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AGRICULTURAL USE OF THE SNOWY WATERS :

II : IRRIGATION PLANS AND POLICY

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The aim of this paper is to present the background against which the various problems of the agricultural use of Snowy waters can be viewed.

It attempts to cover irrigation planning, administration and policy in general terms, and plans and policy for irrigation development in the States concerned, as far as they are known. Naturally enough policy is dealt with only at the departmental level : here, and generally, the discussion centres on the author's own organization, the N.S.W. Water Conservation and Irrigation Commission. Most of the irrigation development will be in New South Wales.

As the secondary purpose of the Snowy Mountains Hydro-Electric Scheme is to supplement Murray and Murrumbidgee waters and operation of its works will be integrated with operation of downstream irrigation storages the discussion on irrigation development is also integrated : the waters are indistinguishable.

The question of the timeliness of the Snowy Project, from an irrigation viewpoint, has not been raised. The opinion seems to be held in many quarters that a revolution in Australian irrigation production is impending—pastoral production largely giving way to arable farming—and on this account it may be premature to commit the Snowy waters to usage in particular regions and forms of land settlement. This paper expresses the view that because of the peculiarities of the Australian environment, or at least that of Southern Australia, the revolution must be a minor one in that our broad-scale irrigation will still have a pastoral basis. Nevertheless, in view of other revolutions in progress, particularly in industry, with its possible demands for special crops, there are bigger than normal dangers in committing these resources at this stage even though irrigation development is planned for as much flexibility of enterprise as possible. Also there are other aspects of this question of timeliness.

Irrigation Planning and Administration

Federation did not disturb the States' general control of their water resources. The exceptions are :—The River Murray waters which are under the control of the River Murray Commission, a body on which the Commonwealth and the three States concerned are represented and which is established under the Commonwealth Constitution ; and the waters of certain N.S.W. streams near the Capital Territory for purposes

concerned therewith—the Snowy River for hydro-electric purposes and certain tributaries of the Murrumbidgee River for water supply. (Also New South Wales and Queensland have set up a statutory body to control the waters of border streams.)

Other water resources—surface and underground—are controlled by State Government Departments and Statutory Authorities. In most of the States there is some division of authority over the various aspects of water usage :—irrigation planning and administration, including State controlled land settlement schemes ; private irrigation development ; production of specialized irrigation crops ; town water supplies ; and rural water supplies.

Riparian rights of individual landowners are generally limited in the public interest but within these limitations these rights are safeguarded by statute and policy.

In the planning of irrigation schemes regard is had to the reasonable irrigation requirements of riparian lands but generally no limitations are placed on stock and domestic and urban usage.

Irrigation in Australia

The pattern of irrigation usage in N.S.W., is illustrated in the following table. It is very similar to usage in Victoria—the pioneer state in irrigation.

IRRIGATION STATISTICS, N.S.W. 1957/58

	Total Area Irrigated	Pastures, Lucerne, Fodder Crops	Rice	Other Cereals for grain
	Acres	Acres	Acres	Acres
Irrigation Areas ...	210,000	107,000	28,000	21,000
Irrigation Districts ...	384,000	321,000	19,000	23,000
Irrigation Trusts ...	5,000	2,000	—	—
Licensed Diversions ...	99,000	79,000	—	—
Totals ...	698,000	509,000	47,000	44,000

	Orchards & Vineyards	Vegetables	Fallow & Miscellaneous	Total Irriga- tion Water Supplied
	Acres	Acres	Acres	Ac. Ft.
Irrigation Areas ...	25,000	4,000	24,000	445,000
Irrigation Districts ...	—	—	21,000	758,000
Irrigation Trusts ...	3,000	—	—	8,000
Licensed Diversions ...	6,000	13,000	(tobacco) 1,000	222,000
Totals ...	34,000	17,000	46,000	1,433,000

These figures show the predominantly pastoral character of N.S.W. irrigation—which is typical of Australian irrigation as a whole. Field crops are of minor importance and these are largely grown in a pasture rotation. This is in marked contrast to the rest of the world where irrigation is predominantly used for arable cropping.

There are good reasons for the present—and future—pastoral character of Australian irrigation. Because of our climate—both its vagaries and semi-insular character—we are a pastoral country with pastoral attitudes. Because of our recent—and not so recent—geological history—which is out of phase with the rest of the world—our topography and soils are senile and drainage is poor. Extensive areas suitable for persistent arable farming are almost non-existent in regions which can be economically commanded for irrigation.

The only advantage that the Australian environment possesses is that of a comparatively long life for irrigation storages because of the low rate of geological and man-made erosion and thus of siltation.

