Agriculture in South Australia—The Lower Murray Basin

DEPARTMENT OF AGRICULTURE, SOUTH AUSTRALIA

LEAFLET No. 3788

AGRICULTURE IN SOUTH AUSTRALIA
The Lower Murray Basin

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THE area under consideration comprises Counties Sturt, Buccleuch and Russell. It includes the cereal sheep areas of the Murray Plains extending to the Mount Lofty Ranges in the west; it also includes similar areas east of the Murray River to Coonalpyn as well as the dairying areas on the Murray Swamps and the lower reaches of the Murray River.

MORE ABOUT THE AREA

The ranges on the western side rise to 1,000 or more feet above sea level, but fall away sharply to the river. The rest of the district east of the river is more typically mallee and gently undulating.

Natural vegetation in the ranges includes red gums, blue gums, peppermints, sheoaks together with annual and perennial grasses. But on the remainder of the area this changes to mallee eucalypts and broom brush together with shrubs and grasses.

The average rainfall in the ranges is as high as 27 inches per annum, but falls away rapidly towards the river where it varies between 11 and 14 inches. Further eastward the average rainfall again increases to 17 inches.

Soils are also extremely variable—on the ranges they may be red-brown to acid-grey soils depending on rainfall, and on the higher stonier portions the top soil is very shallow. On leaving the ranges, however, we find mainly mallee soils and some deep sands.

Bores, shallow wells, creeks and dams supply good stock water over much of the district, but reticulation is necessary in restricted areas east and south-east of the Murray River.

Obviously land use must vary with the rainfall and in the ranges we find wool and prime lamb raising together with some dairying and cereal cropping. However, eastward the properties are

Reprint from the Journal of Agriculture, S.A. (January, 1965) **68**: 169-85.

mainly devoted to cereals and sheep raising, with wheat the most important crop.

Merinos comprise the bulk of the sheep population but crossbreds are often used with prime lamb raising in the hills.

Irrigated reclaimed swamp areas along the Murray River are used mainly for dairying, and a high level of milk production comes from about 240 farms on the river flats.

NUMBER AND SIZE OF FARMS IN THE PERIOD 1952/3-1961/2

In COUNTY STURT, the number of holdings in this period increased by 163 and the area under production by 64,000 acres. However, due mainly to an increase in the more intensified type of farming such as market gardening and fruit trees, the average area of each holding decreased by 33 acres.

In this county the size of holdings varies considerably. Those under horticulture and vegetable crops are a few acres, dairy farms in the higher rainfall regions of the Mt. Lofty Ranges and the reclaimed Murray Swamps range between 50 and 100 acres. Then there are large sheep grazing properties of between 1,000 and 5,000 acres in the eastern foothills, and cereal sheep farms of 1,000 to 2,000 acres on the plains between the River Murray and the foothills.

In COUNTY BUCCLEUCH the number of holdings increased by 41 and the additional area brought under production in the same period was 120,000 acres; this area was derived from newly cleared land. However, individual farm size has remained static at about 2,000 acres.

Land in this County is used mainly for cereal production and sheep grazing and to a lesser extent for beef cattle, but there is a small percentage of dairy cattle, pigs and poultry.

In COUNTY RUSSELL, the number of holdings has remained fairly constant but an additional 38,000 acres were brought into production. In this instance not only was new land developed but individual farmers purchased more property.

The average area of each holding in County Russell is smaller than in County Buccleuch due mainly to the proportion of dairy farms on the reclaimed Murray Swamps and those bordering Lake Alexandrina and Lake Albert. The cereal sheep farms are very similar in area to equivalent farms in County Buccleuch with an average area of about 2,000 acres.

TOTAL PRODUCTION AND AVERAGE YIELDS IN THE PERIOD 1952/3-1961/2

Most of the production in this district is obtained from cereal growing and sheep grazing. Dairying however, particularly on the Murray Swamps and Lakes area provides a substantial contribution.

Wheat—(Table 2)

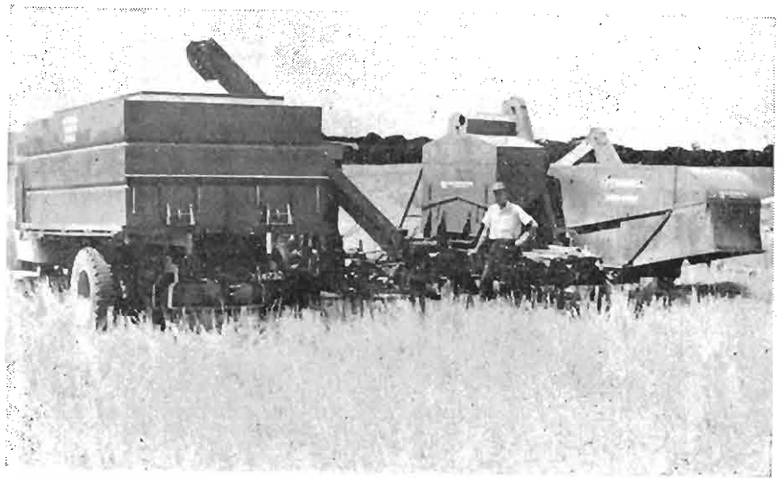
The area sown to wheat, and accordingly the total production of wheat, has increased mainly in the last few years and production of this cereal is still steadily increasing.

Average yields have gradually risen following the introduction of wider rotations and improved soil fertility. The largest increases in acreages and production have occurred in Counties Buccleuch and Sturt.

Barley—(Table 3)

Barley is the most important cereal crop grown in Counties Buccleuch and Russell—the area sown to this crop is about three times that sown to wheat. But in recent years barley growing has declined in favour of wheat because of higher prices and improved markets.

Improved farming methods have also brought about a gradual increase in barley yields.



Scenes taken at Pallamana, in the Murray Plains Zone.
Above: Cultivating fallows.
Below: Bulk harvesting wheat.

Oats—(Table 4)

This is an important dual purpose crop which has become more popular because it provides early feed for stock.

For this purpose the crop is sown dry into stubbles during the autumn or on prepared ground at the break of the season. Depending upon seasonal conditions, it can be grazed two or three times and then harvested for grain.

Oats are also commonly sown into established lucerne stands during renovation—this provides good winter grazing and an excellent hay cut in the spring. In addition, this crops plays an important role as a fodder reserve—it is a popular hay crop in most areas and is used as a source of oat grain intended for storage. The acreage sown to oats, particularly in the main cereal growing areas, has increased slowly and will increase further. Farmers are becoming aware of the value of this crop for winter grazing and as a means of increasing sheep numbers.

Once again production per acre not only for grain, but also for grazing and hay, has followed a definite upward trend with improved soil fertility.

