire Australian economy. The periods after 1923 for fruits and after 1929 for other products were marked, not by production expansion, but by growing marketing problems and concerted attempts to develop suitable means for overcoming them.⁶³

Development After 1930

The main trends in the Victorian irrigated areas during the 1930's and 1940's were:

- (i) No closer settlement of irrigated lands was carried out by the State between 1932 and the end of the 1939-45 war. In fact, between 1932 to 1938, the opposite occurred because the leases of a substantial number of unsuccessful settlers were cancelled and their land subdivided and added to blocks of adjacent and successful settlers to bring the latter to "home maintenance" areas in the face of marketing and land management problems.⁶⁴ This trend started even in the 1920's as shown in Table 1.
- (ii) Rather than State promotion of closer settlement, the period of the 'thirties and 'forties was characterized by changes in land use on existing irrigation farms. These changes affected both the closer settlements and surrounding areas of "partial" irrigation and included:

⁶¹ *Final Report of the Royal Commission on Closer Settlement (1916)*, *op. cit.*, p. 9.

⁶² And after the 1939-45 War.

⁶³ For accounts of these economic problems see: Reports by Commonwealth Migration Commission, *op. cit.*, John Andrews, "Irrigation in Eastern Australia", *op. cit.*, Wadham, Wilson, and Wood, *Land Utilization in Australia* (Melbourne: Melbourne University Press, 1957), pp. 182-183 and Chapter XI.

Development Branch, Prime Minister's Department, *Report on the Present Position of the Citrus Industry in Australia* (Canberra: Government Printer, 1930).

⁶⁴ This trend was emphasised to the writer by Mr. J. A. Aird (then a Commissioner of the State Rivers and Water Supply Commission) in a private communication dated 22.8.56. Since 1939, however, there has been some trend for subdivision of properties in many districts, partly as a result of improved water rights and partly because of better economic conditions. These trends are examined in J. N. Churchyard, "Subdivision in Irrigation Districts 1939-45", *Aqua*, vol. 7, No. 3 (November, 1955), pp. 54-57.

- (a) the gradual adoption of measures to combat problems of high ground water tables and soil "salting",
- (b) a trend for improved pastures to become widely accepted and, in the closer settled dairying and sheep areas, for these to displace lucerne,
- (c) a growing appreciation of the value of irrigation in the "partial" irrigation districts developed as consolidations or additions to old Trust districts for the most part. This was heightened by the long sequence of droughts between 1938 and 1945 and farmers gradually began to increase their reliance on irrigation.

During the period since the 'thirties, a lot of "over-development" occurred because farmers in relatively poor water right areas (e.g. Rodney with 1 in 4) expanded their irrigated acreages on the basis of relatively insecure "sales" water supplies. With the onset of the droughts between 1938 and 1945 and accompanying restriction of water supplies to water rights or less, many of these farmers were seriously embarrassed.⁶⁵ These trends led to the freezing of sales quotas during the mid-forties to the average amount of water used in the early 'forties.

Since 1945, with the notable exceptions of the soldier settlements in the Robinvale (fruit) and Murray Valley (fruit and dairying) Irrigation Districts, the trend of further intensifying irrigation in older "partial" districts has continued. The outer fringe sections of the Murray Valley Irrigation District are the only new areas of "partial" irrigation developed and this District and Robinvale have been the only two additional projects created in northern Victoria. It is the intention not to create new projects in the foreseeable future, despite the fact that the development of the new Eildon Weir will enable a doubling of present irrigated acreages in the Goulburn Irrigation System. The policy for using this water is given as follows:⁶⁶

- (a) The greater part of the water would be allocated on a general basis, but there would be some limited opportunities for a certain amount of extra water to be made available, on application by individual land-holders, over and above the compulsory allocation.
- (b) The greater part of the water from the New Eildon would be used in existing districts. Relatively few new areas would be brought in, and these would be lands actually commanded by existing main channels.
- (c) The Commission does not favour the creation of new extensive districts which involved the construction of considerable lengths of channel in which large quantities of water would be lost by evaporation and seepage. Preference in allocation of the water available would be towards intensive allocation.

Some water will be made available outside existing irrigation districts to allow irrigation by private diverters, especially along the Goulburn and Loddon Rivers. However, most of the additional water will be used to

⁶⁵ Evidence submitted by State Rivers and Water Supply Commission to the Rural Reconstruction Commission.

⁶⁶ L. R. East, *The Goulburn Irrigation System: Use of Eildon and Cairn Curran Waters* (Melbourne: State Rivers and Water Supply Commission, 1955), p. 7.

build up water rights in existing districts without prejudice to rights now operating.

The policies for use of waters to be made available as a result of the enlargement of Hume Dam and from the Snowy Scheme have not been made public. However, available evidence suggests that future policy will be much like the current one with an intensification of land use in existing areas, particularly the Torrumbarry Irrigation System, rather than development of "partial" irrigation in new areas.

Impact on Pattern of Integration

The implementation of closer settlement and more "intensive" irrigation in Victoria since 1909 had the general effect of reducing the importance of "on-farm" integration because it tended to create fruit, dairy, and fat lamb farms with a heavy reliance on irrigated land. Where "partial" irrigation has changed the emphasis of production from Merino woolgrowing to fat lamb raising, a reduction of "on-farm" integration has occurred, the trend being more marked the more abundant the water supplies and the more suited the land to irrigation. Whilst the subject of "on-farm" integration has not been featured in official reports in Victoria, there are numerous references in the writings of Elwood Mead which show that he was clearly opposed to the combination of irrigated and dryland farming (see quote on p. 144), and it is generally agreed that Mead above all others has shaped the destiny of water development in Victoria during this century. It seems reasonable to conclude that Victorian policy has been to encourage a drastic decline of "on-farm" integration in all areas of "partial" irrigation; the aim has been to create farms basically wedded to irrigated land and with dryland a residual resource of secondary value.

By contrast, it is clear that Victorian authorities have always regarded active "off-farm" integration as an important aim of irrigation. Except where fruit growing has been developed, there is no doubt that the creation of intense irrigation settlements was viewed as one vital approach towards combating production uncertainty in dryland areas. Mead's submissions to the Government of New South Wales in 1923 show this to be the case,⁸⁷ and subsequent reports published by the State Rivers and Water Supply Commission make periodical reference to the value of irrigated areas in assisting drought-stricken regions by sales of fodder and the provision of agistment.⁸⁸ More recent official statements show that this type of integration is one of the goals of current policy of increasing the allocation of water to "partial" irrigation districts.⁸⁹ It should be noted that the Merbein Irrigation District is the only example of a Victorian closer settlement sponsored this century with "off-farm" integration as its *major* goal, i.e., the production of lucerne for a local dairying industry and to assist dryland production in the hinterlands. However, this quickly changed to a

⁸⁷ See footnote references to Mead on p. 143.

⁸⁸ For example, see State Rivers and Water Supply Commission, *Annual Report* for 1938-39.

⁸⁹ These "partial" irrigation districts are at present hampered by inadequate water supplies.

non-integrated system of fruit growing along the lines of nearby Mildura. In all other cases, "off-farm" integration has formed a secondary goal of project development.

The policy of "intensive" irrigation pursued in northern Victoria has both reduced and enhanced the scope for active "off-farm" integration to assist production stability in dryland areas; it has reduced it where dairying and fruit growing have been sponsored and it has increased it where sheep properties with copious water supplies and large areas of "permanent" pastures or lucerne have emerged. As far as the writer is aware, the authorities in Victoria have not closely appraised this conflict of achievement of "intensive" irrigation. Also, it appears that no serious consideration has been given to the problem of overcoming an imbalance between trends in irrigated and dryland areas as a result of long swings in seasons.⁷⁰ It seems reasonable to conclude from available data that the concept of integration has not been considered comprehensively by those formulating developmental policy in Victoria. One can find numerous official arguments stressing some of the technical and socio-economic advantages of compact and "intensive" irrigation projects whose development has been outlined in earlier paragraphs. However, the writer has not been able to discover any study which mentioned, least of all appraised, the "opportunity" costs of sponsoring these schemes, measured in terms of the lack of integration emphasised in earlier sections of this study.

4. SOUTH AUSTRALIA

It is necessary here to deal only briefly with irrigation developments in South Australia, because the acreages involved have long been relatively small (see Fig. 3, p. 104) and irrigation schemes there are comparable to the "intensive" projects of New South Wales and Victoria sponsored between 1910 and 1925.

Because of the paucity of its water resources, South Australia has long shown an interest in water development. The Murray River is the only major stream in the State and it has played a vital role in the economy, with all the State irrigation projects concentrated along its banks and important rural and industrial water supply projects dependent on it. Being on the lower reaches of the stream, South Australia has always strongly pressed its riparian rights; until several decades ago, problems of navigation were major issues compared with problems of developing domestic, stock, and irrigation water supplies. In more recent times, with the decline in river trade, navigation has become a negligible issue and the others have held sway.⁷¹

South Australia's command over the river trade of the southern Murray Basin was pioneered by Cadell in 1853. Between 1853 and 1890, the Murray formed an important transport route for supplies to the various pastoral stations and towns of the relatively sparsely populated interior lowlands of the southern Murray Basin and for the outflow of primary products. However, towards the end of last century, this trade declined for

⁷⁰ This problem was discussed in earlier Parts of this study.