It has frequently been argued that our unreliable rainfall makes water conservation and irrigation all the more necessary but it is often overlooked that by the same token they are all the more expensive.

Increasing interest is now being taken in arable irrigation production but it must be realized that this potential is limited by the deficiencies of the Australian landscape ; apart from other factors most of our soils will not stand up to an intense tillage regimen ; lengthy pasture courses will be needed to maintain structure and fertility.

So far the only successful broad-scale field crop is rice ; its demands on land (and farmer) quality are low. The industry in New South Wales (to which so far it is virtually confined) is strictly controlled through water supplies but marketing difficulties are now being encountered (largely because of higher yields resulting from the pasture rotation).

The dried vine fruits and deciduous canning fruits industries are essentially irrigation industries while much of our citrus and wine grapes are grown under irrigation. Irrigated tobacco production is expanding, notably in Queensland.

In recent years there has been a marked expansion of supplemental irrigation in the more favoured regions, especially for lucerne, pasture and vegetables.

Community Irrigation in New South Wales

Under New South Wales law there are three types of community irrigation schemes (disregarding Flood Control and Irrigation Districts). These are :—Irrigation Areas, Irrigation Districts and Irrigation Trusts.

Irrigation Trusts, which are self-governing, are of minor importance. There are only two large self-governing Trusts in Australia, the First Mildura Irrigation Trust and the Renmark Irrigation Trust : both have received substantial government assistance.

Irrigation Areas are essentially closer settlement schemes designed for fairly intensive irrigation. The land is resumed by the Crown and subdivided *de novo* in accordance with statutes governing the settlement of Crown Lands generally and Irrigation Areas in particular into farms of "home maintenance" standards. As defined therein :—" Home Maintenance Area means an area which when used for the purpose for which it is reasonably fitted would be sufficient for the maintenance in average seasons and circumstances of an average family ". In an Irrigation Area it is of course inferential that water supplies must be adequate for " the purpose for which it is reasonably fitted ". Title is Perpetual Lease subject to certain settlement, improvement and permanent conditions : transfer requires consent. Aggregation, and subdivision below home maintenance standards are prohibited and ownership is limited to individuals including joint tenants and tenants in common. (Such limitations on ownership of State lands are widespread : limitations on area of irrigation lands that may be held in schemes developed with public moneys are also common, e.g., U.S.A.)

There are two classes of irrigation farms of home maintenance proportions (i.e. apart from residential holdings) ; horticultural farms, usually comparatively small, and mixed or large area farms on which commercial horticulture is prohibited.

Irrigation Districts represent an entirely different concept. Their primary purpose was to stabilise the existing forms of production at the good season level in the main by fodder conservation. The secondary purpose was to stabilise existing closer settlement and to promote subdivision of larger estates in conformity with the general closer settlement pattern.

Generally they have been developed in the climatic belt extending from marginal wheat country into the moderately dry pastoral zone—from the fringe of the first cross fat lamb country into merino country.

Water was to be supplied in limited quantities for partial irrigation of existing holdings and subsequent subdivisions. The constitutions of the Districts prohibited the supply of water for rice-growing and commercial horticulture. In their primary purpose of stabilising existing forms of production these schemes have failed and the earlier schemes might have failed absolutely but for the advent of wimmera rye grass—subterranean clover pasture. The original forms of production disappeared rapidly : wheat and merino wool production gave place to fat lamb production. As the taste for irrigation developed the demands for water increased and large areas of dry land came to be regarded as an encumbrance. Subdivision below the old norms proceeded with further increase in demands for water. (There is no control over subdivision—except indirectly through water supplies.)

Because of the heavy wartime and post-war demand for rice the irrigation of this crop was permitted and is still being permitted in certain districts. The relevant article in their constitutions has been waived from time to time. The extent of rice-growing is controlled through the water supply.

Under Northern Victorian influence a substantial dairying industry is developing in the more favoured parts of the Southern Riverina Districts. (Production per cow in the Finley District is the highest in New South Wales.) This has led to still closer subdivision and further demands for water.

It is clear that unless administrative action is taken—in the face of popular demand—internal irrigation development and subdivision will outstrip channel and storage capacities.

With intensified irrigation water tables and surface drainage problems are developing : as these schemes were conceived it was expected that these problems would be avoided. The disabilities of the Irrigation District, as compared with the Irrigation Area, *which is designed around the surface drainage system*, are rapidly showing up.