Field Peas—(Table 5)

Although only a minor crop, pea sowings have risen in recent years, mainly in the south-west section of County Buccleuch. Farmers here have used the crop to help build soil fertility.

Sheep and Wool—(Table 6)

Sheep numbers and wool production in all three Counties have greatly increased during the ten year period, especially in Counties Buccleuch and Russell. On the other hand wool production per head has remained fairly static.

These increases reflect a definite improvement in farming methods; methods that have included wider rotations, increased sowings of legumes and applications of superphosphate which in turn have increased soil fertility and greatly increased pasture growth.

Cattle—(Table 7)

Beef cattle numbers have increased markedly during the ten year period. In County Sturt, the increases occurred mainly on sheep grazing properties on the eastern slopes of the ranges and on properties adjacent to Lake Alexandrina.

Owners of properties in the southern parts of County Buccleuch, where cereal growing is less important, have also been responsible for some of the increase. In County Russell, beef cattle numbers have grown on farms adjoining Lake Alexandrina and Lake Albert and in the southern parts of the County.

Because of improved pastures and management on the reclaimed Murray Swamps since the 1956 flood, there has been an increase in the dairy cattle population in Counties Sturt and Russell. Irrigation on properties adjacent to the Lakes in County Russell has made a further contribution.

Milk Production on the Murray Swamps

The peak of production before the 1956 flood occurred in the 1954/5 season with an output of seven million gallons of milk, although this peak was very closely approached in 1953/4 and 1955/6. In the flood year only 3½ million gallons of milk were produced—or about half normal.

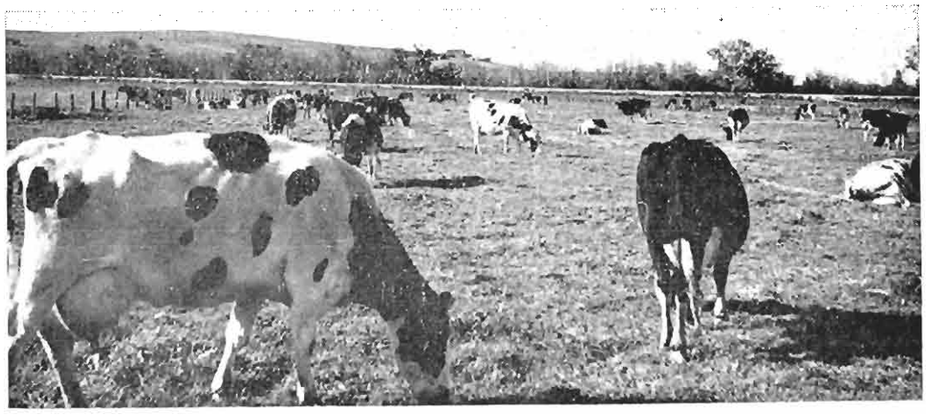
However, since the flood, production has increased each year—in 1957/8 it rose to 6½ million gallons and by 1963/4 more than 10½ million gallons of milk were produced on the swamps farms. This was valued at about £1½ million.

The factors having the most profound effect on these increases were the use of better and more productive pastures, together with improved drainage. There have been other contributing factors, these include:—newly sown pastures, improved herd management

Sheep grazing at Punthari about eight miles north of Mannum in the Murray Plains area.

Above: The Murray River and a typical reclaimed swamp area on which dairy farming is a profitable enterprise.

Below: Cows grazing reclaimed swamp pastures.



and the establishment of areas of irrigated lucerne on high land.

It is considered that a peak in production has almost been attained. Further increases will only come with renovation of pastures, which are now starting to deteriorate, and by maintaining good drainage and by further improvement in herd management.

Although County Buccleuch has had a 38 per cent increase in dairy cattle numbers in the ten year period, further substantial increases are not expected in the future.

Horticulture

Although minor in the overall production of the district big increases in plantings of horticultural crops have occurred in recent years and additional areas are still being planted.

Mypolonga has about 900 acres of established orchards, the average size of which varies from ten to twelve acres. Navel and Valencia oranges are the most important crops, while canning peaches and apricots and some almonds (mainly in shelter belts) make up the remainder.

An extension of about 300 acres, divided into five acre units, is at present under development at Mypolonga North. Depending upon the soil type, this area is being planted to citrus and stone fruit trees.

Besides these areas and close to Murray Bridge, there are about 45 acres of citrus and 20 acres of stone fruit together with 130 to 150 acres of market gardens.

Glasshouse production of tomatoes and cucumbers at Murray Bridge has also become important during the past few years. At the beginning of 1963/4 tomatoes were being produced in 554 glasshouses—an increase of 28 per cent on the previous year. The glasshouses were operated by 51 growers and the highest number owned by one operator was 24.

The tomatoes and cucumbers are mainly sold on the Melbourne market. More than 23,000 half bushel cases of tomatoes netting about £52,000 and 31,500 bushels of cucumbers worth £22,000 were sold on this market in the 1962/3 season.

Tomato production to the end of June 1964 was about 90 per cent higher than that of the corresponding period the previous year, but prices fluctuated considerably.

Poultry

Suitable climate and readily available markets make this district ideal for egg and poultry meat production. Despite these advantages, relatively low prices for eggs in recent years produced small margins for producers, unless their birds were raised under good management conditions.

Production of both eggs and poultry meat, particularly chicken meat (broilers), has increased considerably.

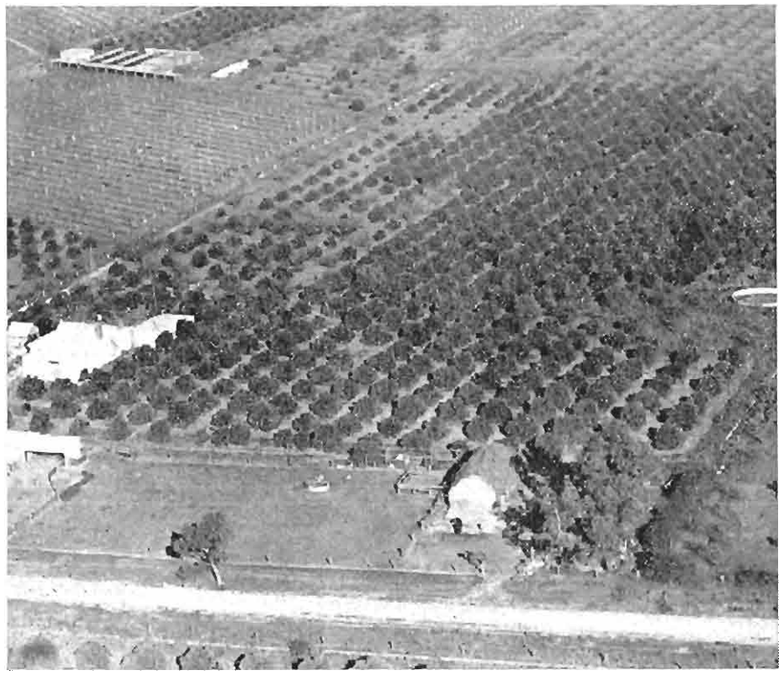
This increase occurred more especially in County Sturt where a large number of commercial poultry units were established. The biggest of these has 20,000 layers and there are many smaller units with 4,000 layers or more.

