

ued by Upper Eyre Peninsula District Soil Conservation Board.

A Farm is Only as Good as Its Soil

Foreword

To the Farmers of the District

With the purpose of decentralising activity and placing the initiative for soil conservation work in the hands of farmers themselves, the Soil Conservation Act, 1939-1947, allows for the setting up of Soil Conservation Districts.

Five soil conservation districts have been set up in South Australia and one of these covers the area set out in the accompanying map.

The Upper Eyre Peninsula District Soil Conservation Board held its first meeting in October, 1948. Since then, we as members of this Board, have aimed to develop a greater awareness of the need for soil conservation in the community.

The time has now arrived when a more positive programme of action is possible and we are prepared to assist you with your problems. This assistance will be available to all farmers. We invite you to contact us if you have any erosion problems, as the success of the movement will depend on the interest and co-operation which you as farmers are prepared to give to the Board.

Once you are prepared to put a conservation plan into action on your farm, we will assist you wherever possible. An officer of the Soil Conservation Branch of the Department of Agriculture will be available to give advice and technical assistance. This service is available throughout the district free of charge.

This Pamphlet

This pamphlet has been prepared for your information. It outlines the functions of the Board and explains what can be done to overcome erosion problems.

We invite your co-operation and welcome suggestions on the operation of the Board. You can do this by contacting any of the Members:—

- G. W. Cant—Kimba (Chairman)*
- O. J. Murphy—Warramboos ✓*
- J. L. Roe—Yaninee*
- H. A. Schiller—Miltalie ✓*
- H. P. McCallum—Carpa*
- R. J. French—Department of Agriculture—Cleve.*

What is a Soil Conservation District?

MOST people recognize that soil conservation is now a matter requiring all the attention that it can get. Most farms have lost soil through erosion, and we cannot afford to let this loss continue.

The challenge today is to produce more, but continued production cannot be maintained if soil loss occurs. Soil conservation methods are basic to farming; and by putting these methods into practice we can improve a damaged and eroded soil and prevent any further decline in productivity.

Greatest improvement will always occur when soil conservation methods are adopted before losses reach serious proportions. The damage that has already taken place in our soils has occurred in the comparatively short time that has elapsed since the land was first broken up, and it is apparent that there is a time limit for getting soil conservation methods on all farms.

At present, soil conservation work is carried out by direct contact with the officers of the Soil Conservation Branch. Much has been achieved in the past, but the amount of work remaining to be done is so large that it could never be done by this means alone. We need a system of fostering soil conservation work among farmers, so that they can learn many of the practices from each other. Work would become concentrated, and this would allow for more efficient use of the technical officers of the Soil Conservation Branch.

This is the idea behind the Soil Conservation District movement. It will make use of local talents within each farming community. It will be a local organization, and as such deserves the active support and co-operation of all land holders and general public.

THE FORMATION OF SOIL CONSERVATION DISTRICTS.

The Soil Conservation Act contains clauses which allow districts to be formed, but there must first be some support from the local people themselves. Firstly, a Soil Conservation District can be formed when at least 60 per cent of the occupiers of land in any

district sign a petition. Secondly, the Governor, on the recommendation of the Advisory Committee on Soil Conservation, may declare that the whole or any part of an area in which Part IV. of the Sand Drift Act applies shall be a district. Your district came into being by both methods. The District Council Districts of Kimba and Franklin Harbour were areas within which Part IV. of the Sand Drift Act operated. The remainder was added by petition.

HOW A SOIL CONSERVATION DISTRICT WORKS.

Once a district is established, the aim is to develop an organization which will assist in fostering interest and action in soil conservation amongst the farmers. It will depend on the attitude of farmers. It needs the co-operation of all farmers to be successful.

For a movement such as this which depends on the active participation of so many people, experience the world over shows that a system entirely dominated by Government is unsatisfactory. A Government-dominated programme sooner or later loses much of its appeal to farmers. On the other hand, greater interest is shown by farmers if the programme is run by farmers and assisted by the Government.

The controlling body in a district is the Soil Conservation Board, whose membership is limited to seven. One member is nominated by all District Councillors within the area, and the remainder are nominated by the Advisory Committee on Soil Conservation. With the exception of one member who is an officer of the Soil Conservation Branch all board members are farmers actively engaged in farming in the district.

The board is a co-ordinating body for all district soil conservation matters. It provides a liaison between farmers and the Soil Conservation Branch. It assists farmers in carrying out soil conservation measures. It also has the responsibility of providing information on soil conservation in the district to the Advisory Committee, which is a central committee set up to advise the Minister of Agriculture on soil conservation matters.

DUTIES OF THE BOARD.

The duties of the board are briefly:—

- (1) To get people interested and informed on Soil Conservation.
- (2) To keep itself informed on what is happening in the district.
- (3) To supply information on soil conservation in the district when required by the Minister or the Advisory Committee.

immediately apparent that even a district board is fairly remote from all its farmers. It cannot be expected to meet all farmers face to face, and yet this is necessary before the programme can be fully effective.

Provision is made for forming local committees, each consisting of not more than five persons. Each local committee has the responsibility of getting in contact with farmers individually in a small area, e.g., in a particular hundred or on a watershed, and



You cannot judge the level by eye. All contouring projects need to be surveyed to be successful. Surveying for this purpose is provided free of charge by the Soil Conservation Branch of the Department of Agriculture.

- (4) To settle disputes over soil erosion between two neighbours. It is important to note that the board cannot act in these cases until the matter is raised by the person concerned (where no Soil Conservation District Board exists, the Soil Conservator is the judge in such cases). The board on its own initiative has not the power to compel any farmer "out of hand" to do this or that.

LOCAL COMMITTEES.

With up to seven members representing over 4,000 square miles of country, it is

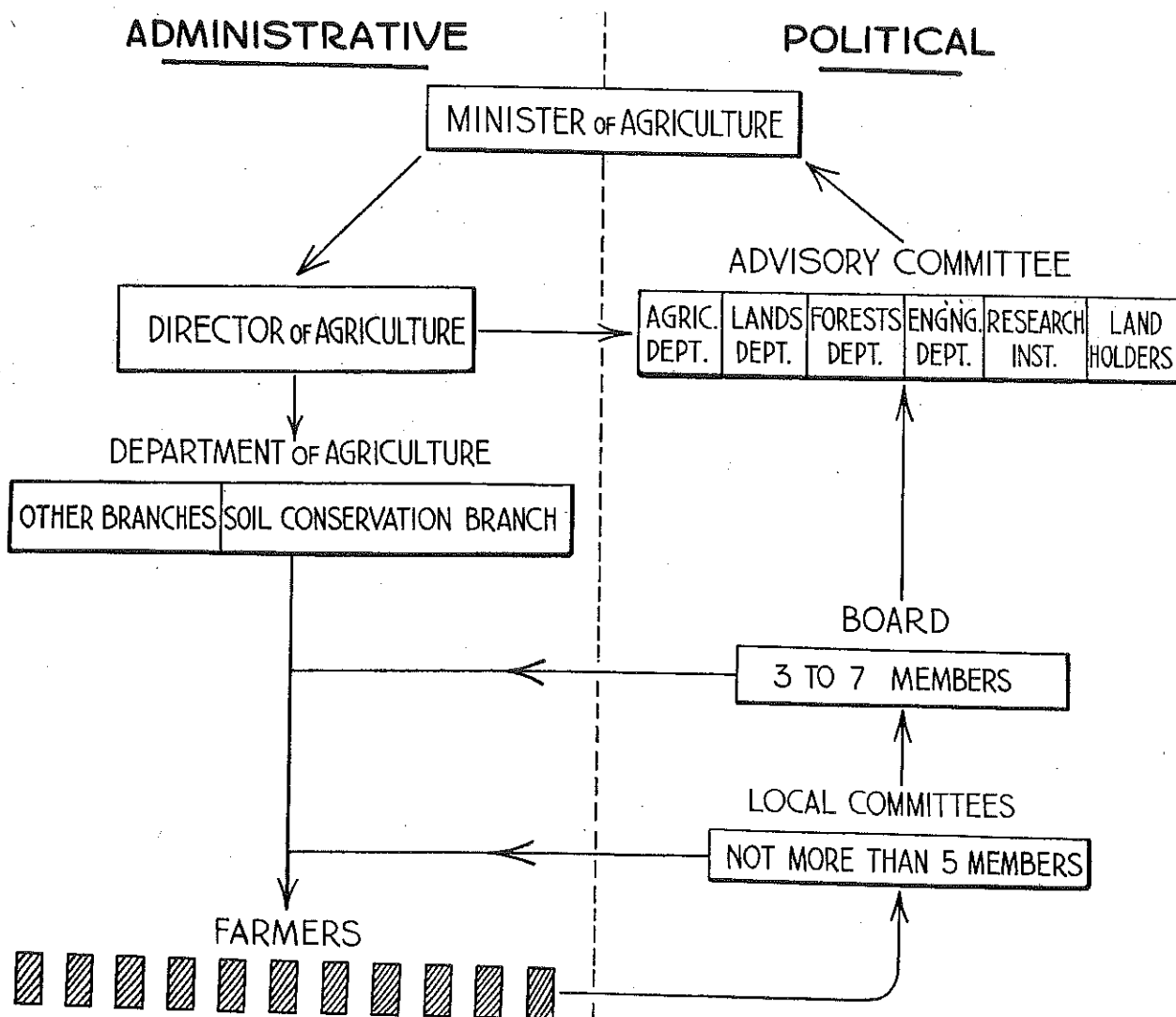
discussing board matters with them. In other words, a local committee is a local organizing and action group.