A further and serious disadvantage of the Irrigation District is that its structure permits little flexibility of enterprise. Even if irrigation is intensified to the full extent of storage and channel capacities dry land will predominate and its utilization demands that production be largely pastoral. They have little potential for special irrigation crops—only in comparatively small areas between long pasture courses—even if soil and other conditions are suitable for arable irrigation farming.

Present policy favours Area rather than District development.

In general rural lands in Areas and Districts have certain rights to water, usually expressed as the number of Water Rights—a Water Right being the right annually to one acre-foot of water. Water Rights must be paid for even if the supply is not taken.

In Irrigation Areas it has been the usual practice to attach one water right for each irrigable acre for horticultural farms but for mixed (“ Large area ”) farms the number is usually nominal and has no relationship to area or normal demand. Provision is made for supplies of “ Additional Water ”.

In Irrigation Districts water rights have more significance as the channel system is designed for a particular ratio of irrigable to dry land and water rights are allotted on this basis. Partial irrigation schemes are often described on this basis, e.g., “ one in three ”.

Financial Policy

Irrigation storages in New South Wales are National Works : that is their cost is borne by the general taxpayer. Most modern dams are dual or multiple purpose dams, combining a flood mitigation component and/or hydro-electric generation with the irrigation storage. At the same time there has been a change from the early policy of annual replenishment dams resulting from early U.S.A. and Indian influence to the drought storage dam. A good illustration of this is the Big Eildon Dam recently completed in Victoria : its capacity is almost ten times the old annual replenishment dam.

The policy of heavy or complete subsidy of irrigation storages seems to be universal.

Similarly some subsidy towards the cost of irrigation works—and other public works—is not uncommon. In New South Wales the Treasury demands neither repayment of, nor full interest on, the cost of works of Irrigation Areas and Irrigation Districts nor on the cost of acquiring the lands of Irrigation Areas. Revenue from these schemes—mainly from sales of water and, in the case of Irrigation Areas, rents—is paid into a common fund which is drawn on for operational expenses. This account is to be more than self-balancing over an average run of years and the Treasury expects any surplus above requirements for working capital as a contribution towards interest on the capital costs of the schemes.

Rents of rural lands in Irrigation Areas are fixed at setting apart of the farms and cannot be varied but water charges can be varied from year to year. Water charges as between schemes and for comparable usage are equalized as far as practicable.

Some minor schemes, especially pumping schemes, are unprofitable.

It might be mentioned that ownership of New South Wales water resources is not vested in the Water Conservation and Irrigation Commission or the Crown—only their control. The whole philosophy is that water is regarded as a national resource and water conservation and stream control as national responsibilities to provide a commodity which can be shared as equitably as possible. Water charges, even though they be on a volumetric basis, are for the service of supply rather than for the commodity itself. Licence fees for private diversions are merely to meet administrative expenses.

Planning Irrigation Schemes

Planning of a major irrigation scheme covers a broad field. The prime consideration is the extent of the available water supply ; not the average but the supply available in drought periods. The “drought storage” dam is not a complete answer to the vagaries of the Australian climate : in drought periods nett evaporation losses are considerable. In New South Wales it is the practice to assume up to 25 per cent restriction of supplies in critical periods : without such an allowance irrigation would be severely limited.

Supplies available for diversion to the irrigation project are those in excess of the anticipated riparian demand, less transit and operational losses in the river.

The selection of firstly, the general locality, and secondly, the particular area to be developed involves integrated consideration of numerous engineering, land, agricultural, climatic, economic and social factors.

The headworks to command the area should not be unduly expensive, the slopes should be suitable for economic distribution of water both in the external distributory system and within the farms, and for internal and external surface drainage, including outfalls. The soils should be physically suitable for irrigation and generally suitable for some range of crops and pastures. Ideally there should be free natural under-drainage but failing this the underlying conditions should be physically and economi-

cally suitable for artificial under-drainage if arable farming is to be practised.

The extent of the area to be developed will obviously be governed by the water requirements for the anticipated forms of land-use. Except for rice, the particular crops or pastures to be grown are of little account : their water requirements are largely imposed by meteorological conditions and thus the crop is important in any particular climate only insofar as its growing season is concerned.

In Southern Australia, with its Mediterranean climate, reliance, albeit limited, can be placed only on winter rainfall in the calculation of water requirements. The extent of the area to be developed will depend on the anticipated proportion of perennial, summer-growing and winter-growing crops.

Channel capacities—which affect the frequency of irrigation—should be based on peak demands, i.e., heat wave conditions.

Surface drainage design is far more complex as there are so many unknown factors. Generally it is not possible to provide drainage systems which will cope with extreme conditions : some delay in drainage following extremely heavy downpours is inevitable but for horticultural lands the delay should be short.