⁷¹ R. T. McKay, "The Murray River: Irrigation and Navigation", *Proceedings of the Sydney University Engineering Society* (1903), pp. 150-152.

various reasons including: the droughts of 1897 to 1902 which reduced river trade and made the stream unnavigable; extensions of rail lines into the interior, particularly as the frontier for wheatgrowing expanded and older "river ports" became rail heads; and differential rail freights imposed by the governments of New South Wales and Victoria to attract interior trade away from South Australia. By 1900, using the Murray River for water supply projects assumed much greater significance for South Australia. However, it was not until after the River Murray Agreement of 1914 that they could be promoted with confidence.

The Murray River has always been relatively more important to South Australia than it has to the other two States. Added to this fact is the proximity of the river to Adelaide—the State's major concentration of population and political centre. As a consequence, the South Australian Government has tended to match Victoria's promotion of "intensive" irrigation projects based on Murray waters. This policy has been reinforced by physical conditions in the Murray-Mallee which have demanded compact and highly productive communities close to the river. It is natural therefore that all the group irrigation schemes of South Australia have been concentrated along the Murray and concerned with specialized fruit growing and dairying with little or no integration, particularly of the kind to assist neighbouring dryland production.

Experimental Projects to 1918

All of the Murray River in South Australia is in the Mallee zone. A characteristic feature of the development of the Mallee in the three eastern States is that major settlement had to wait the growth of arable agriculture after the 1890's when the establishment of wheat farms could pay for the expense of clearing the relatively dense Mallee scrub.⁷² This was the reverse of what happened on the riverine plain. As a result, the creation of Renmark in a sparsely settled part of the Mallee in 1887 represented resource development in a minor part of a region otherwise of very limited economic value. The emergence of this project coincided with the beginnings of a phase of major upsurge of water development in South Australia as shown by Fenner.⁷³

Whilst the Victorian Parliament was arguing the proposal to allow the Chaffey's to proceed with their Mildura venture, South Australian authorities were quick to seize the opportunity of attracting the Californians to their State. The development of Renmark was a duplication of Mildura, on a less ambitious scale, and its location and mode of development were governed by similar factors. Both suffered "growing pains" but their

⁷² C. A. Fenner, *et. al.*, *The Contemporary History of South Australia* (Adelaide: Royal Geographic Society of Australia, 1936), p. 158. For a very interesting study which throws light on many aspects of the history of the development of South Australia in its geographic setting, see C. Fenner, "A Geographical Enquiry into the Growth, Distribution and Movement of Population in South Australia, 1837-1927", *Transactions and Proceedings of the Royal Society of South Australia*, Vol. 53 (1929), pp. 79-145.

⁷³ See Fenner, "A Geographical Enquiry into the . . . Population of South Australia, 1836-1927", *op. cit.*, Fig. 14, p. 118. This figure brings out the very rapid development of water supplies in South Australia between 1880 and 1928, with periods of greatest increase following the major droughts of 1897-1902 and 1914-15.

eventual success provided the necessary precept for later "intensive" irrigation schemes between Swan Hill in Victoria and Morgan in South Australia. There was more harmony between the settlers and the Chaffey family at Renmark than at Mildura and its progress was steady, if slow; although it was given Government financial aid in 1895 and 1900, it was able to carry on under its own Trust administration without outside direction.

Like Victoria, South Australia suffered a major reverse during the economic depression of the early 1890's. Fearing loss of its valuable river traffic and with pressure from dissident unemployed in Adelaide, the South Australian Government embarked on a number of experimental "village" settlements along the Murray in 1894. These were set up on quasi-communistic lines, mainly as small fruit-growing communities pumping from the river to lower Mallee slopes. They included the settlements of Lyrup, Murtho, Pyap, Kingston, Moorook, Holder, Waikerie, Ramco, Gillen, New Era and New Residence.⁷⁴ These village settlements quickly revealed serious weaknesses of organisation and endeavour and were the subject of a Government enquiry in 1895. During the 1890's many of the settlements failed for reasons exposed by the Royal Commission of 1899.⁷⁵ New Residence, Gillen, New Era and Murtho were dissolved and, in 1901, the Government abolished the principle of "village" settlements. Between 1901 and 1914, with the exception of Lyrup, the various settlements ceased to operate, were converted into State enterprises, or were carried on by private enterprise. "It was evident that human nature is not readily moulded to bring to a successful issue a settlement worked on communistic lines."⁷⁶

Despite their shortcomings and relatively quick failure, the "village" settlements stimulated interest in fruit growing along the Murray River and pinpointed areas suitable for this purpose. As shown in Table 3, p. 130, a gradual increase of irrigated acreages occurred particularly in the early part of this century; tree fruits had been given preference over dried vine fruits in the early days, but the latter assumed major importance during this century, particularly after the 1914-18 war.

Contemporary with early developments of fruit growing, attempts were made to reclaim some of the swamp-lands of the lower Murray. Downstream from Mannum the swamps represented the only sufficiently large and fertile areas of swamp along the Murray in the Mallee Zone to warrant the expense of reclamation.⁷⁷ In 1881, W. F. D. Jervois began developing

⁷⁴ For brief descriptions of these settlements, see: J. Macdonald Holmes, *The Murray Valley* (Sydney: Angus and Robertson, 1948), pp. 39-46. Also South Australian Parliamentary Paper, *Report of Irrigation and Reclamation Works Department for Period Ended 30th June, 1913*.

It should be noted that the period when the "village" settlements were promoted coincided with a phase of general decline in sheep numbers and the prosperity of pastoral production in South Australia. See J. Davidson, "On the Ecology of the Growth of the Sheep Population in South Australia", *Transactions of the Royal Society of South Australia*, Vol. 62, Part 1 (July, 1938), p. 146.

⁷⁵ South Australia, Parliamentary Paper, *Royal Commission on Renmark and Murray River Settlements, Progress Report (1899) and Final Report (1900)*.

⁷⁶ R. T. McKay, "The Murray Waters", *Agricultural Gazette of New South Wales*, Vol. XIV (1903), p. 304.

⁷⁷ J. K. Taylor and H. G. Poole, "A Soil Survey of the Swamps of the Lower Murray River", *CSIRO Bull.* 51 (1931), p. 7.

TABLE 3

*Trends in Irrigated Fruit Areas Along the Murray River in South Australia, 1889-90 to 1919-20**

Year	Orchards	Vines	Year	Orchards	Vines
	acres	acres		acres	acres
1889-90 ..	61	27	1904-05 ..	808	1,717
1890-91 ..	89	198	1905-06 ..	850	1,777
1891-92 ..	196	324	1906-07 ..	765	2,043
1892-93 ..	459	494	1907-08 ..	1,097	2,778
1893-94 ..	†	†	1908-09 ..	1,095	3,184
1894-95 ..	†	†	1909-10 ..	1,207	3,178
1895-96 ..	†	†	1910-11 ..	1,310	3,298
1896-97 ..	790	494	1911-12 ..	1,641	3,521
1897-98 ..	882	476	1912-13 ..	1,986	3,751
1898-99 ..	1,592	517	1913-14 ..	2,101	4,044
1899-1900 ..	1,589	523	1914-15 ..	2,707	4,510
1900-01 ..	1,659	700	1915-16 ..	3,535	5,272
1901-02 ..	1,446	866	1916-17 ..	4,361	5,676
1902-03 ..	1,126	1,193	1917-18 ..	4,794	5,968
1903-04 ..	1,397	1,404	1918-19 ..	4,969	6,517
			1919-20 ..	5,307	7,558

*South Australia, Department of Agriculture, *The Rise and Progress of the South Australian Fruit-growing Areas on the River Murray*, Bull. 168 (Adelaide: Government Printer, 1922), Table II.

† Not available.

3,000 acres below Wellington in the Jervois area to-day. The highly productive soils here led to quick success and this stimulated more development of the flats. In 1896, A. McFarlane developed 700 acres on the opposite bank, and between 1882 and 1908 H. W. Morphett & Co. reclaimed 650 acres at Woods Point with others following on different parts of the lower Murray. Private development of the swamps aroused public interest and the State commenced reclamation of the Mobilong and Burdett swamps near Murray Bridge in 1904-05. Long Flat and Monteith followed in the same year and, in 1909, work was started on the Mypolonga, Pompoota and Wall swamps. As each area became available it was gazetted for settlement under a management board with four local farmer representatives and a government official as chairman. This was comparable to the Water Supply Trusts of New South Wales.

In 1910, irrigation in South Australia came under the control of an Irrigation and Reclamation Department (later merged with the Department of Lands) whose Director was sent overseas to gain experience of water projects. The failure of the "village" settlements, the lessons of Victorian irrigation and the general growing awareness of the need for State-sponsored closer settlement contributed to a rapid awakening of public interest in irrigation and the need for government controls and subsidy. The tremendous impact of the droughts between 1897 and 1902 and in 1914-15 greatly influenced this as it did in New South Wales and Victoria. Their effect in South Australia was to encourage better water supplies for dryland agriculture and the promotion of irrigation as an instrument of closer settlement to

combat the tendency for declining populations in marginal wheat areas. This growing tempo of Government activity in water development was actuated by similar forces described for the other two States.⁷⁸

Major areas of development to the 1914-18 War were at Renmark and Waikerie (part of which embraced the older "village" settlements of Waikerie, Ramco, Holder), and also at Kingston and Moorook which were old "village" settlements taken over by the Government in 1910 and 1912. Development also occurred at Berri.