Chicken meat production has increased from almost nil to more than half a million birds per annum. One of the largest units in the State was established near Murray Bridge about five years ago.

Crossbreds, Australorp x White Leghorns, are the most popular breed for egg production and special strains have been developed for the chicken meat trade.

To keep pace with the increasing popularity of poultry, a stock food manufacturing plant was established at Murray Bridge. This industry employs about 30 men, and each year produces about 12½ thousand tons of prepared poultry and dairy feeds for local consumption.

In many instances prepared feeds are now delivered by bulk transport units to silo storages on farms.



Mixed dairying and fruit growing near the Murray River.

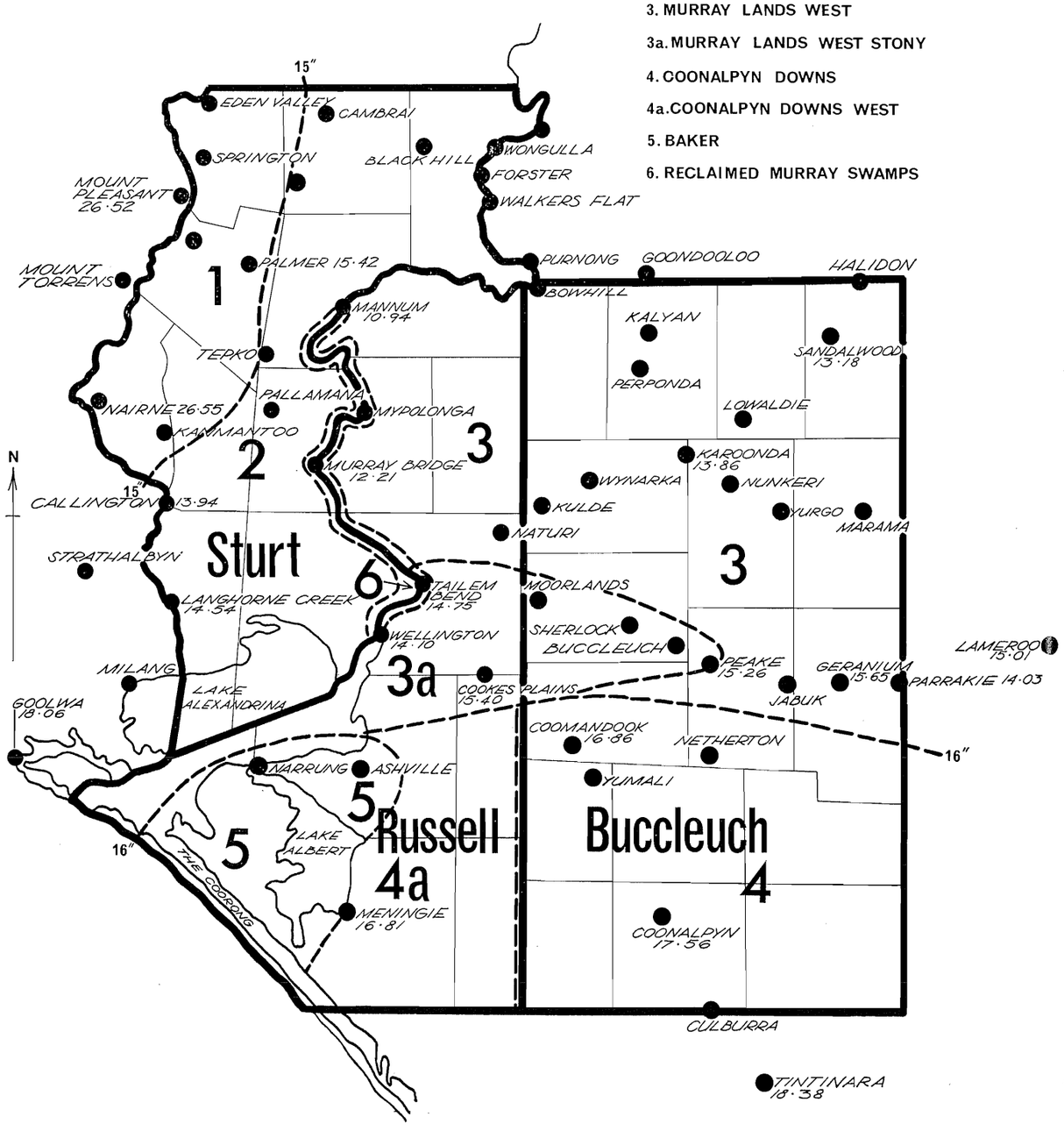
Table 1—HOLDINGS

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Number	1,074	1,069	986	1,133	1,115	1,083	1,088	1,217	1,225	1,237
Acres	691,877	690,076	691,908	763,499	746,135	745,725	748,018	746,386	749,376	755,655
Average, Acres	644	646	702	674	669	689	688	614	612	611
COUNTY BUCCLEUCH										
Number	574	573	609	581	578	592	602	608	609	615
Acres	1,299,995	1,266,184	1,410,372	1,398,971	1,381,422	1,390,248	1,455,831	1,423,538	1,427,290	1,420,503
Average, Acres	2,265	2,210	2,316	2,408	2,390	2,348	2,418	2,341	2,344	2,309
COUNTY RUSSELL										
Number	449	474	474	457	437	435	439	441	445	450
Acres	652,585	648,248	684,914	682,722	728,748	691,809	686,084	692,938	690,299	690,516
Average, Acres	1,453	1,368	1,445	1,494	1,668	1,590	1,563	1,571	1,551	1,534

Murray Bridge and District — Map 1

LAND USE ZONES

1. HILLS AND FOOT HILLS
2. MURRAY PLAINS
3. MURRAY LANDS WEST
3a. MURRAY LANDS WEST STONY
4. COONALPYN DOWNS
4a. COONALPYN DOWNS WEST
5. BAKER
6. RECLAIMED MURRAY SWAMPS