The members are appointed by the Board, and they are responsible to the board on any matter relating to soil conservation.

By this means a recognized channel is provided for farmer's opinion, and in this way a truly farmer programme can be developed, with the Government assisting rather than directing it.

The relationship of the various bodies one to the other is shown in the following diagram. Technical help is available at all levels from the Soil Conservation Branch.

THE SOIL CONSERVATION PLAN FOR SOUTH AUSTRALIA



Organization of soil conservation activities in South Australia.

ACHIEVEMENTS OF THE BOARD.

One of the first jobs of the Board members was to educate themselves on the many aspects of soil conservation farming now practised in this State. To this end, members have attended many field days and lectures, and have been well supplied with soil conservation literature.

In July, 1951, members attended a combined district boards conference in Adelaide, and later visited many farms in the Mid-North of South Australia where soil conservation practices were seen.

Board meetings are held frequently, and many points raised by farmers are dealt with. Several district councils have contacted the board on matters pertaining to soil conservation. One Soil Conservation Order has been heard. Members have spoken to all the Agricultural Bureaux within the district area.

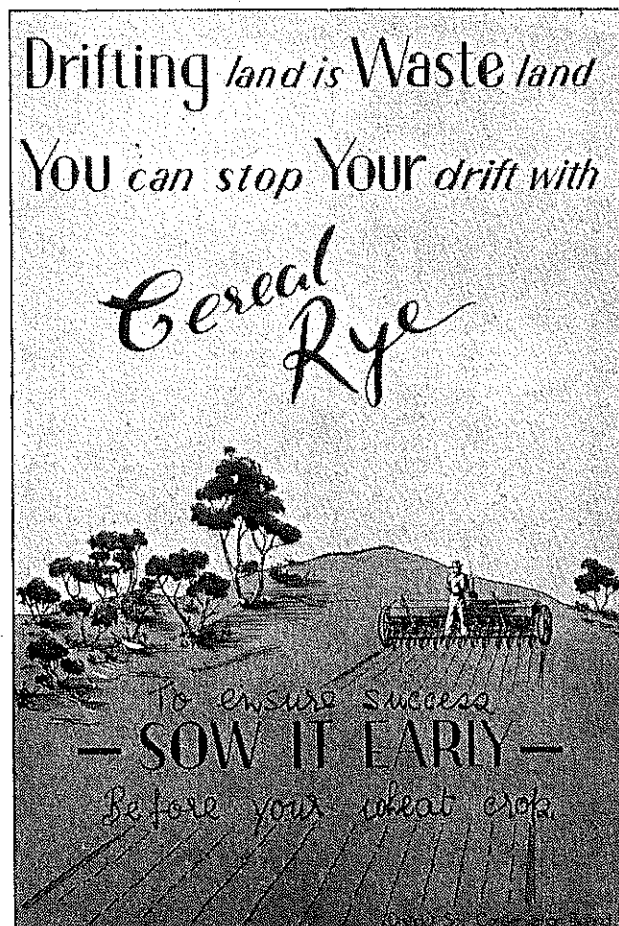
The board also prepared a poster emphasizing the value of rye corn for wind erosion control. This was displayed in most towns.

By far the most important work is the contact with individual farmers. As a result of these contacts, soil conservation projects have been carried out on 23 farms. It is important to record that on eight of these farms several projects have been surveyed.

A summary of this aspect of the work is:—

	Surveyed for Contour Working.		Surveyed for Contour Banking.		
	Projects.	Acres.	Projects.	Acres.	Miles.
1949	3	850	3	220	8.4
1950	6	1,100	4	350	12.6
1951	5	940	3	210	7.8
1952	7	950	9	710	21.0
	21	3,840	19	1,490	49.8

This table shows that as a result of board work farmers are becoming more interested in applying soil conservation measures. The table also shows that only a relatively small



The rye corn poster prepared by the Board and displayed in many country towns.

area of the total area affected by water erosion has been treated.

It emphasizes the need for local committees to contact more farmers and interest them in actively applying soil conservation measures.

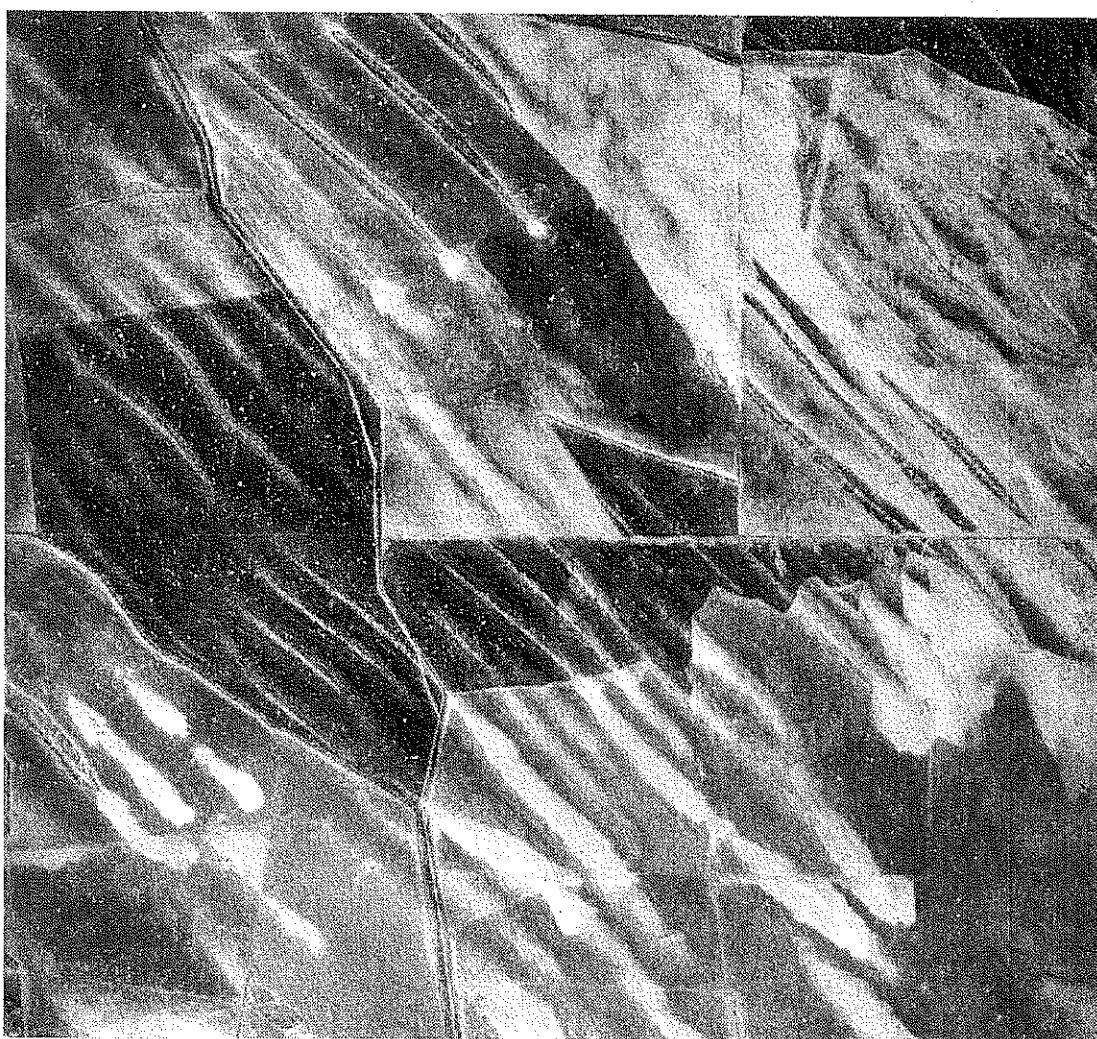
Facts about Your District

The district comprises approximately 4,320 square miles of country, and extends from south of Cowell through Kimba to west of Minnipa. It embraces the area served by the LeHunte, Kimba, and Franklin Harbour district councils and a small part of the Cleve district council area. There are approximately 900 holdings in this area.

Settlement first took place in the vicinity of Cowell in 1853, but it was not until 1878

that subdivision and closer settlement began. The best of the land from Kimba westwards was first occupied under pastoral lease in about 1870, and closer settlement began in about 1890.

The topography varies from hill country (the highest point is a little over 1,400ft. above sea level) to nearly flat sandy ground. There are no permanent rivers.



This aerial photograph shows about 8 square miles of sandy country with parallel sand-ridges running in a northwest-southeast direction. The darker area is natural scrub, and many sandhills can be seen within the scrub. Above this there is an area of cleared land in which the natural scrub has been left on the big sandhills. There is little trouble from erosion. Below the natural scrub the land has been completely cleared and all the sandhills have drifted—as shown by the white patches. There is less erosion in a paddock if the big sandhills are not cleared.