The whole supply system and the subdivisional pattern should be designed around the drainage system.

Once constructed an irrigation scheme is fairly rigid. Obviously the proportion of summer cropping originally conceived cannot be increased without additional demands on storage and, at some critical level, without enlargement of the supply system ; also any general subdivision of farms may be impracticable because of topographical considerations. While the aim is to provide for flexibility of land-use the limits are only partly elastic.

The Snowy Mountains Hydro-Electric Scheme

The Snowy Mountains Hydro-electric Scheme, as agreed to by the Commonwealth and the States of New South Wales and Victoria, is a scheme to provide both hydro-electric power for the Capital Territory and the two States and irrigation water for the Murray and Murrumbidgee Valleys. It arose out of the New South Wales proposals to divert some proportion of the Snowy waters into the Upper Murrumbidgee primarily for irrigation purposes.

The scheme finally adopted is a compromise between power and irrigation considerations. More power, or at least cheaper power, could be developed by diversion of the Snowy waters wholly into the Murray, but on the other hand the Murrumbidgee Valley has the greater irrigation potential.

It is unnecessary to describe the works : descriptions are available in the reports of the Snowy Mountains Hydro-Electric Authority.

Although there is generally some conflict between irrigation requirements and the operation of hydro-electric installations, there is no such conflict in the broad concept of the Snowy Mountains Scheme. Assurance of water supplies is vital to both and this is to be achieved at high elevation by the huge Adaminaby Dam—a drought storage dam which will give complete control of the Eucumbene River and can be supplemented as occasion offers from the Tumut, Upper Snowy, Tooma and Upper Murrumbidgee Rivers and will permit discharges into either the Tumut or Upper Murray Rivers as occasion demands.

Downstream regulation of the diverted waters, and of natural flows, for irrigation purposes will be the function of Hume Dam on the Murray (now in process of enlargement) and of Blowering Dam on the Tumut which is yet to be constructed. The latter work is included in the Snowy Mountains Scheme. The reason for this is not clear as its construction is the sole responsibility of New South Wales and its functions are identical with those of Hume Dam and other storages which are primarily for irrigation purposes and only incidentally for hydro-electric generation.

The agreement contains the basis of allocation of waters as between the Murray and Murrumbidgee Rivers and the duty of advising on the principles of operation on the Snowy works is given to an Advisory Council consisting of representatives of the Commonwealth, New South Wales and Victoria. Within the framework of these principles and subject to the States minimum entitlements to water as provided in the agreement, the hydro installations will be operated entirely according to electricity demands. Although drought storage is a common interest, routine hydro operations will conflict in many ways with irrigation requirements ; the job of the irrigation authorities is to re-regulate these discharges by means of the downstream irrigation storages.

Irrigation interests will bear no share of the costs of the Snowy works either by way of water or capital charges. The capital cost of the Snowy works (which is being financed from revenue) is to be debited to electricity interests which will bear interest and depreciation as well as, of course, operation and maintenance charges.

The estimated capital cost of the Snowy works, excluding Blowering Dam, is £460m.

Water Available for Irrigation

The estimated volume of discharges into the Murray and Murrumbidgee (via the Tumut) Rivers as published in the various reports of the Snowy Mountains Hydro-electric Authority do not represent additional water for irrigation, even if re-regulation by irrigation storages is complete. They are average discharges and under certain assumed conditions of operation which may not be realized. Also, in the case of Murrumbidgee flows, the quantities include the natural flow of the Tumut which is already utilized as far as possible.

The hydrographic staff of the Water Conservation and Irrigation Commission is working in close collaboration with the staffs of the Snowy

Authority and Electricity Commission on Murrumbidgee discharges but as yet results are only tentative as there are so many unknown factors.

At this stage the programme of releases over the next few years is probably more important than the volume that will ultimately be available.

On present indications approximate quantities (at diversion points) available annually for new irrigation development in the Murrumbidgee Valley, including that from enlargement of Burrinjuck Dam, recently completed, are :—

1959	..	..	..	..	90,000 ac. ft.
1961/63	..		increasing to		230,000 ac. ft. (av. for period)
1963/66	..	..	..	..	590,000 ac. ft.* (av. for period)
Post Snowy-Murray Diversion (1966) and pre-Blowering	..			..	500,000 ac. ft.
Post Snowy-Murray Diversion and post-Blowering	..	..	..	..	1,000,000 ac. ft.

*Pending completion of the Snowy Murray diversion part of the Snowy (proper) flow will be diverted into the Tumut.