Progress After 1918

As shown in Fig. 3 (p. 104), the major and most rapid development of irrigation along the Murray in South Australia occurred after the 1914-18 War and until the early 1920's. The irrigation schemes of this period formed part of soldier and civilian (local and immigrant) settlements promoted by the State along the same lines and for the same reasons as the closer settlements of New South Wales and Victoria.⁷⁹ In South Australia, as in Victoria, expansion along the Murray during this phase was made possible by the River Murray Agreement of 1914, which assured South Australia a reasonable share of Murray waters with Lake Victoria as the storage.

Specialist fruit growing (dried vine fruits, citrus, wine grapes, and tree fruits) were paramount above Morgan with chief centres of development at Cadell, Waikerie (extensions at Holder), Renmark, Cobdolga, Moorook, and Kingston. Lower down the Murray, dairying (plus some sheep fattening) were stimulated by further expansion of the reclaimed swamps after 1920 with main progress at Wellington, Jervois, Wall, Pompoota, Neeta, Cowirra and Baseby.⁸⁰ Soldier settlement was concentrated at Cadell, Berri, Chaffey, Pompoota, and Neeta, whilst civilian settlement was more important at the other centres.⁸¹

Under the *Irrigation Act* (1914), the land allotted to each settler in the State irrigation projects was granted as perpetual leases with a maximum area of 50 irrigable acres per landholder. Some additional drylands above the main supply channels were granted to encourage dryfarming in conjunction with irrigated farming, particularly in the case of dairyfarms. Where partnerships were involved, a maximum of 150 irrigable acres to

⁷⁸ For an example of the State publicity given to closer settlement by irrigation in South Australia, see Government Immigration, Publicity and Tourist Bureau, *River Murray; Opportunities for Irrigationists* (Adelaide: Government Printer, 1913).

⁷⁹ This period coincided with the middle and later phases of extensions of railways and closer settlement for dryland wheatgrowing into the Murray-Mallee districts of South Australia. The growth of irrigation settlements along the Murray in this period occurred during a phase of "general prosperity" despite problems of the 1914-15 drought and the 1914-18 War. See Fenner, "A Geographical Enquiry into the Growth . . . of Population in South Australia, 1836-1927", *op. cit.*, Fig. 16, p. 121, and discussion on pp. 135-139.

⁸⁰ A description of some of the problems encountered in the early closer settlements for dairying is given in: South Australia, *Report of Parliamentary Committee on Dairy Questions on the River Murray Reclaimed Swamp Areas* (Adelaide: 1922).

⁸¹ A brief summary of each of the Murray Settlements by 1929 is given in *Official Year Book of Australia*, No. 22 (1929), pp. 879-882.

each partnership was stipulated. The Government carried out the erection of works such as pumping plants, main channels, and initial development of the land necessary to make it ready for settlement. Liberal financial assistance was given to each settler; the State was empowered to grant cash advances to settlers for certain approved works.

By December, 1928, the irrigation areas above Morgan under State control amounted to some 27,986 acres of irrigable land. These were allotted to 1,173 settlers of whom 495 were soldier settlers. On the reclaimed swamps under Government control in the same year, a total of 10,234 acres of irrigable land were included in irrigation projects with 941 acres of high land irrigable (chiefly for fruits) and 9,293 acres of reclaimed land irrigable for lucerne and pasture. These lands were allotted to 217 settlers of whom 36 were ex-soldier.⁸²

In 1930, the major irrigated areas in South Australia along the Murray were at Cobdolga, Loveday, Nookamka, Ral Ral, Berri, Renmark, Cadell, Waikerie, Kingston, and Jervois. In the fruit settlements above Morgan, a reduction of fodder cropping had occurred and, after the initial upsurge to the early 1920's, the acreages of fruits stabilised because of the onset of marketing problems which beset all similar development in Australia at that time. On the reclaimed swamps, a peak of development was reached rapidly by the early 1920's and only slow expansion was recorded after this.⁸³ Hence, present irrigated areas along the Murray in South Australia were largely formed by the late 1920's; there was little development to 1950, partly because of marketing and land management problems and partly because most of the "safe" water supplies were committed early. Some further expansion occurred after 1950, mainly for soldier settlement with the chief new areas of expansion at Loxton and Cooltong and an emphasis on fruit growing.

Important adjustments in land development occurred throughout the irrigation settlements during the 1930's; some were directed at the problems of rising water tables and soil "salting". Major adjustments were made to farm sizes as the early pattern proved inadequate with deterioration in the marketing position and changes in the productivity of soils. On the lower Murray, an important change was the increase in the size of dairyfarms arising out of an official enquiry⁸⁴ which showed the need for non-irrigated Mallee lands as an adjunct to the reclaimed and irrigated lowlands. The object was to achieve the benefits of "on-farm" integration described in Part II for the Swan Hill dairyfarms.

5. NEW SOUTH WALES

The first major expansion of irrigation in New South Wales occurred between 1906 and 1930, i.e., during the second period of development in Victoria. Whilst the southern State has continued her second phase with

⁸² *Ibid.*, pp. 879 and 881.

⁸³ These trends have been observed from a study of statistics published annually in the *Statistical Register of South Australia*. Changes in the effectiveness of resource use in irrigation areas during the 1930's should be viewed as part and parcel of more general improvements in farming throughout South Australia as in other States. See Davidson, *op. cit.*, p. 147.

⁸⁴ South Australia, Parliamentary Paper, *Report of the Irrigation Royal Commission* (1925), see comments on reclaimed swamps.

reduced momentum to the present day, New South Wales embarked on a new era of "extensive" projects after 1930 which continued (with war-time interruptions) until about 1955. Since then, the first steps have been taken in the current phase which should last for several decades, one of "intensive" irrigation with a new twist, using waters becoming available from the Snowy Scheme. For our present purposes, the first and second phases, from 1906 to 1930 and from 1930 to 1955, are the most relevant.

Once it began, Government sponsorship of water projects has been just as active in New South Wales as in Victoria and for the same reasons of physical geography. In fact, the greater distance of irrigable lowlands from headworks and diversion weirs, a product of the more gentle gradient of the lowlands, has made development even more expensive in New South Wales and the need for State-sponsorship more pronounced. The main difference with Victoria has been the later stage when Governments saw fit to commence schemes and the lesser emphasis given to "intensive" projects north of the Murray. This latter feature seems to stem from three related factors of the physical geography of the irrigable lowlands:

- (i) Their greater distance from the metropolitan and political centre in New South Wales (see Fig. 2).
- (ii) Their relatively less important position in the economy of the State.
- (iii) Their proximity to the alternative markets in Victoria and its metropolitan and political centre (see Fig. 2).

The Period to 1905⁸⁵

A number of important enquiries into problems of using the water resources of New South Wales were undertaken in this period but little was achieved in developing irrigation projects. By 1906 the only projects that had emerged in the southern Murray Basin were two small Trust schemes, one at Hay and the other at Wentworth; these were modelled on the contemporary Victorian projects and both suffered from problems of poor soils and inexperience of settlers. Nevertheless, they have persisted to the present day under Government control, the Wentworth scheme being changed at a later date to the Cullwaa Irrigation Area.

There are several major reasons why New South Wales lagged behind Victoria in water development for irrigation to 1905. Firstly, because of its greater distance from the major goldfields and remoteness from the State political centre, southern New South Wales felt the impact of the closer settlement after the Gold Rushes much less than did northern Victoria. As a result, the major upsurge of wheatgrowing and the first impact of drought on it, which triggered off interest in water development in Victoria after 1880, occurred in New South Wales at a later date; the lag between the two States amounted to about two decades as indicated by the com-

⁸⁵ For a brief history of this period see New South Wales Parliamentary Standing Committee on Public Works, *Report Together with Minutes of Evidence . . . Relating to the Proposed Barren Jack Storage Reservoir and Northern Murrumbidgee Irrigation Scheme* (Sydney: Government Printer, 1906).

parison between the Northern Division and the Riverina Division in Fig. 4. It was not until this arable land settlement was hit by the droughts of 1897 to 1902 that New South Wales displayed as much interest in water development as did Victoria after 1880. A second explanation for the lag of development in New South Wales is that, during the phase of extensive pastoralism to 1890, the Riverina tended to be linked economically much more with Melbourne than with Sydney, particularly as the southern capital offered better marketing facilities.⁸⁶ Hence, any socio-economic impact of drought in the Riverina was felt more in Melbourne than in Sydney, although public investment to correct it would necessarily have had to stem from the latter. A third factor retarding development in the Riverina was the long-standing inter-State discord over the use of the Murray which was not healed until 1914. All three factors combined to impede any special Government activity for promoting irrigation in southern New South Wales and the State occupied itself with developing better water supplies for Sydney as well as assisting graziers to develop bores and water facilities for stock.

The period to 1905 was not without a great deal of public interest in the question of water development throughout New South Wales, particularly in the southern Murray Basin, although this tended to wax and wane with seasonal variations. The Lyne Royal Commission which sat between 1884 and 1887 carried out very comprehensive enquiries into the scope for water development; it also consulted with the Victorian Commission of the same period and their proposal that the Murray should become the joint property of the two States triggered off much of the bitterness about the development of this river that persisted in South Australia for many decades.⁸⁷ The Lyne Commission submitted three reports and drafted legislation which covered such important matters as definition of water rights, the national administration of water projects, and the question of local Trust controls. The Commission emphasised the paramount importance of the Murray and Murrumbidgee to New South Wales and expressed the view that the latter river presented superior conditions for water storage. However, public interest in the matters raised by this enquiry lessened with the onset of good seasons.