An appreciable part of the district is still in its natural state, the principal vegetation being mallee species and broombush with a wide variety of undershrubs. In some places pines, sheoaks, titree, and spinifex become conspicuous. New land is still being opened up by farmers.

The soils are mainly mallee soils. The heaviest types occur in the Cowell and Buckleboo district. Loamy types occur at Kimba, Minnipa, and Wudinna. Elsewhere the soils are lighter and sandier. Parallel sand ridges running roughly north-west and south-east are associated with the sandier soils. These ridges are about 25-30ft. high, and usually 10-30 chains apart.

The principal land use is mixed farming, combining cropping and sheep raising. Wheat is the main crop with barley and oats becoming more important. Merinos are the most common breed of sheep, and these are usually run in conjunction with cropping.

The average rainfall varies from 11-15in. per annum. Most of the rain falls between

April and October, although occasionally high intensity summer rains occur. Temperatures are high, readings in excess of 100deg. F. being common in the summer months, whilst the average winter temperature is about 52deg. F.

Water reticulation is not very extensive. The Tod pipeline supplies part of the western area, and there are several small reservoirs in the eastern part supplying Cowell and surrounding farms. In other parts, notably Kimba, the towns and the farmers depend largely on surface catchments for water supplies. There are no bitumen roads. A plane service connects Cowell with Adelaide. Part of the area is served by two railway lines, whilst road transport plays an ever-increasing role.

The main towns are Cowell, Kimba, Wudinna and Minnipa. Hospitals are located at Cowell, Kimba and Wudinna. The total population within the whole area is about 4,000.

Hordes of gullies now remind us,
We should build our land to stay;
And departing leave behind us,
Fields that will not wash away.

When our boys assume the mortgage
On the land that's had our toil,
They'll not have to ask the question:
"Here's the land, but where's the soil?"

—Anon.

Land Use Problems

RAINFALL.

One of the big natural disadvantages of the district is the low annual rainfall. Much of the area is marginal land, and is outside Goyder's line of rainfall.

Moisture is often the factor limiting production. Over most of the district, fallow periods have been considered necessary to conserve sufficient moisture for cereal crops. Droughts are a feature of the district.

Farming should be based on the recognition that the area is a dry land region where lack of moisture will limit production.

FERTILITY.

Considerable variation exists in the fertility of the soils throughout the district. Generally speaking the basic reserves are low, and are soon exhausted with continued cropping. All soils lack phosphate, organic matter, and nitrogen. To maintain fertility these must be kept at a reasonable level. Phosphate is applied through superphosphate, and organic matter and nitrogen through legumes and suitable rotations.

EROSION.

Throughout the whole district erosion in one form or another is evident. The problem is intensified in dry years, when it is very difficult to maintain a protective covering on vulnerable soils.

Wind erosion is a problem throughout the whole district except for a small area in the hills out from Cowell. High sand ridges are very liable to drift.

Water erosion is most evident in the hill country, and sheet and gully erosion are increasing. There is increasing evidence that water erosion is becoming an important problem in the undulating sandy soils.

LIVESTOCK.

Livestock are playing an ever-increasing part in the economy of the country, and one of the problems facing the landholder is to be able to judge the safest number of stock to carry. This problem is aggravated by the wide variety of seasons experienced, and by the lack of suitable markets and transport facilities. Over-grazing induces erosion, and stock tracks increase the hazard, particularly around watering points.

WATER CATCHMENTS.

In the Kimba district farmers rely on surface catchments to provide their water requirements. A bare, smooth surface provides the best type of catchment, but one of the big problems is to obtain sufficient runoff without creating serious erosion.

VERMIN.

Rabbits and foxes are found throughout the district, and cause considerable damage. Rabbits aggravate erosion whereas foxes affect livestock. Eradication is difficult.

On the fringe of scrub land, kangaroos and emus often cause damage in crops. When conditions are dry in the pastoral country to the north, galahs and eagles become a nuisance to farmers. Galahs are particularly destructive on germinating crops.

WEEDS.

Noxious weeds are increasing throughout the district, the most common being onion weed, false caper, horehound, Ward's weed, Bathurst burr, and three-cornered Jack. In addition, long and short-fruited wild turnips, Scotch and saffron thistles and melons are a problem.

GRAZE WISELY

You can do this by—

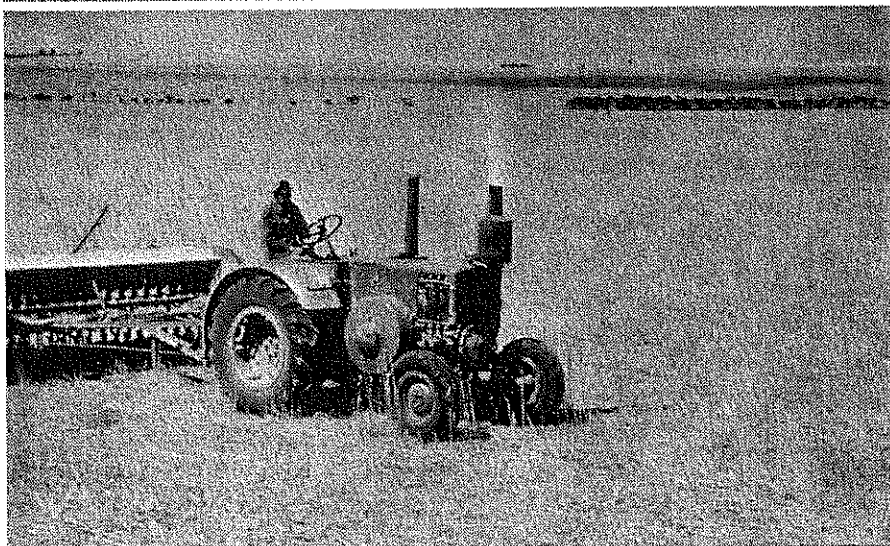
★ Keeping Careful Check on Sheep Numbers

Too many sheep will produce an erosion problem through over-grazing. It is better to grow more wool per sheep than try to carry greater numbers of sheep.



★ Sowing Oats for Early Greenfeed

The safe number of sheep to carry is determined by the amount of feed available in the early autumn months. Early sowing of oats in the stubble provides a good source of feed for these months.



★ Conserving Fodder

Conserve the surplus growth of the spring months. Even a small haystack is a very valuable fodder reserve on a farm.



Objectives for the District

The objectives for the district are to correct the problems discussed in the preceding section. These objectives can only be reached by:—

- (1) The application of a conservation plan to the farm so that each type of land is treated according to its needs.
- (2) Assistance to farmers or groups of farmers in applying soil conservation measures.
- (3) Education—Keeping the farmers up to date on soil conservation matters by means of field days, meetings, articles, etc.
- (4) By developing in the community an attitude which will regard soil conservation as the basis for all types of farming.

PRACTICAL CONSIDERATIONS OF THE PROBLEMS.

Rainfall.

As the area receives a low rainfall, full use should be made of the rain that falls. Farm programmes should be based on the dry years. Surface cover increases the intake of water into the soil and helps conserve this moisture by reducing losses from evaporation.

Bare fallowing increases the reserves of subsoil moisture, but it also creates serious erosion problems. Modified types of fallow, such as stubble-mulched fallows, cover crop fallows, and rough cloddy fallows are better. These practices hold the soil and conserve moisture.

Soil conservation farming demands that each type of soil be assessed individually and worked according to its capabilities.

Fertility.

Rotational cropping is essential to maintain moderate to high yields indefinitely on any type of ground. Liberal dressings of superphosphate give highest crop yields and best pasture growth in the following years. One wheat crop in four years is recommended as the minimum rotation. A five-year rotation, viz., fallow-wheat-oats or barley-pasture-pasture, has given good results, and can be taken as a guide for your own farm. It is

necessary, however, to have flexibility in any farm programme to meet the effect of seasonal conditions in different paddocks.

A fertile soil is necessary for sound farming. Plants can use soil moisture more efficiently on a fertile soil. Good pastures build fertile soils. Pasture species most suitable for the district are Wimmera ryegrass and barrel medic, and to a lesser extent lucerne.

Erosion.

Smooth, bare surfaces accelerate erosion. Cover is essential. Too much valuable cover is destroyed by fire, over-grazing, bare fallowing and vermin. Stubbles should not be burnt once the land is free of shoots.

The fallow period is very vulnerable to erosion. Practices recommended to reduce the erosion hazard are:—

- (a) Leave the surface rough during the summer months.
- (b) Work as little as possible when the ground is dry.
- (c) Stubble mulching.
- (d) Cover crop fallows are often worth while on lighter soils.

Wind Erosion.