Murray Bridge and District — Map 2

RAINFALL 1911–40 30 Yr. Mean

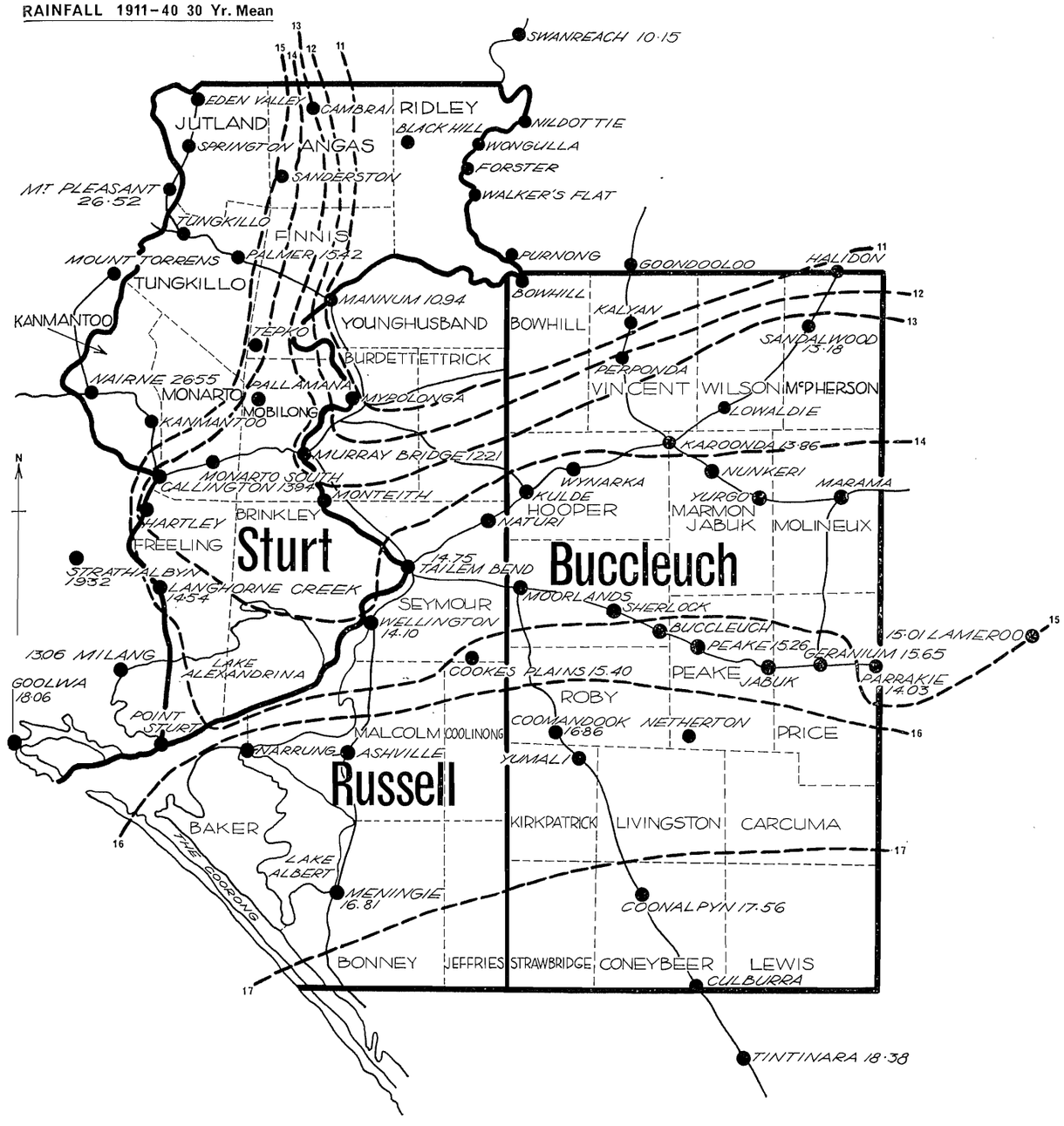


Table 1a—GENERAL See Table 8—Rainfall

Zone	Rainfall	Soils	Water Supplies	Size of Farms	Value of Farms
1	15in. eastern foothills to 26½in. in hills	Stony outcrops interspersed with arable land on eastern slopes to fertile soils in hills on western side of zone	Generally reliable. Supplied from creeks, dams and bores	1,000 to 5,000 acres on eastern slopes to 100 acres on fertile dairy farms in hills	£30-£60 per acre on eastern slopes to £150 per acre for highly developed farms in hills.
2	10in. in north-eastern section to 14½in. in south-western section	Mallee soils varying from fairly fertile red sandy loams with areas of light drifty sands, loose surface limestone and sheet limestone mainly adjacent to the river	Mainly bores supplying good stock water at 150 to 300 G.P.G. The Monarto, Brinkley and Mobilong hundreds being mainly supplied from a reticulated system from the River Murray	1,000 to 2,000 acres for cereal-sheep farms. 10 to 12 acres for orchards	£25-£50 per acre for cereal-sheep farms to £1,000 per acre for established orchards under permanent sprinkler irrigation.
3	10½in. in north-eastern section to 14in. in southern section	Mallee sandy loams, with light drifty sand rises. Areas of loose limestone and patches of sheet limestone mainly adjacent to the river	Mainly bores supplying good stock water at 150 to 400 G.P.G. although parts of the hundreds of Burdett, Ettrick and Seymour are supplied by a reticulated water supply from the River Murray	1,000 to 3,000 acres for cereal-sheep farms	£10 per acre in drier northern areas to £30 per acre in wetter southern areas for fully developed sheep-wheat farms.
3A	14½in. to 15½in.	Similar to Zone 3 with a high percentage of sheet limestone	Mainly bores, with good stock water supplies at 150 to 300 G.P.G. increasing to 700 G.P.G. from Cooke Plains westward. Some wells in the western section have reasonable supplies of 150 to 200 G.P.G. water at a depth of 8ft. to 12ft.	1,000 to 2,000 acres for cereal-sheep farms, and up to 5,000 acres for sheep-cattle grazing properties in the western section	£10 to £25 per acre for fully developed cereal-sheep farms. £10 to £15 per acre for grazing properties.
4	16in. to 17½in.	Mallee loams to sandy loams with light drifty sand rises and some loose limestone in northern section to white leached sands varying in depth over clay sub-soil with some loose surface limestone areas in southern section	Mainly bores with good stock water supplies at 150 to 400 G.P.G. Water is generally of superior quality on the eastern side of the main highway	1,000 to 2,000 acres	£15 per acre in northern section to £30 per acre in southern section.
4A	16in. to 17in.	Mixed mallee soils with high sand ridges in northern section to white leached sands over clay sub-soil at varying depth and pockets of loose limestone outcropping in southern section	Mainly bores with good stock water supplies at 200 to over 500 G.P.G. with some wells 10 to 20ft. deep with water at 50 to 200 G.P.G. in the hundred of Bonney	1,000 to 5,000 acres with 300 to 400 acres for small dairy farms adjoining Lake Albert	£10 per acre in northern section to £30 in southern section.
5	16in. to 17in.	Light drifty sand rises with limestone outcropping in the Ashville area and adjoining the Coorong in the hundred of Baker. Dark sandy loams with some limestone outcropping and heavy black soils adjoining lake fringes	Mainly shallow wells 10 to 20ft. deep with limited supplies of stock water at 120 to 600 G.P.G. Water at about 30 G.P.G. is available to properties adjoining the lakes	Vary considerably from 10,000 acres for cattle-sheep grazing properties to 600 acres for dairy farms adjoining the lakes	£7 per acre for large grazing properties with drifty sands and salt lakes to £50 per acre for fully developed dairy farms with up to 20 acres of irrigation
6	11in. to 15in.	Fertile black clay reclaimed swamps with sandy mallee soils with and without sheet limestone on adjacent highland	Supplied from River Murray. Murray Swamps are gravity irrigated and water is pumped to heights of 120ft. above the river to adjacent highland	Murray Swamps dairy farms, 45 to 50 acres of swamp plus 50 to 100 acres of highland	Murray Swamp dairy properties are valued at £500 per acre for Class 1 reclaimed swamp soils and £50 per acre for adjacent highland on a walk in-walk out basis.