Following Victorian precedent, the New South Wales Parliament nationalized the water resources of the State and established a system of licensed diversions. The *Water Act* of 1896 led to the formation of a Water Conservation Service under H. G. McKinney (one-time engineer to the Lyne Commission and previously an irrigation expert in India).

⁸⁶ This orientation to the southern "entrepôt" is borne out by a map in R. S. Parker, "Australian Federation: The Influence of Economic Interests and Political Pressures", *Historical Studies Australia and New Zealand*, Vol. 4, No. 13 (November, 1939), pp. 1-24. One reason for the greater links with Melbourne was the preference of many woolgrowers for the wool-selling facilities there (see Debate on Proposal to Resume Tuppall Estate, New South Wales Parliamentary Debates, Session 1910).

⁸⁷ See comments by South Australian representative in New South Wales Parliamentary Paper, *Interstate Royal Commission on the River Murray Representing the States of New South Wales, Victoria and South Australia* (1902).

McKinney instituted a comprehensive system of river gaugings and carried out detailed studies of the Murrumbidgee and Murray Valleys. The publicity he gave to irrigation helped to keep the subject alive politically.

At the request of the Government, Colonel Home, an expert from India, undertook a comprehensive study of the scope for water development north of the Murray. His report⁸⁸ of 1897 emphasised that two projects were most likely to succeed; the first envisaged diversion from the Murray by a weir at Bungowannah for developing country now occupied by the present Berriquin Irrigation District and the proposed Corurgan District to the east of it; the second involved diversion of the Murrumbidgee waters southward by means of a weir below Yanco Creek offtake to water country to the south-west of Narrandera in an area now proposed for development in a "Billa-bidgee" Scheme using Snowy Scheme waters. Home expressed the view that the Murrumbidgee scheme was "more likely to succeed than to pay for a canal from the Murray River" and he selected "Barren Jack" as the site most suitable for storage because of its nearness to the irrigable plain and local physiographic conditions which made for cheap storage. However, with the pattern of settlement still very extensive over much of the Riverina, little interest was taken in Home's proposals, particularly as he was pessimistic about the scope for using irrigation either for new industries like fruit growing (because of the small Australian population) and for existing dryland agriculture.

By the late 1880's and 1890's, closer settlement for wheatgrowing was beginning in the central and eastern Riverina (see Fig. 4), aided by an influx of Victorians who were attracted by the relatively cheap land north of the Murray available under the *Land Act* of 1884. The development of railways serving the wheat areas and the imposition of differential rail freights, tended to bring the Riverina into greater economic and political bondage with Sydney so that the political powers centred there became more interested in the welfare of the south-west. It should be noted, however, that the major upsurge of wheatgrowing in and near areas now affected by "partial" irrigation schemes did not occur until after the 1914-18 War (see Fig. 4). A run of good seasons helped closer settlement for wheatgrowing in its early stages but a major reverse was encountered with the droughts between 1897 and 1902.⁸⁹ This gave rise to much public agitation for better water supplies in the Riverina.⁹⁰ As a direct result, the important Corowa Conference was called in 1902 with attendance by leading politicians from the Commonwealth and other governments as well as many persons with interest in water projects.⁹¹ This Conference stressed the poor development in New South Wales compared with Victoria and emphasised the scope for projects to assist new industries as well as more stability in the

⁸⁸ F. J. Home, *Report on the Prospects of Irrigation and Water Conservation in New South Wales* (Sydney: Government Printer, 1897).

⁸⁹ R. T. McKay, "The Utilization of the Murrumbidgee Waters", *Agricultural Gazette of New South Wales*, Vol. XVIII, Part 2 (February, 1907), p. 103.

⁹⁰ Similar agitation led to the formation of the Australasian Federation League which was "destined to grow into the main propagandist organization advocating federation". This "sprang directly from the economic grievances and political pressures of the border districts", see Parker, *op. cit.*, p. 22.

⁹¹ See *Official Report of the Corowa Conference . . . 1902* (Berrigan: "Advocate", 1902).

existing dryland economy. As a result of the Conference, the Interstate Royal Commission of 1902 was set up to closely investigate the future of the Murray River. It emphasised the need for agreement between the States but this was delayed for another 12 years. The Commission was partly to blame for this because it re-affirmed the conviction of New South Wales and Victoria that irrigation should have priority over better navigation; South Australia had always pressed more for the latter although she was not at all disinterested in irrigation. She feared the impact on her vital water supplies of excessive diversions by the upstream States.

In 1904, Wilson, an engineer of the Department of Public Works, carried out investigations of possible development using waters from the Murray by diversion at the proposed Bungowannah Weir, for the purpose of encouraging "partial" irrigation for existing farms on the basis of water rights of about 1 in 9.⁹² Following this in 1905, L. A. B. Wade of the same Department closely investigated schemes for the Murrumbidgee Valley. Assisted by experts of the Department of Agriculture, he concentrated on areas north of the river in country not investigated previously by Home. Arising out of this basic study by Wade, the Department of Public Works convened a Sydney conference on water development in 1905.⁹³ This was attended by many persons from the three eastern States and it considered three major schemes for developing the riverine plain. Two were to be located north and south of the Murrumbidgee and one flanking the northern bank of the Murray. These schemes were elaborations and modifications of those suggested earlier by Home and McKinney, and they were to be based on storages at Barren Jack (now Burrinjuck) on the Murrumbidgee and Cumberoona on the Murray. The 1905 Conference urged the Government to develop the Murray and assert its rights over its share of the stream; it also expressed its belief in State-sponsored development although it saw "no objection to . . . schemes being carried out by private enterprise" with certain provisos, if the Government failed to embark on projects "within a reasonable time".⁹⁴ The Conference expressed its confidence in Trust administration as allowed under the *Water and Drainage Act* of 1902 and re-affirmed the tremendous scope for more irrigation in New South Wales, both for new industries and for greater production stability in existing ones.

It was made clear at the 1905 Conference by C. A. Lee (Secretary of the Conference and Minister for Public Works) that the Government was then alive to the need for State-sponsored projects on the interior lowlands and developments in Western America, Victoria and South Australia were cited as examples of what could be achieved. After admitting the tardiness of the State in this field, Lee affirmed⁹⁵ that:

"we intend to deal with the question in conjunction with our closer settlement policy and thereby create facilities for developing and settling people on that part of the country which is not provided with the much-needed reliable water supply.

⁹² See New South Wales Parliamentary Standing Committee on Public Works, *Report . . . on Proposed Railway from Rand (Lake Billabong) to Ringwood* (1922), evidence by H. H. Dare, p. 27.

⁹³ See *Conference on Water Conservation and Irrigation: Report Containing Minutes of Proceedings and Debates* (Sydney: Government Printer, 1905).

⁹⁴ This was not in accord with McKinney who favoured private enterprise.

⁹⁵ See *Conference on Water Conservation* (1905), *op. cit.*, p. 11.

. . . closer settlement of a profitable character cannot be attempted in that portion of the State which has the advantages of soil and climate, but for want of water is to-day carrying but a limited number of people."

"Intensive" Irrigation, 1906 to 1930

This was the most spectacular phase of irrigation development so far in New South Wales and was dominated by the emergence of the Murrumbidgee Irrigation Areas after 1912, with the creation of Burrinjuck Dam and Berembidj Weir. The increasing tempo of Government interest in water development early this century formed part of a more general process of closer settlement promoted under the Crown Lands Acts of 1895 and 1903 and the Closer Settlement Acts of 1901 and 1904.⁹⁶ Early this century the Riverina offered much scope for closer settlement, particularly as the average size of farms there was large because:

"the auction and improvement clauses of the Crown Lands Act of 1861 were extensively brought into operation for the purpose of consolidating holdings and preventing the land from falling into the hands of free selectors, whom the great pastoral lessees did not look upon as desirable neighbours."⁹⁷

The droughts of 1897 to 1902 had a great impact on Riverina development and achievements in water development south of the Murray on comparable country heightened public awareness of the need to rectify the position north of the river. However, when conditions became ripe for major State investment in water development, it was natural that efforts should first be made in the Murrumbidgee Valley rather further south near the Murray. The Murrumbidgee was not handicapped by the same degree of interstate rivalry as was the Murray and its closer proximity to Sydney was greatly in its favour. A variety of factors conditioned the detailed design of the first Murrumbidgee project—the Murrumbidgee Irrigation Areas and their basic works at Burrinjuck and Berembidj. These are worth detailing here because they are splendid examples of the interaction of physical and cultural geographic factors that have shaped "intensive" development and its associated patterns of integration in other parts of the riverine plain south of the Murray.

The Murrumbidgee Irrigation Areas

(i) *Timing of Development*

These projects were planned soon after 1900, but prior to the arrival in Australia of Elwood Mead and the change to "intensive" irrigation which he encouraged, particularly in Victoria, but also in New South Wales. The M.I.A. project reached an advanced planning stage during the twilight period of Trust development in Victoria. Conditions by this stage had emphasised the need for greater government control over district location, farm types and water use, as well as State-sponsorship of large-scale head-work.⁹⁸ Victorian experience had shown also the need for measures to ensure that closer settlement was achieved to give a financial return from

⁹⁶ See an account of this legislation in *Official Year Book of New South Wales*, 1905-06 (Sydney: Government Printer, 1907), pp. 88-151.