These estimates are probably conservative and further analysis and experience may show that there is reasonable assurance of more water.

The Snowy Authority's works programme has been adhered to so far and as finance therefore does not seem to be a problem it will presumably be completed on schedule. Blowering Dam is in a different category. Field investigations are complete but no date has yet been fixed for commencement. Construction will take about five years.

The flows diverted from the Snowy proper to the Murray will be shared equally by New South Wales and Victoria except in periods of restrictions on the use of Murray waters when South Australia is to get her full entitlement of 6/26 of the flow passing Albury irrespective of its source.

The estimated gain to the Murray exceeds 400,000 ac. ft. annually but as many factors are still unknown the volume available for irrigation has not yet been calculated.

Proposed Irrigation Development

No decision has been reached on further irrigation development on the New South Wales side of the River Murray to utilize the additional waters consequent upon Snowy-Murray diversion and the enlargement of Hume Dam storage. As previously pointed out no firm decision could be reached until there is clearer indication of the way in which the diverted waters will be re-regulated into the Murray. Investigations include the possibility of intensifying the better favoured Irrigation Districts or parts thereof.

It is understood that Victoria will use her share of the Snowy waters largely to safeguard present development in existing irrigation districts with some intensification therein.

South Australia cannot undertake further irrigation development from Snowy diversions as her sharing of these flows is limited to periods of restriction. Her problem is quite different from those facing New South Wales and Victoria being that of quality rather than quantity of water. Her irrigation potential along the Lower Murray Valley because of topographic considerations, falls short of available supplies, but salinity of the waters is a periodic problem. The greater assurance of flows in dry periods will ease the salinity problem to some degree and thus will benefit existing and proposed irrigation development.

Except for lands bordering the Lower Murray Lakes the topography in Southern Australia is unsuitable for broad scale irrigation. Here, it is understood, some development, largely pastoral, is under consideration but will be severely limited by unsuitable soils. Elsewhere topography and high pumping lifts limit development to crops giving a high return per acre and per ac. ft. such as horticulture. Private enterprise is developing comparatively large tracts in this region, largely for wine production : as there is no water shortage, South Australia does not limit private diversions. Widespread use is made of Murray waters for stock and rural domestic, urban and industrial purposes.

In New South Wales the earlier and major irrigation development will take place in the Murrumbidgee Valley. The duty of advising on the broad use of additional Murrumbidgee waters following Snowy diversions and construction of Blowering Dam has been given to an inter-departmental committee—the Blowering Dam Investigations Committee—consisting of representatives of the Water Conservation and Irrigation Commission, Commonwealth Scientific and Industrial Research Organization and (State) Departments of Lands, Agriculture and Local Government.

Its First Report¹ recommended that the major development of irrigation take place to the south and west of the Murrumbidgee Irrigation Areas—the schemes, now known as Coleambally, Carrathool and Euroley. In addition certain minor schemes were recommended ; the development of a fodder conservation scheme in certain “ lakes ” north of Balranald, expansion of Hay Irrigation Area, and supplementation of supplies to Irrigation Districts adjoining the Murrumbidgee Irrigation Area.

In an addendum (of October 1957) to the First Report certain modifications to the major schemes and the priorities to be accorded thereto were recommended and consequent upon their adoption the construction of Gogeldrie Weir and of the Coleambally Canal and the Sturt Canal to serve lands respectively to south and the north of the river was authorized. The weir and the conveyor section of the Coleambally Canal have been

¹ *First Report of the 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.* N.S.W. Government Printer, Sydney, 1956.

constructed and the Sturt Canal is under construction : in addition certain distributary and drainage channels in Coleambally Irrigation Area have been constructed and a number of farms designed and surveyed ready for occupation.

The location of these works and major schemes is shown on the accompanying map.

The Committee's recommendations on major irrigation schemes in the Murrumbidgee Valley set out in more detail the proposals broadly recommended by the (Commonwealth) Economic Investigating Committee on agricultural aspects of the Snowy diversions (1946) and (N.S.W.) Snowy River Investigation Committee (1944).

The Committee's general recommendations on land settlement were that these schemes should be developed as Irrigation Areas, for horticulture where suitable, but in the main as " mixed farms " containing a minimum of 400 acres suitable for pastoral irrigation and with an initial water allotment of 400 ac. ft. Future flexibility of enterprise was envisaged, particularly arable farming, with later demand for increased water supplies.

Subsequently the Committee reviewed the size and water allotment of mixed farms in Coleambally and its recommendations for a minimum of 500 acres including at least 400 acres irrigable and an (eventual) water allotment of 625 ac. ft. have been adopted.