Table 1b—TYPE OF PRODUCTION See Table 9—Topdressed Pastures

Zone	Crops	Rotation	Fertilizers	Pastures	Special Crops	Livestock
1	Wheat, oats and to a lesser extent barley. Potatoes on suitable soils in hills area	Arable land on eastern slopes, 3 to 4 year rotation with cereals. Non arable, permanent annual pasture. High rainfall areas, 5 to 6 years of pasture with oats for hay, fodder crops and potatoes	Eastern slopes of ranges 112 lb. to 187 lb. superphosphate per acre per year. Hills areas, 1 bag with 2 bags of superphosphates under irrigation	Annual pastures of Dwalganup, Geraldton and Yarloop (in wetter situations) and Wimmera Rye grass and perennial pastures of lucerne, perennial Veldt grass, Phalaris tuberosa and Currie Cocksfoot on the eastern slopes. Mount Barker subclover perennial Rye grass with some Phalaris tuberosa constitute pastures in the higher rainfall areas	Lucerne under irrigation, Chou Mollier and Sudan Grass in lower rainfall areas. Millet, Sudax, rape, turnips and Chou Mollier in areas over 20in. rainfall. Relatively small areas of stone, fruit and vines	Sheep and beef cattle pigs and poultry in lower rainfall areas. Sheep, beef and dairy cattle, pigs and poultry in higher rainfall areas.
2	Wheat, barley, oats	3 to 4 year cropping rotation with 2 to 3 years of pasture between crops. Fallowing is still practiced fairly extensively for the wheat crop on the heavier soil types. Stubble grazing crops sown dry before the break of the season is increasing in popularity. Oats generally being used on heavier soil types and barley, particularly Noyep on the light poor fertility soils	90 lb. to 112 lb. of superphosphate is used with the crops and top-dressing of pastures with 90 lb. to 112 lb. of superphosphate is increasing annually with decided benefit. 7 lb. of Copper and 7 lb. of Zinc together with superphosphate are used to good advantage for pastures on the light soils in the southern wetter parts of the zone	Annual pastures of Barrel Medic together with Wimmera Rye grass are the most common. Commercial Barrel plus Barrel 173 being most suitable for the heavier soil types with Barrel 173 plus Harbinger Medic the best on the light to drifty soil types. Lucerne, Perennial Veldt grass and Evening Primrose are used to a lesser extent as perennial pastures	Citrus stone fruit and vines adjacent to the river. Vines near Langhorne Creek. Glasshouse tomatoes and cucumbers and vegetables including celery mainly adjacent to Murray Bridge. Irrigated lucerne is an important hay crop adjacent to the river	Mainly sheep with some poultry, pigs and dairy cows on cereal-sheep farms.
3	Barley, wheat, oats	3 to 4 year cropping rotation with 2 to 3 years of pasture between crops. Fallowing is becoming less important yearly and shows little advantage over non fallow under existing rainfall and soil conditions. Increasing interest in grazing crops of oats and barley sown early in the season	90 lb. to 112 lb. of superphosphate is used with crops. Topdressing of pastures is becoming more popular with good advantages. Copper 7 lb. per acre every 7 years shows an advantage in stock health particularly in wet seasons on the lighter soil types. 3:1 super and ammonia is used extensively for sowing light drifty soils with cereal rye	Annual pastures are similar to Zone 2. Lucerne is an important perennial pasture, with lucerne, perennial Veldt grass and Evening Primrose more common in the south-eastern parts of the zone. Evening Primrose is mainly used as a pioneer plant being replaced as soil fertility builds up	Special crops are not important and summer fodder crops are not reliable in this relatively low rainfall zone.	Mainly sheep with some beef cattle, dairy cows, poultry and pigs.
3A	Similar to Zone 3 although soils being generally of a more stoney nature are more suited to perennial pastures such as lucerne.					
4	Barley, oats and wheat, mainly in northern part of zone	3 to 4 year cropping rotations in northern part of zone with little fallow. Wider rotations in southern part of zone where crops are used mainly for hay and during pasture renovation	Northern part of zone similar to Zone 3. Southern part of zone initially 1 to 2 bags of superphosphate per acre in developing new country with annual dressing of 1 bag to 112 lb. of superphosphate per acre. Copper 7 lb and Zinc 7 lb. essential every 7 years. Lime at 1 bag per acre is important for establishing lucerne on acid sands	Northern parts of district similar to Zone 3. Verging into Medic sub-clover mixtures going southward, early sub-clovers, Bacchus Marsh, Yarloop, Geraldton, Dwalganup and Woogenellup. Lucerne is important and Phalaris tuberosa in southern parts	Peas are used to a minor extent as a soil building crop, with some areas of Chou Mollier in southern parts of the zone.	Mainly sheep with increasing numbers of beef and dairy cattle going southward, also pigs and poultry.