⁹⁷ *Ibid.*, p. 145.

⁹⁸ See Parliamentary Standing Committee on Public Works, *Report Together with Minutes of Evidence* . . . (1906), *op. cit.* Evidence by Wade, pp. 65 and 72, and pp. 88-89.

public works. However, the policy of "partial" irrigation to assist dryland production was still accepted as well. It was natural, therefore, that the M.I.A. project when first planned should embrace both resource development and production stability—both "intensive" and "extensive" irrigation.

(ii) *State Development Policy*

A combination of physical and cultural factors moulded State policy during the early phases of the Murrumbidgee scheme. These can be summarised under five headings as follows:

Choice of Dam Site: After careful study over many years of the eastern highlands, the decision was made finally to choose Barren Jack as the site for major headworks on the Murrumbidgee River. This site exploited a relatively narrow juvenile gorge with a hard granite floor which allowed the dam to be placed relatively close to the irrigable lowlands but sufficiently downstream below headwater tributaries to ensure considerable storage. The shape of the gorge was such that the maximum storage could be achieved with the minimum expenditure on the dam wall, the height of which was limited only by requirements of safety.⁹⁹

Choice of Site for Diversion Weir: Having regard to the choice of suitable irrigable lands (see below), Berembed Weir site was selected for diversion north of the Murrumbidgee for several reasons.¹⁰⁰ It was the narrowest point of the valley between Wagga and Narrandera, sufficiently downstream to reduce flood damage of the offtake canal and to ensure proximity to irrigable plain, but upstream enough to ensure the greatest command over this plain. The site also possessed a rocky bar giving good foundations, always difficult in alluvial country.

Choice of Channel Route: For reasons detailed below it was decided to commence irrigation development in the Murrumbidgee Valley west of Narrandera but to the north of the river between Yanco and Gunbar. The offtake channel from behind Berembed Weir was so located as to run round the lower slopes of the McPherson and Cocoparra ranges to give command over the entire riverine plain, particularly the "first-class" irrigable country which surveys showed to be much more prevalent around the foothills of these uplands than elsewhere in the valley. The main channel was to be taken 132 miles from Berembed towards Gunbar. A subsidiary channel was also to run parallel to the Murray towards Hay to give domestic and stock supplies, plus limited irrigation facilities to large dryland properties.

Choice of Irrigable Land.—Surveys carried out by the Department of Public Works, aided by the Department of Agriculture, had shown that there were about 6,500,000 acres of irrigable country in the lowlands of the Murrumbidgee Valley west of Narandera. This land was divided into three classes and it was determined that only about 200,000 acres were "first-class". Of this, about 177,700 acres occurred in a narrow strip between Yanco and Gunbar in the northern half of the valley and skirting the McPherson and Cocoparra ranges. The original scheme was to divert water

⁹⁹ See Parliamentary Standing Committee (1906), *ibid.*, p. 20.

¹⁰⁰ *Ibid.*, pp. 24-25, and pp. 68, 73 and 86. Also, L. A. B. Wade, "Irrigation from the Murrumbidgee River New South Wales", paper read before Sydney Univ. Eng. Soc. (1909), p. 20.

from the Murrumbidgee (as controlled by Barren Jack storage) both to the northern and southern sides of the river on to "first" and "second" grade land and for some scattered "partial" irrigation on "third-class" land. In view of the lack of experience with irrigation and the uncertainty of future needs in the Valley, it was decided to begin north of the river on "first-class" land. Should this prove successful, a later decision would be made on the extent to which further development would take place north or south of the river.

Irrigation north of the Murrumbidgee was to be tried in two major zones. The first was north of Mirrool Creek with emphasis on "first-class" land in the Mirrool District No. 1 which corresponds to the central and eastern portions of the present Mirrool Irrigation Area. Further expansion was envisaged west of this to the Benerembah District No. 2 and the Wah Wah District No. 3, which occupied parts of the present Districts of these names. The second area for development was south of Mirrool Creek towards Yanco, again with emphasis on Yanco District No. 1 near to the ranges and possible further expansion on to lower and heavier soils west of this. The Yanco No. 1 District coincided with much of the present-day Yanco Irrigation Area. The plan was to develop first in the Mirrool No. 1 area, because the soils north of Mirrool Creek were regarded as superior to those south of it. In addition, whereas dryland farmers near Yanco (including McCaughey with his famous irrigation scheme at Yanco) had been successful in developing their properties, the same did not apply north of Mirrool Creek. Conditions made resumption of lands north of the Creek much easier and cheaper than south of it and it was felt that landholders to the south would gradually subdivide their lands for irrigation following the application of compulsory water rights along Victorian lines.

The best agricultural advice of the day placed a high value on the scope for irrigation north of Mirrool Creek in Mirrool District No. 1. Here it was considered that the gentle slopes would lend themselves well to gravity supply and:

"the lands in the vicinity of, and most recently shed from, the hills are the most suitable in their mechanical properties, and at the same time are the equal to any other soils in their chemical constituents."¹⁰¹

These lands were classed as:

"first-class for irrigation purposes, being rich, red, loamy soil with a subsoil of limestone formation, which forms good natural drainage."¹⁰²

Whatever the defects in early assessment of potential irrigation land, there is ample evidence that a searching enquiry was made into the problem for the 1906 Public Works Enquiry. The selection of the Mirrool No. 1 District for initial development was based on the belief that, of all areas in the Murrumbidgee Valley, it was most suited to intense culture and the training of uninitiated settlers in irrigation techniques. Closer Settlement between Yanco and Gunbar as a whole had the added attraction that it would ensure financial salvaging of the Narrandera to Hay railway which was then being run at a huge loss.¹⁰³

¹⁰¹ See Parliamentary Standing Committee on Public Works (1906), *op cit.*, p. 30.

¹⁰² *Ibid.*, p. 47.

¹⁰³ *Ibid.*, pp. 467-468. Undoubtedly, this was one of the factors which persuaded the Government to agree to the Murrumbidgee Scheme.

Choice of Types of Farms.—Experience in Victoria and western America, coupled with current programmes to aid closer settlement in New South Wales, persuaded the Department of Public Works to favour relatively “intensive” projects during the initial stages of development in the Murrumbidgee Valley. Official opinion was generally opposed to “partial” irrigation schemes to aid existing dryland farming of broad acres as postulated earlier by Gibson, McKinney, Wilson and others.¹⁰⁴ Various factors can be cited to explain this Government policy in 1906.

Early this century, the Government of New South Wales was engaged in an overall programme to sponsor closer settlement, particularly to provide opportunities for immigrants from the United Kingdom. This programme had been hampered by a lack of suitable Crown Lands in the better-watered parts of the State. Irrigation of interior plains was welcomed as a means of overcoming this problem. On the level of project planning, Government architects of irrigation schemes were convinced that a rapid process of State resumption and resale of land, coupled with closer settlement programmes, was essential to the success of the Murrumbidgee Irrigation Scheme. It was estimated that resumed lands would return twice their cost when resold after water supplies had been developed, and the scheme allowed for complete settlement of the “first-class” land in fifteen years. The fact that New South Wales was, in 1906, a net importer of fruits and vegetables, helped to persuade authorities to recommend compact “intensive” irrigation projects. Mildura and Wyuna in Victoria and Salt Lake City in the United States were cited as the “shape of things to come” on the Murrumbidgee.

However, the promotion of fruit and vegetable growing communities was not the major aim of the Murrumbidgee Irrigation Scheme as planned in 1906. Because of cheap water supplies, it was thought that dairying and fodder growing (for fattening stock and sale to dryland farmers) would be the main industries on heavier soils and “beginning” industries for fruit growers. The scheme was to develop several towns and, around them, to set up concentric belts of farming with small fruit-vegetable blocks of 5 to 20 acres nearer the towns and on the best soils. These were to be surrounded by larger farms (20 to 100 acres) given over to dairying with “partial” irrigation—20 to 25 acres watered and the balance dry. These farms would specialize in dairying, stock fattening, and sale of hay to dryland farms. Pre-irrigation landholders were to be given a “living area” of 100 irrigable acres in the new venture.

The success of the Murrumbidgee Scheme was to be founded on State land resumption, rapid settlement, the application of compulsory water rights, and careful State subsidy and leadership. It was agreed that the project should begin in a small way, and then expand according to the dictates of later conditions. A total of 196,000 acres of “first-class” land and 162,000 acres of “second-class” land were to be developed mainly by allocating water rights of 1 in 3½; but 1,000,000 acres of “third-class”

¹⁰⁴ The case of these protagonists was not helped by the fact that the Department of Public Works obtained no response to a questionnaire it sent to dryland farmers on the riverine plain of the Murrumbidgee to obtain their views on the scope for irrigation.

land (towards Hay) were to be given a domestic and stock water supply and sufficient water to allow scattered "partial" irrigation of some 30,000 acres in order to provide "an absolute insurance against drought".¹⁰⁵

Although Chaffey, Lever, and others with experience of the Mildura and similar projects stressed the need for caution in expanding fruit production in view of marketing difficulties,¹⁰⁶ the official view of the Department of Agriculture was optimistic. Dried vine fruits (particularly sultanias), citrus and other tree fruits, and vegetables were recommended for development and a rosy picture was painted of the ability of local and overseas markets to absorb the production of the Murrumbidgee Scheme. It was agreed that the Government would have to provide a great deal of assistance during the early phases of the project but few officials doubted its ultimate success.