The increased allocation of water to Coleambally means that there will be insufficient water for development of both the Carrathool and Euroley schemes. The question of which should receive preference is now under consideration. Discussion is therefore confined to the areas shown as First and Second Stage development on the plan.

First Stage development embraces the central section of Coleambally draining into Coleambally Creek, to contain about 180 mixed farms and 80 horticultural farms together with the rural centre ; and the area north of the Hay Railway to be included in the Murrumbidgee Irrigation Areas.

Second Stage development embraces the balance of Coleambally together with the major part of the " Kooba " estate south of the Hay Railway, comprising about 40,000 acres : this will presumably be incorporated in the Murrumbidgee Irrigation Areas.

As Coleambally will set the pattern for the use of the bulk of the Snowy waters it is described in more detail in the succeeding section and this section is concluded with a brief description of proposals for the lands to be served by the Sturt Canal and to be incorporated into the Murrumbidgee Irrigation Areas.

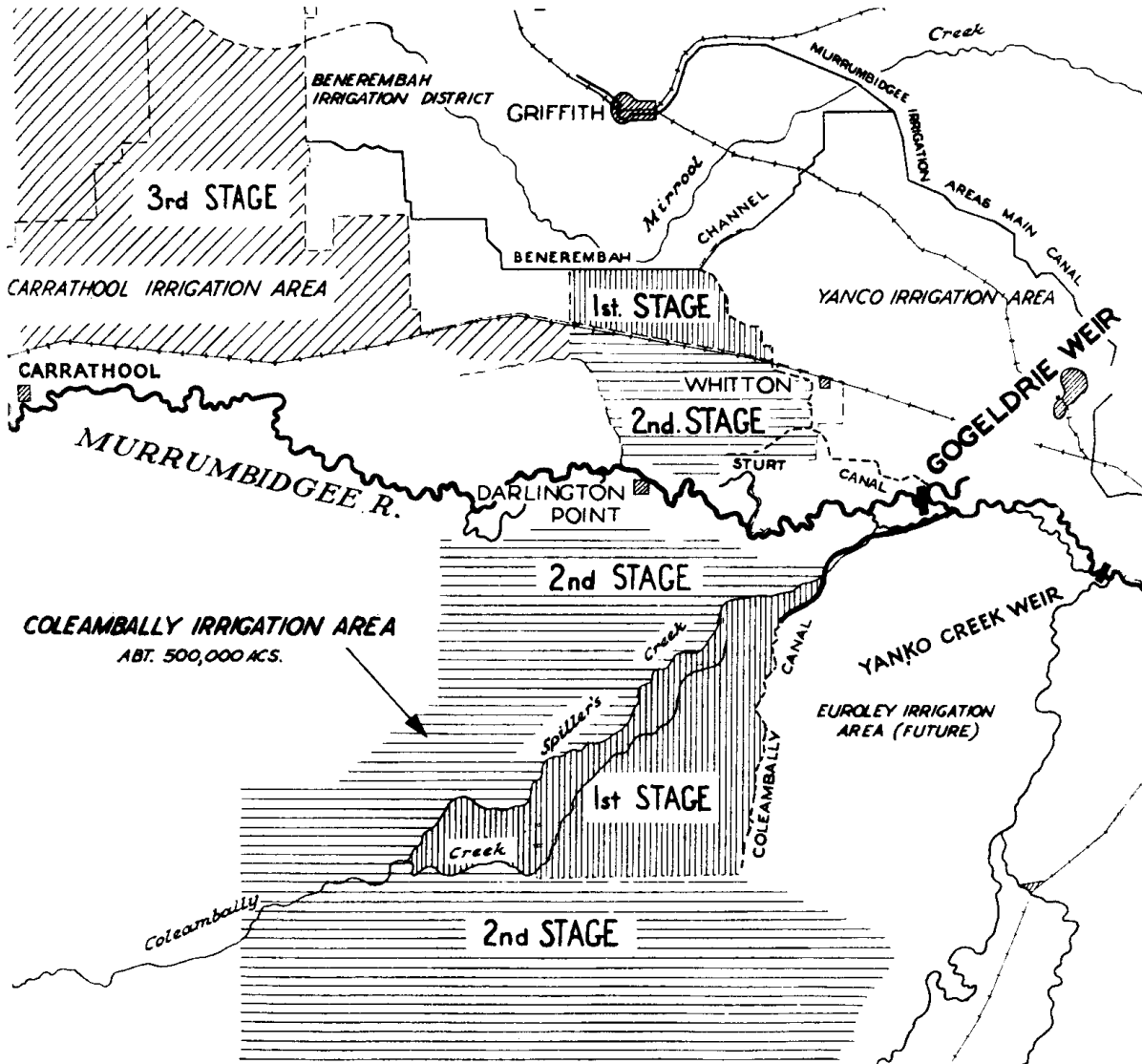
The area north of the Hay railway has been designed for 46 mixed farms each containing a minimum of 400 irrigable acres. Land-use envisaged is 50 acres of rice, annually grown in a seven year rotation with winter pasture, the remaining irrigable land being under permanent pasture, the pasture being utilized mainly for fat lamb production. Annual water allotment on this basis is rather more than 700 ac. ft.