Table 1b—TYPE OF PRODUCTION See Table 9—Topdressed Pastures—*continued.*

Zone	Crops	Rotation	Fertilizers	Pastures	Special Crops	Livestock
4A	Barley, oats and wheat, mainly in northern part of zone	3 to 4 year cropping rotation in northern parts of zone to permanent pasture with crops during renovation for hay and grazing in southern part of zone	Similar to Zone 3 for northern part of zone. Similar to Zone 4 southern part of zone. Irrigated lucerne 2 bags of super-phosphate per year	Similar to Zone 3 northern part of zone. In the southern part of the zone lucerne is the outstanding pasture species. Lucerne and Perennial Veldt grass mixtures are popular with perennial veldt providing more production than Phalaris tuberosa. Bacchus Marsh, Yarloop, Dwalganup and Geraldton are not as popular as lucerne and there are indications that medics such as Barrel 173 and Harbinger together with Rose Clover may be more adaptable in the future. Clare sub-clover is only suitable to limestone outcrop soils	Chou Moellier is grown to good advantage when sown early in the spring in suitable seasons. Irrigated lucerne for hay and grazing on dairy farms. Irrigated lucerne for lucerne meal production is expanding	Similar to Zone 4. with dairy cattle on irrigated farms adjacent to the lakes.
5	Barley, oats, little wheat	3 to 4 year cropping rotation with cereals, mainly during renovation for hay and grazing on permanent pasture areas	Similar to Zone 4 southern part, although lime not essential for lucerne establishment. Irrigated lucerne 2 bags of super-phosphate per year	Sub-clovers mainly, Bacchus Marsh and Dwalganup have not been reliable in the past. There is every indication that Barrel 173 and Harbinger and possibly Rose Clover will replace the sub-clovers in the future for annual pastures. Lucerne very adaptable for the area. Perennial Veldt grass and Primrose used to some extent	Chou Moellier, millet and Sudax are grown to a limited extent. Irrigation lucerne for lucerne meal production plays a minor role	Dairy cattle, beef cattle, sheep, pigs and poultry.
6	Oats and barley on reclaimed swamps and adjacent highland	Permanent pasture on swamps with no definite period for renovation. Highland used continuously for grazing and cereal hay crops	Irrigated reclaimed swamps: 2 bags of superphosphate per year, one bag March, one bag August. Potash used to limited extent with varying results. Increasing usage of nitrogen fertilizers for special purposes. Adjacent highland: 112 lb. to 187 lb. per acre per year	Permanent pastures of Perennial and H1 Rye grass, Cocksfoot, Prairie grass, N.Z. White and Palestine Strawberry Clover. Phalaris used to a limited extent. Lucerne mainly used on adjacent irrigated highland with a small proportion on swamps	Fodder crops on swamps used to a limited extent and include millet, maize, sudax, amber cane. Purple top turnips and rape show promise as an Autumn sown crop during renovation. Cereals, particularly oats, are used for hay and Autumn-Winter grazing mainly on adjacent highland	Dairy cattle provide the main livestock with some beef cattle, sheep, pigs and poultry Highland used for Autumn - Winter grazing of milkers, dry stock and young stock.

Table 1c—PROBLEMS

Zone	Weeds	Cereal Diseases	Erosion	Trace Elements	Other Problems
1	Salvation Jane, Soursob, Boxthorn, Artichoke and Slender Thistle are the most important with Cape Tulip and Hoary Cress being a threat in certain areas	Generally a minor problem with Rhizoctonia, Mildew and Frost damage being the most important	Wind erosion no real problem. Water erosion a problem particularly in eastern foothills on cropping ground and where care is not taken to maintain ground cover	Molybdenum is the most important trace element and generally restricted to use on ironstone soils	—
2	Horehound, False Caper, Onion Weed, Skeleton Weed, Saffron Thistle, Boxthorn, Soursobs, isolated areas of Hoary Cress and Bladder Campion, with Tomato Weed, Three Cornered Jack, Caltrop and Innocent Weed mainly adjacent to the river	Rhizoctonia, eelworm, on light soils. Mildew in wet seasons. Frost and occasionally stem rust of wheat	Wind erosion of light soils is always a problem and requires special care in soil management. Water erosion has to be watched in hilly country	No real problem. Only required on light leached soils mainly in the southern part of the zone using Copper and Zinc, 7 lb. each every 7 years	—
3 and 3A	Similar to Zone 2 with Skeleton Weed being the greatest problem. Soursobs are spreading and there are isolated patches of Cape Tulip and Bladder Campion	Similar to Zone 2	Wind erosion is a real problem on light soils and requires special care in soil management. Early sowing of cereal rye with 1 cwt. 3: 1 super and ammonia is recommended for drift areas and early sowing of barley on less problem areas	Copper 7 lb. per acre mainly of importance for stock on light soils, particularly in wet seasons	—
4	Horehound, False Caper, Onion Weed, Skeleton Weed, Saffron Thistle, Soldier Thistle, Boxthorn, Soursobs. Isolated patches of Caltrop, Three Cornered Jack, Wards Weed and Bladder Campion	Similar to Zone 2 with Manganese deficiency spasmodic on lime rich soils	Similar to Zone 3 with 1 bag of 2: 1 super and ammonia for southern areas for stabilizing drift	Northern areas similar to Zone 3. Southern areas, Copper 7 lb., Zinc 7 lb. and Molybdenum 1 ounce recommended every 7 years on light soil types	
4A	Similar to Zone 4 with Caltrop and Three Cornered Jack prevalent adjacent to lakes, and some patches of Cape Tulip and Bathurst Burr	Similar to Zone 4	Similar to Zone 4	Similar to Zone 4	—
5	Similar to Zone 4A with some isolated patches of Wild Tomato and Wild Mignonette	Rhizoctonia, eelworm	Wind erosion a problem. 1 bag 2: 1 super and ammonia recommended for stabilizing drift	Copper 7 lb., Zinc 7 lb. Only required on light drifty soils every 7 years	—
6	*Swamps*—Spear Thistle, Bathurst Burr, Water Couch (Paspalum Distichum), Ranunculus Spp., Rumex Spp., (Dock), Common Rush, Phragmites. *Highland*—Similar to Zone 2	*Swamps*—Cereals suffer mainly from wet conditions and mildew. *Highland*—Similar to Zone 2	*Highland*—Similar to Zone 2	*Swamps*—Not required. *Highland*—Some response to Copper 7 lb., Zinc 7 lb. per acre every 7 years on very light soils. A marked response to copper 14 lb. per acre on irrigated lucerne on light soils, frequency of application not yet determined	*Swamps*—Bloat in dairy cattle is a constant problem on White Clover based pastures, being worse in some seasons than others. Tallow spraying of pastures before grazing has given positive control. *Highland*—Occasional bloat on grazed highland lucerne stands.