In his comprehensive study of the Murrumbidgee Valley, Langford-Smith¹⁰⁷ has been very critical of the planning of the Murrumbidgee Irrigation Areas. He alleges that an undue weight was given to engineering issues and too little attention was devoted to agricultural and economic problems. He supports this by quoting the relatively small space accorded to the latter problems, in contrast to detailed treatment of engineering issues, in the 1906 Report of the Public Works Committee. Few would argue against the case that many mistakes were made in the early development of the Murrumbidgee Scheme; but Langford-Smith appears to overlook the fact that his case rests on hindsight and he inadequately assesses the attention accorded agricultural and economic problems. A careful reading of the Minutes of Evidence at the 1906 Public Works enquiry (as distinct from the official Report itself) shows that numerous government experts were closely questioned on these points and there was complete unanimity as to the soundness of the Murrumbidgee project on agricultural and economic grounds. That these issues received relatively small space in the Report of the Committee is a reflection of the fact that there was less agreement on other engineering issues and relatively more space was devoted to them in a report designed to persuade Parliament of the wisdom of proceeding with the venture. History has proved that mistakes were made on some vital agricultural and economic problems but, in the light of knowledge available to government authorities of the day, it seems that every reasonable effort was made at a sound agricultural and economic assessment of the proposal, based on Victorian and overseas experience.

The Development of the MIA from 1912 to 1930

The Public Works Committee of 1906 approved the Murrumbidgee Irrigation Scheme and it was authorized by the *Burrinjuck and Murrumbidgee Construction Act of 1906*. Work on the Burrinjuck Dam was started in 1907-08 followed by work on the Berembed Weir and the Main Canal.

¹⁰⁵ R. T. McKay, "Utilization of Murrumbidgee Waters", *op. cit.*, pp. 107-108. See also: *Report of the Standing Committee on Public Works (1906)*, *op. cit.*, pp. 47-54.

¹⁰⁶ Evidence to Parliamentary Standing Committee on Public Works (1906), *op. cit.*, p. 117.

¹⁰⁷ T. Langford-Smith, *Landforms, Land Settlement, and Irrigation on the Murrumbidgee, New South Wales*, unpublished thesis submitted for the Degree of Doctor of Philosophy in the Australian National University, 1948. See especially pp. 143-144.

Water was first supplied in 1913 when the Murrumbidgee Irrigation Scheme was opened. Prior to this, an Agricultural Experiment Farm was set up in 1908 at Yanco under the Department of Agriculture; it was located on land made available by McCaughey and its purpose was to explore agricultural problems of local irrigation development and give advice to settlers. By the *Murrumbidgee Irrigation Act* (1912), control of the irrigation area was vested in a Trust comprising the Ministers for Public Works, Lands, and Agriculture (in contrast to the local government control of earlier Victorian Trusts). The *Irrigation Act* (1912) came into operation in 1913 when a Water Conservation and Irrigation Commission began to operate in place of the Trust, with Wade as its sole member. After Wade's death, the Commission was established with three members in 1914 along present lines.

During the early years, the Commission was given very considerable control over the Murrumbidgee Scheme including:¹⁰⁸ construction of channels, roads, and other works, local government functions, establishment of townships, water supply, sewerage and power supply, setting up processing factories and giving financial and other aid to settlers. Following the *Report of the Water Conservation and Irrigation Advisory Committee* in 1935,¹⁰⁹ some of these functions were transferred to other bodies.

Land acquisition began under the *Murrumbidgee Resumption Act* (1910) which authorized the resumption of about 1,668,000 acres between Yanco and Gunbar. Later, the *Crown Lands Consolidation Act* (1912) provided that all lands acquired under earlier legislation should become Crown land to be disposed of as Perpetual Leases.

Contrary to earlier plans, the Murrumbidgee closer settlement scheme first began south of Mirrool Creek, just north of Yanco in the area now flanking Leeton in the Yanco Irrigation Area, i.e., in country previously designated "second-class". It was not until soldier settlement after 1918, that the "first-class" country north of Mirrool Creek (now in the Mirrool Irrigation Area) was greatly developed for closer settlement. This change of policy was due to several factors including:

- (i) The fact that McCaughey readily agreed to let the State resume his land (North Yanco) at the relatively low value of £3 10s. per acre.
- (ii) Rising costs of development between 1906 and 1912 which meant that it was more economic to develop first as close to the diversion weir as possible.
- (iii) Proximity of the Yanco Area to the existing rail line from Narrandera to Hay.
- (iv) The suitability of the soils near Yanco to intensive development, even if they were considered earlier as "second-class".

By the time the farm settlement of the Murrumbidgee Scheme got under way after 1912, Victorian policy towards irrigation development had changed radically under the influence of Elwood Mead. This greatly affected the decision of the New South Wales authorities to abandon their

¹⁰⁸ See *Official Year Book of Australia*, No. 15 (1922), pp. 442-444.

¹⁰⁹ *Report of the Water Conservation and Irrigation Advisory Committee . . .* (Sydney: Government Printer, 1935).

earlier intention of promoting "partial" irrigation on farms up to 100 acres in size and to concentrate on smaller and more "intensively" developed properties, i.e., fruit-vegetable farms of from 10 to 20 acres and dairy-sheep farms from 20 to 50 acres with 100 per cent irrigation. The earlier policy of using only half the Murrumbidgee water south of the river was altered and all available supplies were committed to "intensive" development in the north. The main canal as originally designed soon proved inadequate, especially for the planned extension north of Mirrool Creek and was altered later.¹¹⁰

In 1923, Elwood Mead, at the request of the New South Wales Government, submitted three reports dealing particularly with irrigation development in the Murrumbidgee and Murray Valleys.¹¹¹ These submissions had a great influence on the shaping of irrigation policy during the 1920's and they included the following propositions:

- (i) Irrigation should be devoted largely to "intensive" projects for the purpose of growing lucerne and other fodders, both for sale to dryland farmers and for fattening stock on the irrigation farm. It was suggested that graziers and irrigationists should enter into contracts for this purpose and the sale of fodder should be handled through Co-operative Lucerne-Growing Associations. The latter would allow "great economies in production". Victorian precept was quoted as an example of what irrigation could achieve in this field. Mead envisaged the lucerne farms as small properties between 25 and 50 acres and averaging about 40 acres. The aim was to develop contracts for the sale of 50,000 tons of lucerne yearly by 1930.
- (ii) An earlier scheme to promote market gardening on small blocks (2 to 5 acres) around Griffith should be continued and the State should aim to attract British immigrants with experience in this type of production.
- (iii) Experiments with rice growing on the heavier soils of the Area should be put under way.

In recommending the promotion of lucerne farms, even at the expense of some development of fruit growing, the following advantages of irrigating in the riverine plain compared to Mallee areas were emphasised by Mead:¹¹²

"Water will cost less being distributed by gravitation, a cusec will irrigate more acres because there will be less evaporation, and more moisture will come from rain. These conditions favour lucerne-growing, which, from the national standpoint, is the most valuable crop which can be grown in the irrigated areas.

¹¹⁰ For a discussion of these changes see evidence by H. H. Dare and L. A. B. Wade of the Irrigation Commission in New South Wales Parliamentary Standing Committee on Public Works, *Report . . . Relating to the Proposed Enlarging of the Northern Canal, Murrumbidgee Irrigation Scheme* (New South Wales Parliamentary Paper, 1915).

¹¹¹ See New South Wales Parliamentary Papers (1923) containing:
 Elwood Mead, "Fodder Conservation".
 ———, "Murrumbidgee Irrigation Scheme".
 ———, "River Murray Waters".

¹¹² Mead, "River Murray Waters", *op. cit.*, Parliamentary Paper, p. 116 (p. 2 of report).

"Without disparaging fruit-growing, which is an agreeable and remunerative form of irrigated culture, fruit does not have the value to the surrounding areas that lucerne and other fodder crops have, and there needs in the future to be a closer relation between the dry-farmed and irrigated areas."

Outside of the "non-integrated" fruit areas, it is clear then that Mead, and those who followed his advice, envisaged an active system of "off-farm" integration for the Murrumbidgee Scheme. This was in sharp contrast to the deliberate attempt to reduce farmers' dependence on a system of "on-farm" integration. As planned in 1906, 100 acre dairyfarmers were to have up to 75 acres non-irrigated. However, with the change to smaller farms (less than 50 acres) by 1912, the dryland portion was omitted. This did not meet with the approval of dairyfarmers, but Mead argued that:

"the request of dairy-farmers to be granted more land should not be approved. No permanent prosperity will come from attempting to follow dry-farm methods in an irrigated area."¹¹³

During the 1920's and 1930's, physical and economic problems enforced many radical changes in the pattern of farming on the Murrumbidgee Irrigation Areas.¹¹⁴ Major difficulties were the economic problems of the Depression years as well as waterlogging and damage by "salting". Although these problems were felt most by the fruit industry, a radical change occurred on the grazing properties. A major factor was that the heavier plain soils of the Murrumbidgee project proved unsuited to lucerne with the contemporary cultural practices. Lewis has explained this in terms of soil impermeability, the flat terrain conducive to bad drainage, and the tendency with poor irrigation for water to lie on the surface and "scald" the crop.¹¹⁵ Attempts to organize co-operative exchanges of lucerne also failed,¹¹⁶ but the "permanent" pastures which eventually replaced lucerne in other dairying areas (Victoria and South Australia) had not been developed at this time. As a result, the dairying industry gradually declined and was replaced by new systems of land use, dominated at first by rice growing¹¹⁷ and later by a diversified system of rice-fat lamb production with improved "annual" pastures as the nexus between the two. Both rice and "annual" pastures were well adapted to heavier plain soils but they necessitated radical changes in the sizes of "large area" farms, from less than 100 acres

¹¹³ Mead, "Murrumbidgee Irrigation Scheme" (1923), *op. cit.*, p. 8.