A number of similar farms has recently been settled under War Service Land Settlement ; so far quite successfully. In contrast to the Coleam-

bally farms, which will not have "permanent" rice-growing, there is no deliberate inclusion of "dry area".

It is proposed to develop this area in the two years 1960/61, 1961/62.

It has not yet been decided whether the Second Stage area south of the Hay Railway will be subdivided into farms of the above standards or Coleambally standards: the former is more likely. On this basis the area will accommodate about 80 mixed farms.



Proposed Irrigation Areas in the Murrumbidgee Valley.

Scale - approx. 15 miles to 1 inch.

Coleambally Irrigation Area

The Coleambally Irrigation Area will eventually cover about 500,000 acres and comprise about 875 mixed farms and about 200 horticultural farms. The latter will be situated on the scattered strings of aeolian sandhills, the dominant feature of the landscape.

The horticultural farms will contain a minimum of 40 acres of first class land suitable for the most exacting of crops such as citrus and peaches : with incidental inferior land the average area is likely to be much greater. Topographical and soil considerations will necessitate the general use of sprinkler irrigation.

Water rights will be allotted at the rate of one per suitable acre with provision for additional water. Water charges are to be 25/- per ac. ft.

Subdivisional designs have been prepared for a small number of farms but none has yet been valued for rental purposes.

The productivity of these lands should be very much greater than the average for Murrumbidgee Irrigation Area lands and the potential volume of production would obviously present marketing difficulties under present day conditions.

The demand for these farms will probably lag behind the demand for mixed farms—to which development will be attuned : they will be made available for settlement as the demand grows.

No estimates have been formed of the capital cost of developing these farms nor of the minimum capital requirements for settlement. It would not be necessary to develop the whole 40 acres immediately : this area is to provide a minimum of 30 acres under continuous full production.

Catch-cropping may assist internal development but the range will be reduced by comparative remoteness from rail. An interesting suggestion is tobacco ; the sandhill soils are virtually free of chlorides.

The mixed farms as previously pointed out are to have a minimum area of 500 acres with a minimum of 400 acres irrigable with an eventual water allotment of 625 ac. ft.

There is a fairly wide range of soils and while none appear to be problem soils some will obviously require more careful handling than others, particularly as regards arable farming : they will require longer pasture courses to maintain soil structure and fertility especially if they are to be used for row crops.

The farms are designed for future flexibility of enterprise but it is expected that for many years they will be devoted largely to pastoral production, mainly fat lambs but with fattening of dry sheep and breeding and, or fattening of cattle. Until a demand for irrigated crops eventuates it is expected that generally the only cropping will be in the form of winter cereals, primarily for winter pasture regeneration.

Capital values of the order of £20 per acre have been struck for the initial batch of 26 mixed farms and rentals will be based on this value.

Water rights have been fixed at 200 at 25/- per ac. ft. and additional water charges at 15/- per ac. ft.

In reviewing its early recommendations on farm size the Blowering Committee was greatly handicapped by the dearth of reliable information on the agronomics and economics of irrigated pastoral production and utilization. It was forced to adopt the budget approach and the assumptions, particularly of production levels, on which the budgets are based are admittedly speculative. With costs and prices then obtaining (early 1959) it was clear that, despite the high production levels assumed, there was little prospect of recovering the capital costs of straight pastoral development or pastoral development through initial winter cereal production. It therefore recommended that rice-growing should be permitted in the initial years to improve the economics of development, either 5 years at 70 acres or 6 years at 60 acres ; the latter has been adopted.

The Committee's economic analysis was based on the eventual development of 300 acres of winter pasture and 100 acres of permanent pasture devoted entirely to fat lamb breeding. It was realized that this was unreal as the postulated ewe flock (1800) is probably beyond the managerial capacity of the average farmer employing only casual labour : however, it is obviously impossible to gauge the profitability of dealing in stock and it could only be assumed that the other enterprises entered into would be equally as profitable as fat-lamb production.