Research over the last few years has shown that:—

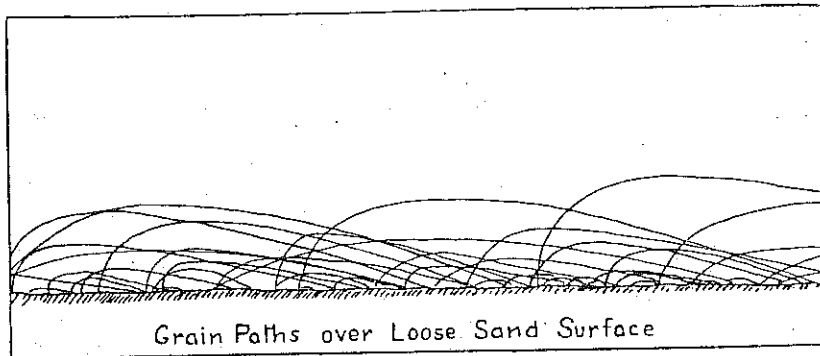
- (a) The speed of the wind becomes less towards the ground.
- (b) There is a thin layer of air above a smooth surface where the air is always still.
- (c) This layer is thick enough to cover the finer soil particles, but the sand grains protrude above it. The sand grains are therefore picked up by the wind and skipped along, thus initiating erosion.

Control measures should therefore aim at:—

- Protecting the soil.
- Reducing the speed of the wind near the ground.
- Increasing the height of the layer of still air.
- Increasing the size of soil particles.

WIND EROSION

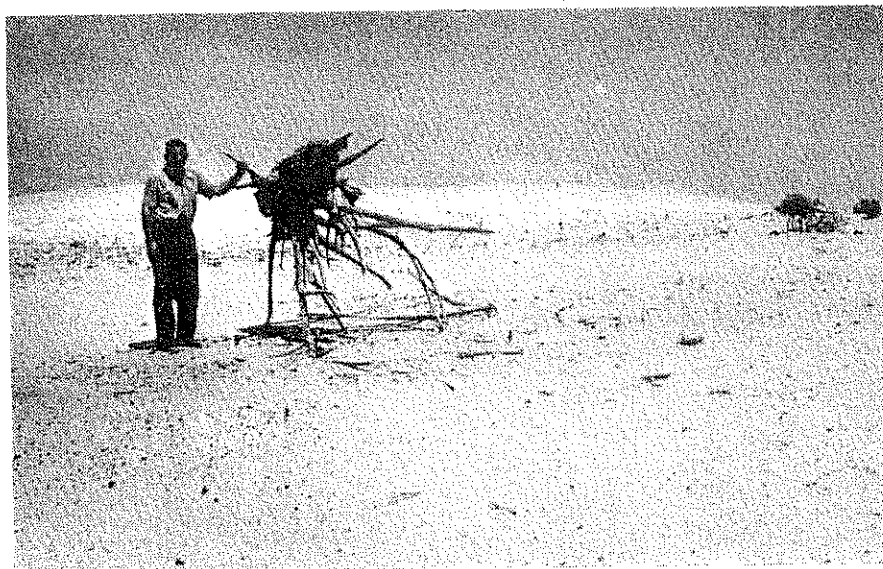
• Wind Blowing over Bare Ground



The diagram shows the way in which fine sand grains bounce when acted on by the wind.

On striking bare ground the moving grains break up clods and set other grains in motion as well as disturbing fine dust particles.

• Removes Surface Soil



The continued action of wind on bare ground—particularly sandhills—will remove the surface soil. This photo shows that about 6ft. of soil has blown away from this area.

• And Makes a Drift Problem



The finer soil particles are carried away as dust. The coarser particles are piled up against fences and trees.

YOU CAN CHECK WIND EROSION

By



- **Leaving Scrub on Hazardous Sandhills**

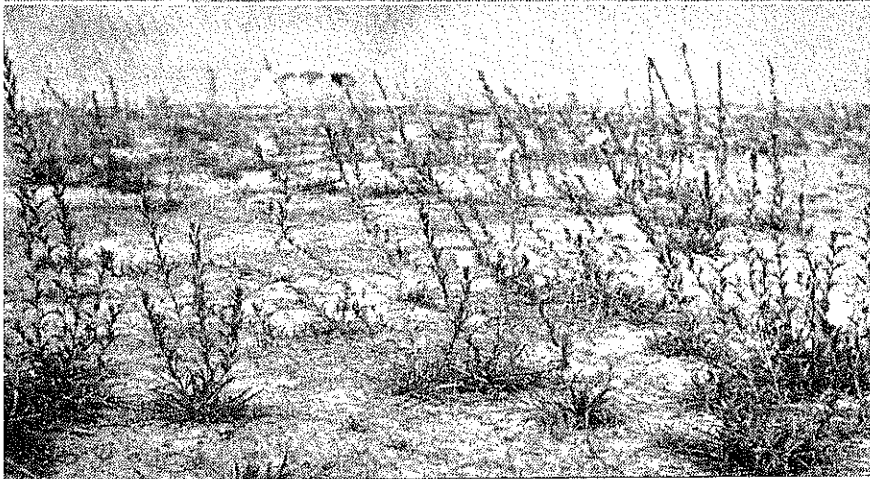
The high sandy ridge has been left under its natural cover of scrub. The flat land is well covered with a good pasture.

There is no erosion.



- **Sowing Rye Corn**

Rye corn is a very valuable plant for getting cover back on blown out areas and covering up sandhills.



- **Sowing Evening Primrose**

Evening Primrose helps to stabilize the cover on vulnerable sandy soils.



- **Removing Stock before the Paddock Gets Too Bare**

All the feed that grows is not stock feed. Some of it is necessary to protect the soil.

Remove stock while there is still sufficient feed to cover the soil.

Practical Ways of Checking Wind Erosion.

- (1) Leaving the scrub on big sandhills. The edge effect due to the mallee roots can be overcome by deep ploughing or ripping.
- (2) Sowing rye corn on bare sand rises. Rye corn must be sown with the first autumn rains. Evening primrose can be sown the following year to maintain a permanent cover on these rises.
- (3) Roughening up bare surfaces is of value as a first step in regenerating blown-out spots. This measure is only temporary, however, and must be followed up with other measures.
- (4) Rough cloddy fallows.
- (5) Cover crop fallows. A light seeding of oats in August gives protection to soils susceptible to drift.
- (6) Stubble mulched fallows. The effectiveness of stubble in checking erosion depends on:—
 - (a) Amount: The first $\frac{1}{2}$ ton of stubble to the acre exerts a marked reduction in the intensity of erosion.
 - (b) Length: Longer stubble gives more protection than shorter stubble. One blade of straw 6in. high gives more protection than three blades 2in. high.
 - (c) Degree of burial: Best protection is given when only sufficient is buried to anchor the straw.
- (7) Building up the size of the soil crumbs with organic matter. A good pasture provides plenty of organic matter.
- (8) Removing stock when there is still sufficient cover to protect the soil.

- (9) Special attention to vulnerable spots, e.g., rabbit warrens, watering points, from which drift will occur most readily and spread to the rest of the paddock.

It must be emphasized, however, that in handling soils liable to drift, forethought is necessary to get the vulnerable spots covered before the summer time.

Water Erosion.

- (a) The basic cause of water erosion is due to the actual raindrops striking bare ground.
- (b) The raindrops possess considerable energy which is used to break off small particles of soil from the soil clods and load these particles into run-off water. At the same time the raindrops pound the soil surface and produce a surface seal.
- (c) This surface seal is only $\frac{1}{16}$ in. thick, but it effectively prevents water from getting into the soil. Water then runs off and carries the topsoil with it.
- (d) The loss of water through run-off means virtually that the rainfall for the year is reduced.
- (e) The intensity of erosion is influenced by slope and soil type. Steep slopes and sandy soils above heavy clays are very liable to washing.

Control measures should therefore aim at:

Protecting the surface soil from the pounding action of the raindrops. Surface cover is an ideal way of absorbing the energy of the raindrops.

Improving the soil structure. A well-structured soil is more resistant to breakdown and is porous.

Holding the water where it falls and thus giving it longer to soak into the ground.

This can be achieved by:—

- (1) Surface cover.
- (2) Pasture—promotes soil structure.
- (3) Cloddy fallows.
- (4) Stubble-mulched fallows.
- (5) Contouring:

(a) Contour furrows: Consist of a series of level furrows 6-8ft. apart. They are a valuable conservation practice on steep grazing land.

(b) Contour banks: Are used on arable land on slopes between 3 per cent and 10 per cent. All working is carried out between the banks. The banks have a maximum grade of 3 in 1,000.

(c) Contour working lines: Consist of level guide lines, and are used on slopes below 3 per cent.

It is impossible to guess level lines accurately. The lines for all forms of contouring must be surveyed to be successful. The surveying is provided free of charge by the Soil Conservation Branch of the Department of Agriculture.

Livestock.

Over-grazing by livestock can cause very serious erosion problems throughout the whole district. The critical factor determining safe stock numbers is the amount of feed available in autumn months. Fodder conserved in the spring and fed in autumn will prove very valuable. Early sowing of oats for greenfeed provides a good supply of supplementary feed. Conserved fodder permits a safe number of sheep to be carried longer without damage to the soil.

Smaller paddocks permit better management of vulnerable areas. Stock can be moved on before the ground becomes bare.

Improved pastures of Wimmera ryegrass and barrel medic give more feed and provide

cover for the ground for a longer time than do the natural grasses, e.g., barley grass.

Quality in sheep is better than quantity. More wool per sheep, rather than more sheep, reduces the risk of over-grazing.

Watering points should be on hard, stony ground. Stock trails and camping areas often intensify erosion problems. Even distribution of watering points permits better management.