¹¹⁴ See T. Langford-Smith, *Landforms, Land Settlement, and Irrigation on the Murrumbidgee, New South Wales*, unpublished thesis submitted for the Degree of Doctor of Philosophy in the Australian National University, 1958, Chapters 10-14. See also:

New South Wales, *Royal Commission of Inquiry Regarding the General Administration of the Murrumbidgee Areas* (1915 and 1916).

Report of the Water Conservation and Irrigation Advisory Committee (1935), *op. cit.*

¹¹⁵ A. D. Lewis, *Irrigation in Australia* (Pretoria: Irrigation Department, South Africa, 1935), p. 35.

¹¹⁶ H. H. Dare, "Water Conservation in Australia" (Sydney: Simmons Ltd., 1939), pp. 108-109.

¹¹⁷ For studies of the development of the rice industry see: R. B. McMillan, "The Rice Industry in New South Wales", *Review of Marketing and Agricultural Economics*, Vol. 13, No. 7, New Series (July, 1945), pp. 163-167.

Report of the Irrigation Research and Extension Committee, *Rice Growing on Murrumbidgee Irrigation Areas* (Griffith: 1955).

common to dairying to between 400 and 600 acres. These "large area" farms have tended to be based on "intensive" irrigation with little or no "on-farm" integration. In addition, the emphasis on "annual" pastures means that they practise less "off-farm" integration than was envisaged for the lucerne growing properties and less than occurs on farms like those described for the Rochester District in Part II of this study (see September, 1959 issue of this *Review*).

The growing of rice on the Murrumbidgee Irrigation Areas has been favoured by many factors including the heavier plain soils allowing deep and prolonged flooding, the hot dry summer conditions for maturing and harvesting the crop, early development of relatively cheap water supplies (originally for dairying), the introduction of very suitable varieties from California and local improvements, mechanical farming methods, co-operative marketing, assistance from State Departments, a protective tariff, and stable markets produced by controlled production. The industry was greatly stimulated by heavy demands during and after the 1939-45 War. Rice growing has given a high return to producers and this has helped them to introduce improved farm methods that have aided the fat lamb industry. The crop has helped also to improve heavier soils for pastures, especially "permanent" pastures which are increasing in importance. In more recent years, this has improved the scope for some "off-farm" integration involving the fattening of store sheep and beef cattle from dryland areas.

"Extensive" Irrigation 1930 to 1955

By the early 1930's, the major irrigation project in New South Wales was the Murrumbidgee Irrigation Scheme (Yanco and Mirrool Areas) with the two minor Areas at Coomealla and Curlwaa (modelled along the lines of the nearby Victorian and South Australian Mallee settlements) plus several small Trust schemes. Once the rehabilitation of the Murrumbidgee Irrigation Areas had been achieved and Hume Dam was completed, further developments of irrigation became possible during the 1930's in both the Murrumbidgee and Murray Valleys. Over a period of twenty years, large "partial" irrigation districts were evolved including Tabbita, Benerembah and Wah Wah using Murrumbidgee waters, and Berriquin, Wakool, Denimein, Denibootea, and Tullakool using Murray waters. These schemes were designed principally during the 1930's and reflect conditions operating then, even though they did not finally emerge in some cases until after 1945 because of the interruptions of the 1939-45 War and its aftermath. Whilst the aims of these projects have been similar to the projects sponsored by Trusts in northern Victoria after 1886, important differences have been the application of compulsory water rights, and State administration of Districts.

It is an overstatement to argue that the "partial" irrigation schemes were set up as a result of a deliberate change of Government policy favouring this type of development in place of the "intensive" schemes of the previous era. Until the early 1930's, the Government was fully occupied with the Murrumbidgee Irrigation Areas. By the time available funds and water resources made it possible to develop new schemes, economic conditions ruled out further "intensive" projects for growing fruit and rice. We saw earlier, that dryland farmers in the Riverina had been urging for years for "partial" irrigation schemes, and this pressure became much stronger

in the 1930's after further closer settlement of "marginal" wheat areas (see Fig. 4) and the subsequent onset of droughts.¹¹⁸ Because they did not involve the considerable expense of land resumption and initial property development needed for "intensive" projects like the M.I.A., and because they did not mean that the Government was so committed to make each scheme a success, "partial" irrigation schemes to help dryland agriculture were favoured after 1930. The aim was to make limited water resources "available to suitable lands on the widest scale".¹¹⁹

To a large extent, the development of Irrigation Districts (as the "partial" irrigation schemes of New South Wales are called) was the "line of least resistance". The expressed aim of these projects was to aid dryland forms of production like woolgrowing and fat lamb raising. Farmers were to be allotted small water rights (1 in 10 in most cases but a minimum of 50 acre-feet for small farms and as little as 1 in 25 for very large farms) so that they could develop small areas of irrigated fodder production to assist stability in woolgrowing and fat lamb raising.¹²⁰ In the initial phases there was a prohibition on developing more "intensive" systems of farming like fruit growing and rice production. Each scheme was not conceived initially by the Government, as was the M.I.A., but it developed first because of agitation by local farmer groups. An example is the Wakool Irrigation District which was first agitated for by the Western Riverina Development League.

Since they commenced, most of the "partial" irrigation districts have undergone changes in land use from that originally envisaged.¹²¹ Wartime demands resulted in extension of rice plantings to Benerembah, Wakool and Tullakool and there has been a gradual build-up of water rights in all districts. Some post-war closer settlement has occurred, both for "large area" farming (rice-fat lambs) and dairying, and there has been a gradual drift out of earlier pre-irrigation industries like Merino woolgrowing and wheat raising into more specialised fat lamb raising with some rice and dairy production in selected districts.

¹¹⁸ The problems encountered during the late 1920's and 1930's in these marginal wheat areas are discussed in:

J. Andrews, "The Present Situation in the Wheatgrowing Industry in South-eastern Australia", *Economic Geography*, Vol. 12, No. 2 (April, 1936).

New South Wales Parliamentary Paper, *Report of Committee Appointed to Inquire into the Position of Wheat Farmers in the South-West Portion of New South Wales* (1935).

¹¹⁹ *Report of the Water Conservation and Irrigation Advisory Committee* (1935), *op. cit.*, p. 49.

¹²⁰ Accounts of the aims of the "partial" irrigation schemes are given in:

H. H. Dare, "Water Conservation in Australia", *op. cit.*, pp. 106-109.

Report of the Water Conservation and Irrigation Advisory Committee (1935), *op. cit.*, pp. 30-33.

Report of the Board Appointed Under the Provisions of the Water Act, 1912 to 1930, *Proposed Wakool Domestic and Stock Water Supply and Irrigation District* (Sydney: Government Printer, 1932).

¹²¹ These changes are discussed in:—

J. Rutherford and L. Dillon, "Dairy Farming in the Berriquin and Denimein Irrigation Districts", *Review of Marketing and Agricultural Economics*, Vol. 22, No. 2 (June, 1954), pp. 87-164.

F. H. Gruen, "Stocking Rates in the Berriquin and Wakool Irrigation Districts", same *Review*, Vol. 21, No. 2 (June, 1953), pp. 113-140.

As originally developed, the "partial" irrigation districts meant very active "on-farm" integration, mainly of the types discussed for the Loddon Valley in Part II of this study. It is reasonable to conclude that this was a major State aim in sponsoring these projects. For the reasons given earlier in Part II, little "off-farm" integration has been possible, except for the purchase of replacement ewes by irrigators fattening lambs and we have seen that this has afforded little assistance to dryland areas. The more recent trend towards a greater dependence on irrigated land as water supplies have increased has meant a decline in the importance of "on-farm" integration, particularly in districts closer to the eastern highlands, where conditions of water supply and soils allow relatively more dependence on irrigated land. However, where this has allowed the production of "permanent" pastures on any scale, the scope for "on-farm" integration has increased. Until very recent years there was no evidence that the Government's assistance of this development of "permanent" pastures by allocating more water supplies was a deliberate policy to promote "off-farm" integration.