Full carrying capacity would not be achieved until about the 9th year—when water requirements would taper off to 625 ac. ft.

The estimated capital deficiency at full development together with accrued interest on investment is of the order of £25,000. To develop a farm in this period it seems that the farmer would require resources in cash or kind of about £15,000 to £16,000 and this on the assumption that he can obtain credit to the full extent of present day banking practice, some long-term and some "carry-on". It is no secret that long term credit for farm development is hard to come by.

While it is likely that the financial resources qualification will be less than £15,000 it seems that settlers with less than about £10,000 would be taking an undue risk.

The Water Conservation and Irrigation Commission is not a financing authority for land settlement. Any scheme for financial assistance from State funds would normally be administered by the Rural Bank of New South Wales but so far no such scheme has been mooted. The farms will be open to general application but with preference to ex-servicemen for the first batch of 26 mixed farms : there is no decision on any preference for later farms, mixed or horticultural. Assistance under the War Service Land Settlement scheme, funds for which cut out this financial year, will not be available.

Without a scheme for assistance for internal development it is doubtful whether the demand for mixed farms will be commensurate with the rate of construction that could be sustained at the present rate of expenditure—which will permit construction of works for about 70 mixed farms a year with incidental horticultural farms. Further the time at which Blowering Dam is needed hinges on the demand for mixed farms

and in turn on the question of financial assistance for settlers. Without Blowering Dam there is no assurance of water supplies for more than about 450 mixed farms including the 46 to be developed north of the Murrumbidgee by 1961/62.

The total cost of the Coleambally scheme—land resumptions, channel and drainage works, roads, administrative establishment, incidental works and its share of Gogeldrie Weir—will be of the order of £12m. Eventual annual revenue is estimated at £900,000, comprising rents £400,000 and water £500,000, and operating and administrative expenses at £500,000 (excluding interest).

The annual value of production from the mixed farms when developed to their pastoral capacity is estimated at about £10,000 per farm and for horticultural farms at full development at about £11,000 : the gross annual value of production from the scheme will therefore be about £11m. as compared with about £750,000 from present day pastoral occupation.

It is proposed to establish a town in the centre of Coleambally about 20 miles south of Darlington Point to accommodate a population of 4500-5000 : also a couple of villages. It is hoped that the district will be served by a railway branching from the Narrandera-Tocumwal line and terminating at the town.

Perhaps the major requirements for successful development of Coleambally and other projects can best be described by quoting from the report of the Sub-Committee of the Blowering Committee which reviewed farm size (May 1959, unpublished) :—

“ The Sub-committee is particularly concerned that development of individual farms and of the Coleambally scheme as a whole should not be retarded because of inadequate flow of capital for farm development. Internal farm economy rests on rapid attainment of full production but profitable production of the earlier farms may not be fully achieved unless the scheme expands at such a rate that the requisite services can be provided at an early stage.

The Sub-committee fears that development of Coleambally (and of other proposed schemes) will languish unless special funds are available for internal farm development and in adequate quantity for rapid development of the project as a whole.”

Public and Private Investment

As previously mentioned the cost of land and of irrigation and incidental works for the Coleambally scheme will be of the order of £12m. On present appearances this will be spread over at least 15 years.

Coleambally will absorb about three-quarters of the additional water available for irrigation development in the Murrumbidgee Valley so that on a *pro rata* basis total expenditure there on irrigation and incidental works should be about £16m. To this should be added the cost of Blowering Dam, estimated at £18m. and some proportion of the cost of reconstructing and enlarging Burrinjuck Dam—say £20m. in all.

Private investment in Coleambally farms, on the basis of £25,000 per farm, mixed and horticultural, will be of the order of £27m. and, *pro rata*, £36m. for the whole Murrumbidgee Valley.

Thus the total rural investment in the Murrumbidgee Valley incidental to the Snowy Project will be of the order of £72 m.

Expenditure in the Murray Valley is speculative but assuming 400,000 ac. ft. as against 1,000,000 on the Murrumbidgee Valley it would be, *pro rata*, £29m. For various reasons this may be an over-estimate but for practical (and theoretical) purposes the round figure of £100m. may be accepted as the total for the two valleys.

This takes no account of investment in local urban development and in provision of services, local and remote.

While investment in this sector will be substantial the total investment, public and private, incidental to irrigation will be but a fraction of the public expenditure on the Snowy works, on thermal generation to balance the hydro generation (which is likely to be of the same order) and on transmission and distribution—apart altogether from the prodigious investment necessary to utilize this energy.