Keep a close check on stock numbers. All the feed that grows is not stock feed. Some of it is necessary to protect the surface soil.

Water Catchments.

A small area effectively sealed with a lasting surface seal would give sufficient run-off without producing erosion. As yet no such seal is available. It is therefore necessary to set aside approximately 5 acres of graded surface.

Siltation is best overcome by a settling basin from which the water is pumped or syphoned into the dam.

Vermin.

Vermin create bare spots from which drift starts. Community efforts are needed to destroy all warrens and rabbits. Many methods are tried by farmers, but the success is limited unless there is widespread co-operation.

Some success in reducing the effects of rabbits in a crop has been obtained by sowing rye corn around the edge of the crop.

Weeds.

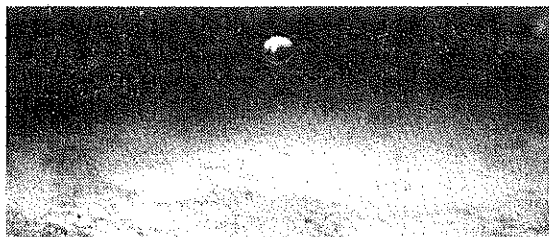
Weeds rob the soil of plant foods and moisture, and often reduce yields in crops. Elimination of weeds can be achieved by:—

Cultivation.

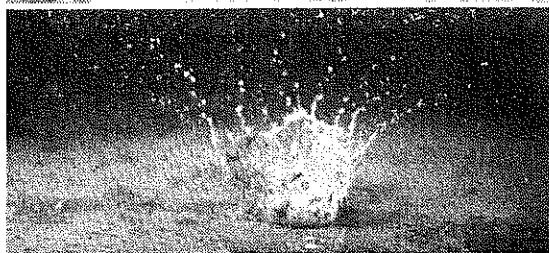
Increased competition from pastures.

Spraying with hormone weedicides.

A FALLING RAINDROP "BOMBS" THE GROUND



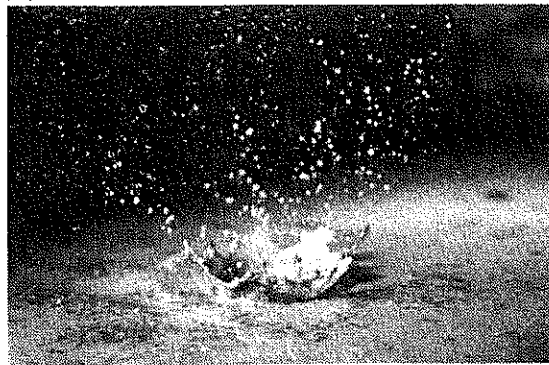
The falling raindrop moves towards the ground.



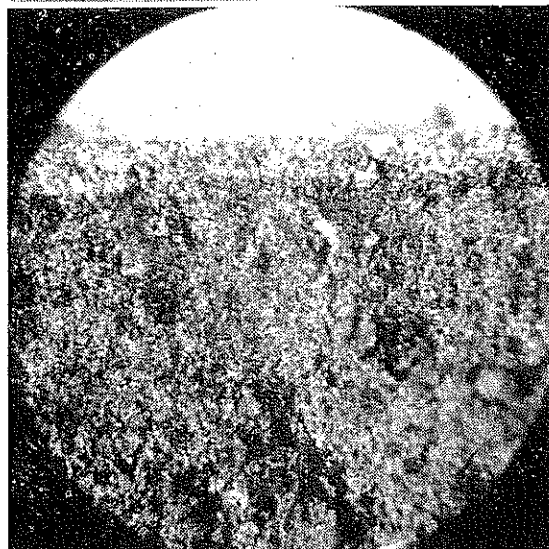
The raindrop on striking the ground creates a blast like a bomb. A liquid cylinder of water is thrown up.



The air is filled with flying soil particles.



The liquid cylinder then collapses.



[Photos. by U.S. Naval Research Laboratory.]

As a result of this action, the surface soil develops a crust. This photomicrograph shows the crust—about $\frac{1}{16}$ in. thick—on the surface of a soil. The crust is very compact, whereas the soil beneath is porous. Water can only move through the crust very slowly.

[From Nebraska A.E.S. Res. Bull. 112.]

THE EFFECTS OF WATER EROSION

Surface Crust

How a soil looks after it has developed a surface crust.

Little water can enter—therefore run-off begins.

[From U.S.D.A. Tech. Bull. 825.]



Rill Erosion

Water running off the paddock soon develops little rills down the hillside. Valuable soil is removed by the run-off water.



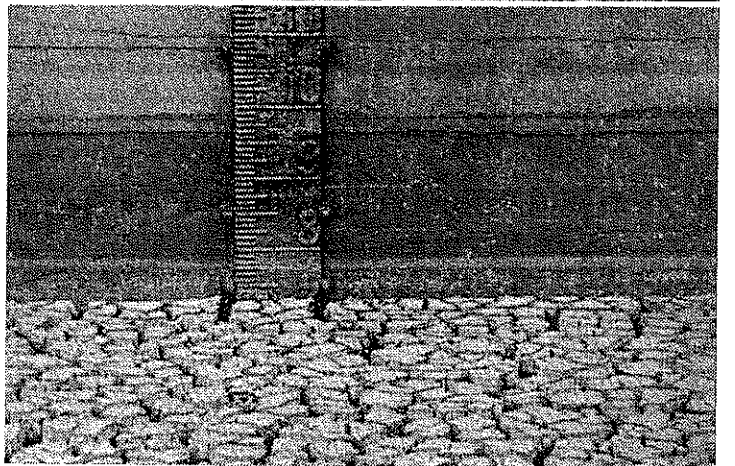
Gully Erosion

An advanced stage of erosion is reached when large active gullies can be seen.



Siltation

The soil carried from your paddocks by run-off water is deposited in creeks, dams, and reservoirs. This photo. shows 7ft. of silt in the Ullabidnie Reservoir.



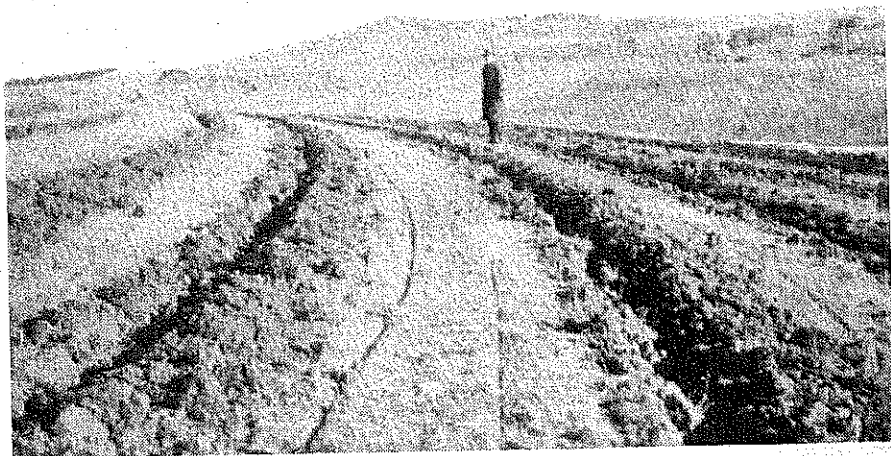
YOU CAN CHECK WATER EROSION

With . . .

* *Contour Furrows*

Contour furrows hold up water on steep grazing land. Furrows 6in. wide, 6in. deep, and 6ft. apart will hold up an extra half inch of rain.

This means less soil loss and better pastures.



* *Contour Banks*

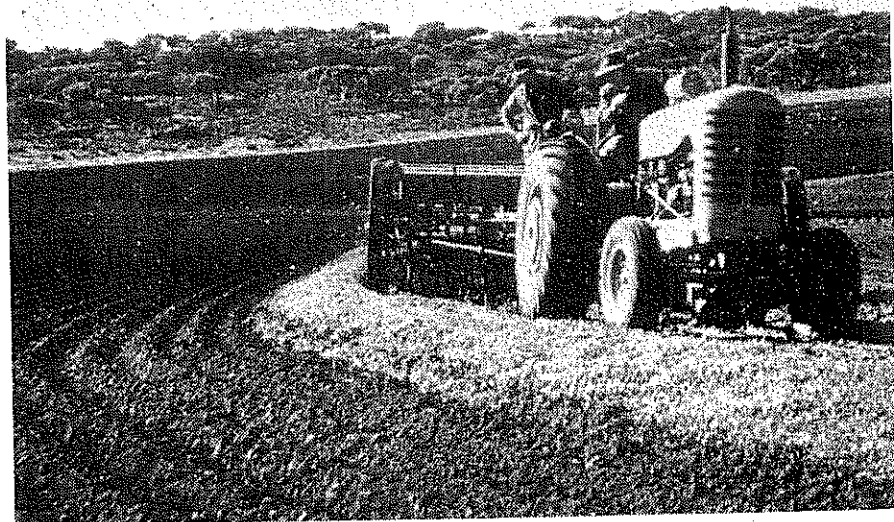
Contour banks check erosion on cropping land. All workings are carried out between the banks. Each cultivation line is therefore on the level and acts as a little dam.