Table 1d—POTENTIAL FOR INCREASED PRODUCTION

Zone	Increased Production	Alternate Land Use
1	The biggest potential for increased production through increased soil fertility is on the eastern slopes of the ranges. Better use can be made of suitable clover species, particularly Dwalganup and Geraldton sub-clovers. Better use of suitable perennial grasses such as Phalaris tuberosa and Currie Cocksfoot. Increased applications of superphosphate by aircraft. At the present time phosphate applications are low and many areas being too rough for ground machines are not topdressed. The control of red legged earth mite and lucerne flea is most important.	On the eastern slopes many properties are large and used entirely for sheep grazing. By periodic cropping of arable country and using standing oat crops and early sown grazing cereals and summer fodder crops such as Chou Moellier, fat lamb raising would be a consideration and in any case carrying capacity could be increased considerably.
2	There is a big potential for increased soil fertility in this zone by using recommended clover varieties, namely barrel 173 and Commercial barrel for the heavier soil types and barrel 173 and Harbinger Medic for the light soil types. Increased applications of superphosphate, particularly by top-dressing pastures, will give big responses in clover growth and soil fertility.	There is a big potential for extending irrigation schemes on suitable soil types provided irrigation water can be supplied cheaply. Citrus, stone fruit, vine, vegetable and glasshouse production as well as lucerne for hay and meal production are practically unlimited. There is also scope for small seed production under irrigation.
3 and 3A	Similar to Zone 2.	Similar to Zone 2 in areas adjacent to river. Under the present price structure for agricultural products alternative land use to cereals and sheep is not considered profitable.
4	Northern areas similar to Zone 2. In southern areas annual clovers and medics are the most important soil fertility building plants. The range of plants suitable varies considerably with early and mid-season species being the most adaptable. Copper 7 lb. and Zinc 7 lb. per acre every 7 years is necessary on the light soil types and regular superphosphate applications are most important. 1½ to 2 bags of superphosphate during the first and second years of pasture establishment and 1 bag during the third and fourth years with 1 cwt. thereafter are considered ideal superphosphate dressings for maximum pasture production. Peas could also play an important part.	There is little scope for alternative land use in this zone unless the price of various commodities alter.
4A	Similar to Zone 4.	With extended cheap irrigation water, dairying, most horticultural crops, lucerne and pasture seed production could be used in areas adjacent to the lakes and possibly prime lamb production.
5	Similar to Zone 4 but medics generally appear more adaptable to the area than sub-clovers.	Similar to Zone 4A.
6	*Swamps*—Increased fertility can be obtained by improved drainage, pasture renovation and adequate supplies of fertilizer, particularly superphosphate. *Highland*—Similar to Zone 2.	*Swamps*—Fodder crop production and market gardening. *Highland*—Similar to Zone 2.

Table 2—WHEAT

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Acres	40,655	40,157	43,001	46,326	41,597	35,809	40,526	40,717	49,694	55,209
Yield, Bushels	851,127	614,189	743,449	690,339	927,220	363,296	919,125	638,415	1,102,767	919,629
Yield, Bushels/Acre	20·94	15·29	17·29	14·90	22·29	10·15	22·68	15·68	22·19	16·66
COUNTY BUCCLEUCH										
Acres	21,172	23,501	28,637	24,976	19,220	14,967	14,978	17,564	25,593	47,086
Yield, Bushels	323,139	284,301	308,764	262,494	283,919	100,457	228,432	84,381	444,909	599,283
Yield, Bushels/Acre	15·26	12·10	10·78	10·51	14·77	6·71	15·25	4·80	17·38	12·73
COUNTY RUSSELL										
Acres	11,659	11,481	12,323	10,355	7,256	6,519	6,485	7,835	11,055	13,027
Yield, Bushels	133,290	107,121	120,969	87,999	88,606	40,068	92,091	65,811	159,051	146,802
Yield, Bushels/Acre	11·43	9·33	9·82	8·50	12·21	6·15	14·20	8·40	14·39	11·27
WHOLE DISTRICT										
Acres	73,486	75,139	83,961	81,657	68,073	57,295	61,989	66,116	86,342	115,322
Yield, Bushels	1,307,556	1,005,611	1,173,182	1,040,832	1,299,755	503,811	1,239,648	788,607	1,706,727	1,665,714
Yield, Bushels/Acre	17·79	13·38	13·97	12·75	19·09	8·79	20·00	11·93	19·56	14·44

Table 3—2 AND 6 ROW BARLEY

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Acres	21,292	23,120	19,099	20,476	25,266	25,846	31,680	31,865	38,266	36,491
Yield, Bushels	503,013	422,978	275,856	374,722	698,603	236,764	896,249	549,991	972,701	631,456
Yield, Bushels/Acre	23·62	18·29	14·44	18·30	27·29	9·16	28·29	17·26	25·42	17·30
COUNTY BUCCLEUCH										
Acres	88,771	110,556	107,140	100,627	119,283	118,097	133,089	136,741	170,766	151,118
Yield, Bushels	1,818,520	2,094,739	1,342,117	1,637,307	2,585,927	1,462,463	2,992,167	1,119,850	3,557,231	2,589,679
Yield, Bushels/Acre	20·49	19·95	12·53	16·27	21·68	12·38	22·48	8·19	20·83	17·14
COUNTY RUSSELL										
Acres	17,161	17,003	19,051	17,663	20,346	20,186	24,772	29,831	38,429	35,987
Yield, Bushels	322,994	296,634	234,139	262,960	400,656	230,573	595,385	364,247	790,988	565,438
Yield, Bushels/Acre	18·81	17·45	12·29	14·89	19·69	11·42	24·03	12·21	20·58	15·71
WHOLE DISTRICT										
Acres	127,224	150,689	145,290	138,766	164,895	164,129	189,541	198,437	247,461	223,596
Yield, Bushels	2,664,527	2,814,351	1,852,112	2,274,989	3,685,186	1,929,800	4,483,801	2,034,088	5,320,920	3,786,573
Yield, Bushels/Acre	20·94	18·68	12·75	16·39	22·35	11·76	23·66	10·25	21·50	16·93

Table 4—OATS

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Acres	7,464	6,357	8,052	9,061	8,376	9,860	10,306	7,814	10,254	7,264
Yield, Bushels	162,646	98,330	108,423	148,017	186,805	74,579	295,921	118,556	242,028	129,540
Yield, Bushels/Acre	21·79	15·47	13·47	16·34	22·30	7·56	28·71	15·17	23·60	17·83
COUNTY BUCCLEUCH										
Acres	19,453	12,876	18,459	22,824	20,304	23,033	22,911	27,701	23,596	16,943
Yield, Bushels	281,087	156,318	181,359	239,502	294,210	168,953	437,181	108,970	311,889	219,465
Yield, Bushels/Acre	14·45	12·14	9·82	10·49	14·49	7·34	19·08	3·93	13·22	12·95
COUNTY RUSSELL										
Acres	8,497	5,165	5,611	7,370	6,244	8,731	8,651	9,067	10,541	7,829
Yield, Bushels	94,809	53,187	51,933	81,084	73,841	67,372	181,393	81,340	131,329	97,163
Yield, Bushels/Acre	11·16	10·30	9·26	11·00	11·83	7·72	20·97	8·97	12·46	12·41
WHOLE DISTRICT										
Acres	35,414	24,398	32,122	39,255	34,924	41,624	41,868	44,582	44,391	32,036
Yield, Bushels	538,542	307,835	341,715	468,603	554,856	310,904	914,495	308,866	685,246	446,168
Yield, Bushels/Acre	15·21	12·62	10·64	11·94	15·89	7·47	21·84	6·93	15·44	13·93