The creation of "partial" irrigation districts in southern New South Wales after 1930 had a marked effect on the location of irrigation and its associated patterns of integration. We have seen how many of the old "partial" irrigation schemes of Victoria were developed after 1886 well out on the riverine plain using "low" plain easily commanded by rudimentary works, including the use of braided stream courses as water carriers. The promotion of "partial" irrigation districts in New South Wales, some fifty years later, led to a similar growth of projects well out on the plain, but for different reasons. In the case of the Murrumbidgee projects, "partial" irrigation was developed west of the M.I.A. to use waters left over from the closer settlements, hence location on the interior plain was necessary if land was to be readily commanded by gravity after outfall from the M.I.A. Further south in the Riverina the inner plain was developed first in the Wakool Irrigation District in the early 1930's because, in spite of delays in interstate agreement over the Murray and the erection of the major diversion weirs, it was possible to anticipate the completion of Hume Dam by developing the Wakool District on the basis of Steven's Weir on the Edwards River (an effluent of the Murray) which was not subject to control by the River Murray Commission. The Berriquin, Denimein and Deniboota districts closer to the eastern highlands and with better conditions for irrigation were created after Yarrawonga Weir was built on the Murray. This also benefited the Wakool district. The Tullakool Irrigation Area was excised from Wakool to allow a small pocket of "intensive" development for soldier settlement after 1945.

All the "partial" irrigation districts have had the effect of spreading irrigation facilities over wide areas of the riverine plain, in contrast to the more compact development by closer settlement on the outer upland flanks of the plan or in the Mallee. This is because water has been transmitted over long distances so that dryland properties could benefit. One important result of the widespread character of "partial" irrigation is that country suited to various kinds of production has been taken into account—the drier pastoral country suited to Merino woolgrowing without irrigation but fat lamb raising after irrigation and the wetter sheep-cereal belt suited after irrigation to fat lamb raising on "annual" pastures or stock fattening on "permanent" pastures. As shown below, more recent policy of emphasising "intensive" irrigation on the upland flanks of the plain has tended to restrict irrigation to the latter type of country.

"Intensive" Projects Now Evolving

The first stages of irrigation development in New South Wales using waters from the Snowy Scheme have unfolded in recent years, with emphasis on the Murrumbidgee Valley which is to benefit on a major scale as soon as Blowering Dam is completed. In the early post-war years, it was envisaged that the new era of water development in the Murrumbidgee Valley would see both resource development and increased production stability, i.e., both "intensive" and "partial" irrigation.¹²² Projects of "intensive" irrigation on the scale achieved in the M.I.A. were envisaged although, because of marketing considerations, it was considered that there would be more emphasis on dairying and fat lamb raising rather than fruit growing. In addition, a very large area was to benefit by the allotment of water rights of 1 in 20 in the proposed "Darlhay" and "Billabidgee" districts to the west of Narrandera and both north and south of the Murrumbidgee. Existing projects were to benefit by more stabilised water supplies, especially needed to underwrite increases in holding areas recommended by an earlier Royal Commission.¹²³

In more recent years the Government's policy towards water development in southern New South Wales has changed, chiefly because of changes in the market outlook for irrigation products, particularly butter, and partly because a number of problems have developed in older districts of "partial" irrigation. In 1952 the Irrigation Development and Food Production Advisory Committee recommended¹²⁴ preference for "intensive" development (or "area" development, as it is known locally) instead of "extensive" (or "District") development, and it was envisaged that the main forms of production that should benefit would be lamb and mutton, dairy produce, veal, beef, pigmeats, rice, other cereals, fruit and vegetables. Because of a rapid deterioration in the export market for dairy products, more recent policy is to not include these as major lines for development. The new policy as it applies to proposals for the Murrumbidgee Valley are set out in the "Blowering Committee" Report of 1956.¹²⁵ Here it was proposed that most of the water to become available from the Snowy Scheme for use in the Murrumbidgee Valley should be used to create farms with about

¹²² See evidence by Water Conservation and Irrigation Commission in *Report of the Snowy River Investigation Committee on the Utilisation of the Waters of the Snowy River*, 1944 (Sydney: Government Printer, 1944).

¹²³ Economic Investigating Committee (Commonwealth and State), *Report on Agricultural Aspects on a Proposed Diversion of the Snowy River to Either the Murrumbidgee River or the Murray River* (Canberra: 1947).

¹²⁴ See *Report of Irrigation Development and Food Production Advisory Committee*, Parts I and II (Sydney: Government Printer, 1952).

¹²⁵ *First Report of Committee Appointed by the Minister for Conservation to Advise on the Use of Additional Water Available Within the Murrumbidgee River Upon Completion of Blowering Dam* (Sydney: Government Printer, 1956). It should be noted that planning for using Snowy Scheme waters is still proceeding. Since this First Report the Committee has recommended for the Coleambally Irrigation Area somewhat larger "mixed" farms (minimum of 500 irrigable acres and eventual water allotment of 625 acre-feet). Some 200 horticultural farms with a minimum of 40 acres of first-class land (well-drained deposits on aeolian dunes) are also envisaged as eventual development in this scheme. See H. N. England, *Agricultural Use of the Snowy Waters: Irrigation Plans and Policy*, unpublished paper read to Australian Agricultural Economics Society Conference, Sydney (February, 1960).

400 acres of irrigable land of high-quality soils adapted to most forms of irrigation and these should be granted about 400 acre-feet water rights. Such farms would be established by State land resumption and resettlement and would practise a system of "intensive" irrigation. Recent marketing difficulties in the way of some fruit products and dairy products have resulted in the recommendation that the new farms be devoted in the first instance to fat lamb raising (possibly with some rice) but cattle fattening and summer crop production are envisaged in the long run. The areas selected for development occur to the west and south-west of Narrandera and they possess the advantages of nearness to water diversion points and well-drained soils (i.e., coarser deposits of "prior" streams) which permit a wide range of land uses. The policy has been to create farms with *flexibility* in land use. This is a deliberate change from the older traditional "partial" irrigation properties where relatively poor water supplies and heavier plain soils dictated a less flexible system of farming—one wedded mainly to the "winter" production of fat lambs. These latter farms, because they have developed without close Government supervision, have strained to change their land use patterns¹²⁶ towards more "intensive" forms of production as water supplies have improved and this has placed severe strains on channels designed for the lesser water deliveries common to "annual" pastures, cereals and fodder crops. Piecemeal development has also placed severe strains on drainage facilities and created problems difficult to overcome.

Arising out of past experience with "partial" irrigation, it is the present Government policy to anticipate changes likely to occur in new districts and, from the outset, by State-controlled closer settlement, to ensure that farms are able to evolve smoothly to new forms of production should conditions dictate this. The new "fat lamb" type farms planned for the Murrumbidgee Valley will involve little "on-farm" integration, although some dryland is envisaged as an ancillary to irrigated land to assist sound stock husbandry. However, because they will be able to engage in the extensive development of "permanent" pastures, the new properties will be in a better position even than the Rochester properties discussed in Part II to engage in "off-farm" integration of most assistance to dryland areas. This form of integration is laid down as one of the objectives of establishing these farms, however, it seems that the preference for "intensive" systems, contrary to requests from present dryland farmers for more "partial" irrigation, is based not on awareness of the need for more integration, but on a limited assessment of the technical requirements of "efficient" irrigation. The policy appears to be based on considerations which have influenced Victoria's long-standing preference for "intensive" irrigation. There seems no doubt that, should the market improve authorities in New South Wales would favour an increase in dairy production with little or no integration. The promotion of dairying was a major proposal laid down in 1952 by the Irrigation Development and Food Production Advisory Committee and the Blowering Committee, as late as 1956, saw fit to remark:

"The immediate economic future of dairy products, especially butter, is very dubious, although in the long run the dairy cow may come into its own as the most efficient means of converting plant protein to animal products, especially animal protein."¹²⁷

¹²⁶ "Blowering Committee's" Report (1956), *op. cit.*, p. 12.

¹²⁷ *Ibid.*, p. 11.

This is more than a hint that the Committee's advocacy of "intensive" irrigation for stock fattening is not as directed to "off-farm" integration as it might seem to be on first reading. The Committee's Report contains no reference to the problems discussed in Part II of imbalances between trends in irrigated and non-irrigated areas which lead to lack of desirable "off-farm" integration in times of national drought. The report contains no indication that, given a marked improvement in the economic outlook for the products of "intensive" irrigation like butter and fruits, the presently designed "fat lamb" farms would not be allowed to subdivide for the production of these traditional products with their characteristic lack of integration to assist production over wide areas of dryland agriculture. *This could be a vital omission because, if this degree of closer settlement was inhibited and better links developed between irrigated and dryland economies, the fat lamb type farms now envisaged for the Murrumbidgee could represent Australia's first major step towards developing a sound system of integration as outlined elsewhere in this study.*

Apart from the abovementioned projects to affect the eastern part of the riverine plain in New South Wales, there are two proposals which should offer scope for more integration in the western areas of greater climatic uncertainty for dryland production. The first is the pilot project to grow fodder by an association of dryland farmers with irrigation in the Paika Lakes area near Balranald.¹²⁸ The second is the project to provide better water supplies to the west of New South Wales by a series of weirs on the Darling River and the closely related Menindie Lakes Scheme.¹²⁹ Apart from allowing irrigation on properties fronting the river and the various lakes and branches of the Lower Darling, this latter scheme could offer scope for a fodder growing project in the west. This could prove of tremendous value in this region, which is removed from the outer peripheries of the riverine plain where "intensive" irrigation of the kind offering most scope for "off-farm" integration will tend to be concentrated.

¹²⁸ See *First Report of the Committee Appointed by the Minister for Conservation* . . . (Sydney: 1956), *op. cit.*, p. 21.

¹²⁹ Water Conservation and Irrigation Commission, *Water Conservation and Irrigation in New South Wales* (Sydney: Government Printer, 1954), pp. 14-16. The actual storages of this scheme are to the north of the Southern Murray Basin.