* *Cloddy Fallows*

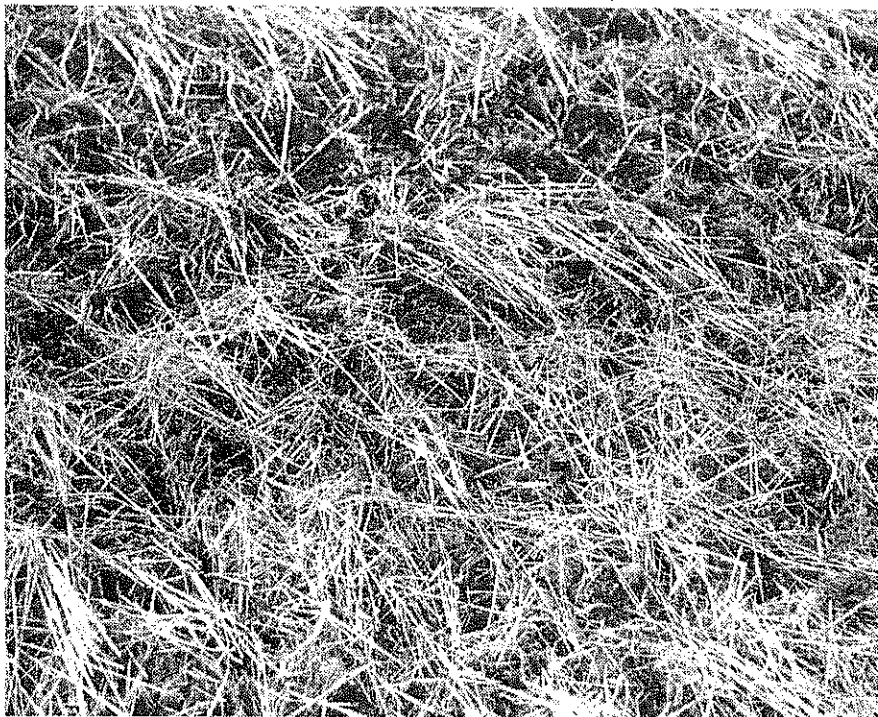
Cloddy fallows absorb more water and do not form a surface crust so readily.

Cloddy fallows between contour banks provide a double protection against erosion.



BOTH WIND AND WATER EROSION

Can be Checked with . . .



★ *Stubble Mulching*

Bare fallows are very vulnerable to erosion. Stubble mulching keeps the wind away from the soil, and also protects it from raindrop action.

Don't burn stubbles—use them.

★ *Good Pasture*

A good pasture protects the soil from the wind and the rain and builds up the crumb structure.

It also increases the fertility of the soil, and provides better feed for livestock.

Here is a good barrel medic and Wimmera ryegrass pasture.



GOOD SOIL IS THE BASIS OF GOOD AGRICULTURE

Conservation of the soil should therefore be the prime consideration on all farms.

Many farmers have proved that soil conservation is a profitable business, profitable not only to the nation but to the individual farmer.

You can prove it for yourself by adopting the practices recommended here. Many of the practices you can apply straight away, as they do not require special equipment or materials. With other practices you will need help.

The Upper Eyre Peninsula District Soil Conservation Board will be happy to help you with your problems. The objectives are worth while and will make for better farming.

For Your Information

I. DISTRICT COUNCIL DISTRICTS.

	Population (as at 30th June, 1947).	Area. Sq. Miles.
Franklin Harbour	1,050	1,230
Kimba	1,075	1,170
Le Hunte	1,710	1,570

II. HEIGHT ABOVE SEA LEVEL.

	Ft.		Ft.
Cowell	20	Koongawa	600
Miltalie	1,170	Kyancutta	210
Mangalo	540	Warrambo	310
Kimba	900	Wudinna	290
Bunora	700	Pygery	410
Waddikee	600	Minnipa	500

Towns Adjacent to Board Area.

	Ft.		Ft.
Arno Bay	20	Darke Peak	580
Cleve	650	Lock	470
Rudall	320	Elliston	80

III. AVERAGE RAINFALL.

	In. per Annum.		In. per Annum.
Cowell	11	Buckleboo	12
Miltalie	13	Kyancutta	13½
Mangalo	13	Wudinna	13
Kimba	12½	Minnipa	13½

Towns Adjacent to Board Area.

	In. per Annum.		In. per Annum.
Arno Bay	12½	Darke Peak	15
Cleve	15½	Lock	16
Rudall	13	Elliston	17

IV. WHAT RAIN MEANS.

- 1 point of rain on 1 acre = 227gall. = 1 ton (approx.).
 10 points of rain on 1 acre = 2,270gall.
 50 points of rain on 1 acre = 11,340gall.
 100 points of rain on 1 acre = 22,680gall., which is equal to 101 tons (approx.).
 100 points, i.e., lin. of rain on 100 acres = 2¼ million galls. (approx.).

V. WATER-HOLDING CAPACITY OF SOILS.

Field Capacity = the maximum amount of water the soil can hold after allowing for drainage.

Wilting Point = the amount of moisture which the soil holds and will not give to the plant.

Available Moisture for plant growth = Field Capacity — Wilting Point.

Some Average Figures for the Amount of Water which Different Soils Can Hold.

	Sand.	Sandy Loam.	Loam.	Clay Loam.	Clay.
Field Capacity	0.67in./ft.	1.70in./ft.	2.96in./ft.	3.63in./ft.	5.04in./ft.
Wilting Point	0.25in./ft.	0.62in./ft.	1.06in./ft.	1.43in./ft.	2.54in./ft.
Available Moisture	0.42in./ft.	1.08in./ft.	1.90in./ft.	2.2in./ft.	2.5in./ft.
Water in 1 acre of soil 1ft. deep	43 tons	109 tons	192 tons	222 tons	253 tons

i.e., between rains 1ft. of sand has only a maximum of 43 tons of water per acre available for plant growth. Similarly 1ft. of clay has 253 tons per acre available.

VI. WATER USED BY PLANTS.

Lucerne requires 750 tons of water to produce 1 ton of feed.

Wimmera ryegrass requires 330 tons of water to produce 1 ton of feed.

Barley requires 340 tons of water to produce 1 ton of hay.

Barley requires 830 tons of water to produce 1 ton of grain.

Oats requires 380 tons of water to produce 1 ton of hay.

Oats requires 1,150 tons of water to produce 1 ton of grain.

Wheat requires 330 tons of water to produce 1 ton of hay.

Wheat requires 1,150 tons of water to produce 1 ton of grain (36bush.).

From the figures for wheat 1,150 tons of water are necessary to produce 36bush. of grain. Now, 101 tons of water = 1in. of rain on an acre, *i.e.*, approximately 11½in. are necessary for 36bush. of grain, or 1in. of rain could theoretically produce 3½bush.

The following yields were registered by West Coast farmers who submitted entries in the 1951 State Wheat Grower Competition. The figures are based on the April-November rainfall recorded at the nearest post office:—

	Bush. per In.
Rayson, E. S. R., Buckleboo	2.93
Secker, W. V., Yeelanna	2.57
Hunt, A., & Son, Mitchellville	2.41
Miller, E. L., Mudamuckla	2.20
Scholz, L. A., Pygery	2.00

Failure to reach 3½bush. per inch of rain is due to losses from evaporation, weeds, and run-off.

VII. EROSION LOSSES.

1. Water Erosion Experiments.

(a) Carried out on a loamy soil type, on a 2½ per cent slope with no cover. Rainfall 50 points:—

Water loss = 17 points. Soil loss = 3cwt. soil per acre.

On a 100-acre paddock this one rain would mean a loss of 1,700 tons of water and 15 tons of soil.

(b) Experiment carried out on a loamy soil type to measure the effect of different rotations on the ability of the soil to absorb rain after 70 years:—

Under virgin conditions, the soil absorbed 9½in. in three hours;

Under lucerne the soil absorbed 7½in. in three hours;

Under three-course rotation—

Fallow stage (recently fallowed), 5½in. in three hours;

Pasture stage (poor pasture), 2in. in three hours;

Under Fallow-Wheat rotation—Fallow stage, $\frac{1}{2}$ in. in three hours;

i.e., as a result of continuous Fallow-Wheat rotation the ability of the soil to absorb water dropped from $9\frac{1}{2}$ in. to $\frac{1}{2}$ in.

Raindrops falling on bare ground initiate water erosion. It has been calculated that in a 2 in. rain on an acre, there is sufficient energy in the raindrops to raise the top 7 in. of soil 3 ft. into the air. This energy is used in packing the soil, giving a surface crust, which slows down the rate of water absorption.

2. Wind Erosion Experiments.

(a) The largest soil particle which can be moved by the wind is about 2 mm. in diameter (about $\frac{1}{15}$ th of an inch). To do this requires a wind velocity of 30 m.p.h. at 1 ft. above the surface. This is equivalent to a wind velocity of 50-60 m.p.h. at a height of 50 ft.

(b) The amount of soil loss by wind action is influenced by the amount, length, and degree of burial of the straw cover. Consider these experimental results:—

Wind velocity of 17 m.p.h. at 1 ft. above the surface—

When the stubble was 2 in. long and $\frac{1}{4}$ ton/acre, the soil loss was 22.6 tons per acre.

When the stubble was 6 in. long and $\frac{1}{4}$ ton/acre, the soil loss was 13.3 tons per acre.

When the stubble was 2 in. long and $\frac{1}{2}$ ton/acre, the soil loss was 10.9 tons per acre.

When the stubble was 6 in. long and $\frac{1}{2}$ ton/acre, the soil loss was 6 tons per acre.

VIII. EFFECT OF GRAZING ON PLANT ROOTS.

Grazing management plays a very important part in maintaining surface cover and reducing erosion. Consider the results of this American experiment where grasses were cut at various heights:—

Height of Cutting.	Weight of Plant Roots (grammes).		
In.	Red Fescue.	Blue Grass.	Colonial Bent.
$\frac{1}{4}$	1.4	1.6	2.1
$1\frac{1}{2}$	8.6	7.5	5.0
3	13.7	11.7	7.7

This shows that close grazing ($\frac{1}{4}$ in.) produces a small root growth, whereas by allowing the plants to grow longer they developed a greater root system.

An increased root system means that the plants can obtain water and plant foods from a greater volume of soil. The plants, therefore, produce more top growth and do not wilt as easily. More top growth means more feed for stock, more cover, less erosion.

IX. SOILS.

All soils are made up of varying proportions of sand, silt, and clay fractions. *Soil texture* is a way of expressing proportions of each fraction. It can be determined in the laboratory by mechanical analysis or with experience by "feel."

Thus—

	Percentage.		
	Sand.	Silt.	Clay.
Sand may contain	90	4	6
Loam may contain	62	18	20
Clay may contain	40	10	50

Soil Structure is the way in which the individual soil particles stick together to form soil crumbs.

Soil Profile.—All soils are made up of various layers, each having different properties. These layers make up the soil profile. The value of a soil depends on the type and depth of individual soil layers. Examples of soil profiles on Upper Eyre Peninsula are:—

Soils on the Heavier Flats—

- (a) 0in.-8in. brown sand.
8in.-24in. brown sandy clay loam.
24in. + limestone rubble.
- (b) 0in.-6in. brown sandy loam.
6in.-8in. red-brown clay loam.
8in. + travertine limestone.

Soils on the Sandy Country—

- (c) 0in.-12in. white sand.
12in.-33in. brown sandy clay loam.
- (d) 0in.-12in. white sand.
12in.-20in. yellow sand.
20in.-30in. yellow sandy loam.
30in.-40in. yellow-brown sandy clay.
- (e) 0in.-4in. light brown sand.
4in.-8in. white sand
8in. + grey-brown sandy clay.

(f) On many of the big sandhills there is over 6ft. of white sand.

A cubic foot of soil weighs between 80-90 lb.

X. TREES SUITABLE FOR SHADE AND SHELTER PURPOSE IN 11in.-15in. RAINFALL AREA.

Canary Is. Pine (<i>Pinus canariensis</i>)	Pepper Tree (<i>Schinus molle</i>)
Aleppo Pine (<i>Pinus halepensis</i>)	Athel Tree (<i>Tamarix aphylla</i>)
Pyramid Tree (<i>Lagunaria Patersonii</i>)	Carob (<i>Ceratonia siliqua</i>)
N.S.W. Swamp Oak (<i>Casuarina glauca</i>)	Native Pine (<i>Callitris glauca</i>)
Black Oak (<i>Casuarina lepidophloia</i>)	Boobialla (<i>Myoporum insulare</i>)
Sugar Gum (<i>Eucalyptus cladocalyx</i>)	Myall (<i>Acacia sowdenii</i>)
Pink Flowering Gum (<i>Eucalyptus torquata</i>)	Mulga (<i>Acacia aneura</i>)
Kurrajong (<i>Brachychiton populneus</i>)	

XI. WEED CONTROL.

If we wish to control weeds we aim to stop them seeding. Increased competition from useful plants is a valuable technique. Chemical control measures are becoming very useful. Details can be obtained from the Research Officer, Weeds, Department of Agriculture, Adelaide.

XII. PRODUCTION FIGURES FOR THE DISTRICT COUNCIL DISTRICTS WITHIN THE AREA.

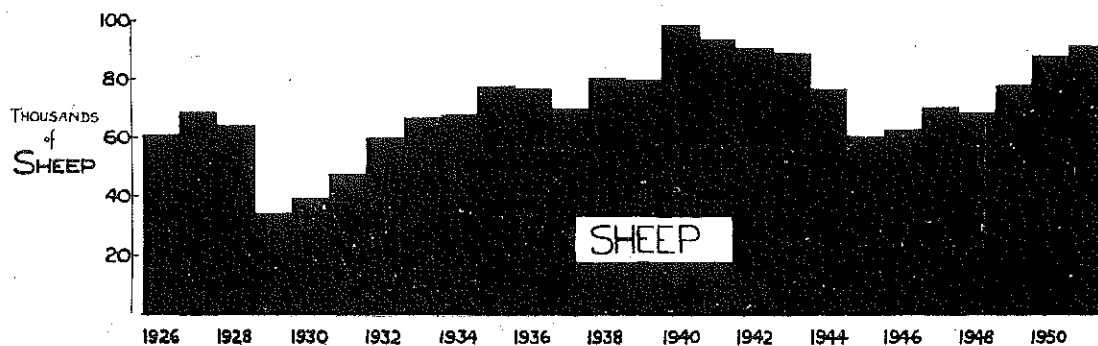
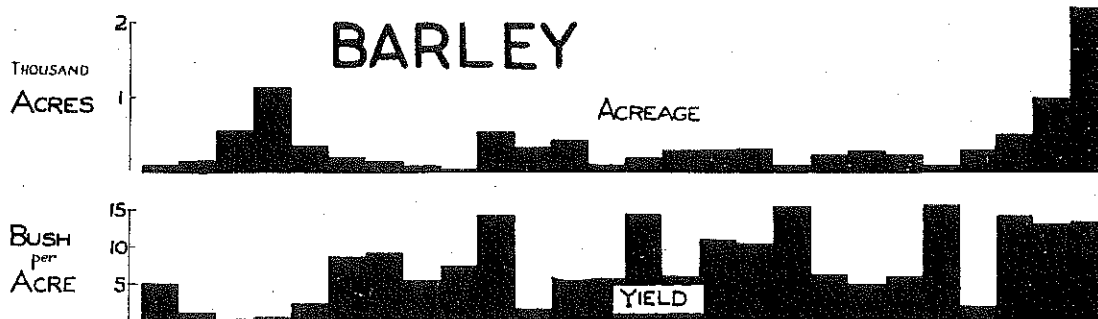
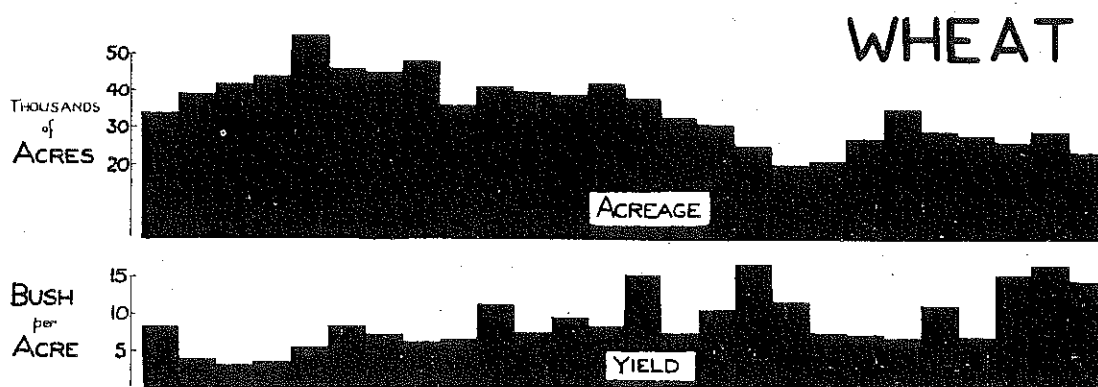
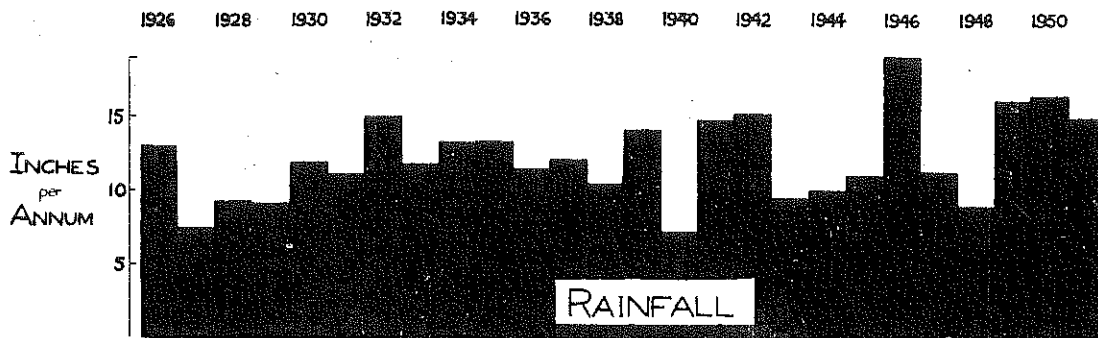
The yearly rainfall, wheat acreage and yield, barley acreage and yield, and sheep population are given for the District Council Districts of Franklin Harbour, Kimba, and Le Hunte.

The rainfall figures used were:—

- (1) Franklin Harbour district—Average for Cowell and Miltalie.
- (2) Kimba district—Kimba.
- (3) Le Hunte district—Kyancutta.

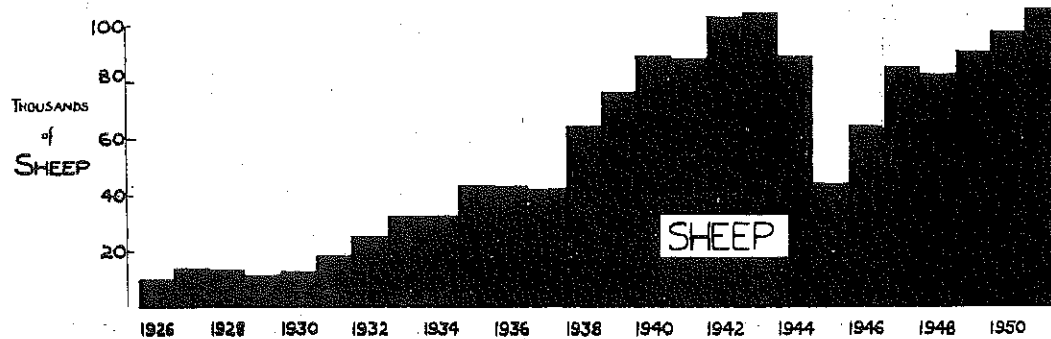
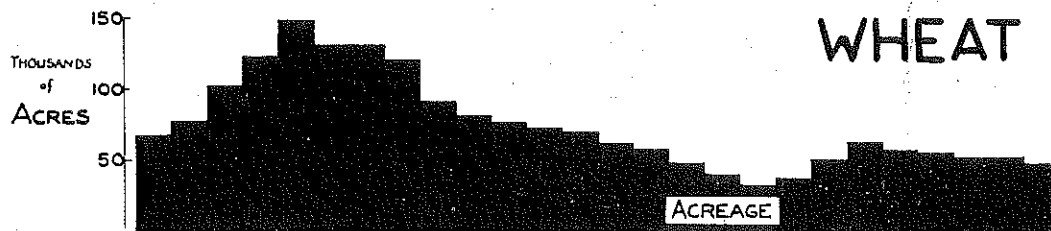
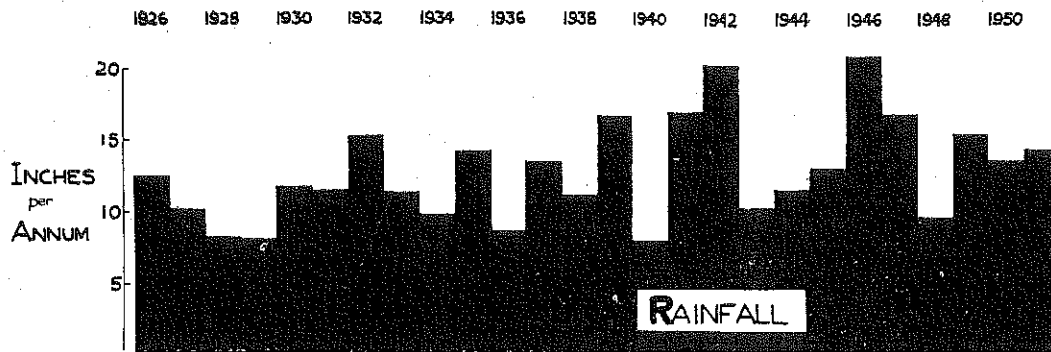
FRANKLIN HARBOUR

DISTRICT COUNCIL DISTRICT



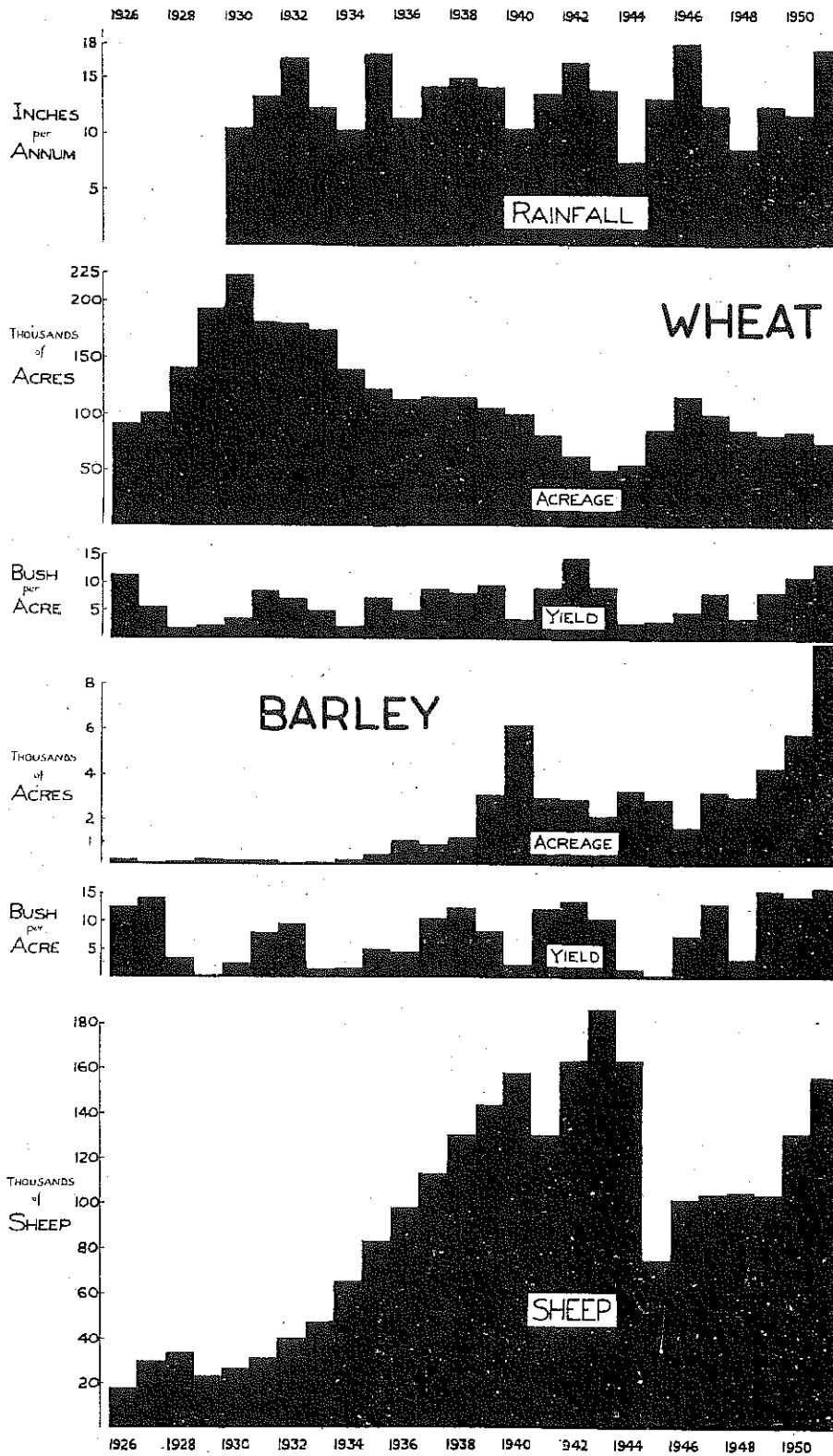
KIMBA

DISTRICT COUNCIL DISTRICT



LEHUNTE

DISTRICT COUNCIL DISTRICT



FOR FURTHER READING

You can obtain further information on soil conservation practices from the leaflets issued by the Department of Agriculture.

Those listed below are supplied free of charge from the Library, Department of Agriculture, Box 901E, G.P.O., Adelaide:—

Can Trash be Handled?	1/53
Contour Furrowing	11/50
Erosion by Wind	2/51
Graded Banks for Soil Conservation	7/49
Raindrops	8/45
Rye	3/48
Soil Conservation Programme	6/52
Stubble Mulching	3/45
Water Erosion—Handling the Problem	7/47

DUST.

I ring-barked the trees on the hilltop,
I crowded my stock on the plain:
For profit I've made me a desert—
And now I am praying for rain.

I ploughed with no thought save markets,
To lay the last acre in grain—
No thought for the sun's and wind's way—
And so I am praying for rain.

I looked for two crops in a season,
And after the harvest its grain;
Then I pastured the sheep on the stubble,
And loud are my prayers for rain.

There is death on the downs where life flourished;
My stock fight to live and are slain,
Not by God, but by me in my folly,
Wherefore am I praying for rain.

The rain-cloud gave way to a dust-cloud,
My years and my efforts are vain;
Now I sit where a desert rolls red to my doorstep,
And wished I had prayed for a brain.

—HENRY PRYCE, "Organic Farming Digest."