Table 5—FIELD PEAS

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Acres	175	94	139	93	196	128	141	53	115	45
Yield, Bushels	2,794	1,114	1,038	1,466	825	306	2,033	240	453	244
Yield, Bushels/Acre	15·97	11·85	7·47	15·76	4·21	2·39	14·42	4·53	3·94	5·42
COUNTY BUCCLEUCH										
Acres	203	18	128	159	36	30	Nil	100	65	177
Yield, Bushels	772	164	—	1,818	326	300	—	50	500	200
Yield, Bushels/Acre	3·80	9·11	—	11·43	9·06	10·00	—	·50	7·69	1·13
COUNTY RUSSELL										
Acres	110	36	43	Nil	Nil	20	Nil	Nil	Nil	2
Yield, Bushels	1,180	132	80	—	—	72	—	—	—	10
Yield, Bushels/Acre	10·73	3·67	1·86	—	—	3·60	—	—	—	5·00

Table 6—SHEEP AND WOOL

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Sheep Number	311,625	301,176	307,781	367,117	377,288	349,582	378,854	381,859	379,728	416,579
Sheep Shorn	362,197	343,543	348,527	406,966	427,624	435,803	413,158	463,232	414,601	465,502
Wool (lb.)	3,854,143	3,273,955	3,553,161	4,465,198	4,681,130	3,983,921	4,281,208	4,686,000	4,276,501	5,127,758
Wool/Head, lb.	10·6	9·5	10·2	11·0	10·9	9·1	10·4	10·1	10·3	11·0
COUNTY BUCCLEUCH										
Sheep Number	292,202	298,242	313,389	325,857	388,421	399,743	424,038	362,012	417,145	517,532
Sheep Shorn	323,377	325,982	349,373	366,060	401,593	460,722	454,701	457,085	423,764	541,406
Wool (lb.)	3,689,707	3,206,172	3,593,412	3,955,459	4,414,890	4,555,376	4,821,957	4,844,159	4,430,002	5,869,761
Wool/Head, lb.	11·4	9·8	10·3	10·8	11·0	9·9	10·6	10·6	10·5	10·8
COUNTY RUSSELL										
Sheep Number	166,890	158,344	177,374	185,551	215,279	230,287	242,307	237,563	243,632	269,201
Sheep Shorn	180,367	178,880	203,802	210,084	240,479	261,582	275,513	277,089	253,644	286,404
Wool (lb.)	1,894,419	1,685,215	1,999,840	2,089,268	2,539,027	2,441,672	2,568,996	2,760,871	2,630,384	3,044,579
Wool/Head, lb.)	10·5	9·4	9·8	9·9	10·6	9·3	9·3	10·0	10·3	10·6

N.B.—Sheep shorn includes lambs.

INCREASED PRODUCTION

	Sheep No.	Wool (lb.)
Sturt	105,000 34%	1,300,000 33%
Buccleuch	225,000 77%	2,200,000 59%
Russell	102,000 61%	1,200,000 61%

Table 7—CATTLE

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	10 Year Increase
											%
COUNTY STURT											
Beef	2,553	2,528	2,392	3,857	4,013	3,306	3,776	2,715	3,932	5,031	97
Dairy	18,643	19,136	18,186	19,100	15,675	18,131	18,679	18,891	19,637	21,383	14
Total	21,196	21,664	20,578	22,957	19,688	21,437	22,455	21,606	23,569	26,414	25
COUNTY BUCCLEUCH											
Beef	218	188	249	466	639	542	869	961	2,142	4,613	2,016
Dairy	3,398	3,325	3,319	3,495	4,385	3,634	3,773	3,559	3,933	4,680	38
Total	3,616	3,513	3,568	3,961	5,024	4,176	4,642	4,520	6,075	9,293	157
COUNTY RUSSELL											
Beef	3,460	3,656	3,353	4,525	5,532	4,324	5,375	3,311	3,603	5,564	61
Dairy	8,666	9,362	10,194	10,252	9,598	10,025	9,472	9,026	9,612	11,078	28
Total	12,126	13,018	13,547	14,777	15,130	14,349	14,847	12,337	13,215	16,642	37

1960-61 figures show—

County Sturt—79% of Dairy Cattle are on the Murray Swamps, river and lakes areas.
16% of Dairy Cattle are on the eastern slopes of the Adelaide hills.
5% of Dairy Cattle are on cereal-sheep farms.
58% of Beef Cattle are on the eastern slopes of the Adelaide hills.
35% of Beef Cattle are on the Murray Swamps, river and lakes areas.
7% of Beef Cattle are on cereal-sheep farms.

County Buccleuch—All Beef and Dairy Cattle mainly associated with cereal-sheep farms with largest numbers of both in the southern part of the county.

County Russell—97% of Dairy Cattle and 96% of Beef Cattle are on the Murray Swamps, river and lakes areas.

Table 8—RAINFALL (inches)

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
COUNTY STURT										
April-November	14·15	11·62	10·82	18·88	15·87	9·11	14·54	7·60	15·97	11·27
Year	16·26	14·72	12·96	22·98	18·24	9·71	16·27	11·76	19·24	13·39
COUNTY BUCCLEUCH										
April-November	12·62	12·90	10·33	16·96	15·65	8·75	14·31	5·90	14·30	12·02
Year	16·16	16·46	12·56	20·60	18·32	10·03	16·23	9·04	17·48	14·21
COUNTY RUSSELL										
April-November	13·45	12·11	10·94	18·01	14·81	9·22	13·13	6·37	14·42	11·18
Year	15·91	15·35	13·04	21·83	17·57	10·03	14·56	10·36	17·59	13·20

Table 9—TOPDRESSED PASTURES

	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62
COUNTY STURT										
Acres	49,382	70,834	72,201	82,508	89,055	93,819	74,950	73,936	68 542	79,683
Tons	2,950	3,901	4,039	4,525	4,628	5,019	4,184	3,984	3,710	4,296
Lb. per Acre	134	123	125	123	116	119	125	121	121	121
COUNTY BUCCLEUCH										
Acres	61,480	71,897	93,619	114,579	117,013	135,510	100,612	99,093	83,406	87,682
Tons	3,408	3,777	4,689	6,070	6,298	7,735	5,885	6,019	4,636	4,646
Lb. per Acre	125	119	112	121	121	128	130	137	125	119
COUNTY RUSSELL										
Acres	45,198	79,370	94,371	90,926	90,701	95,151	85,755	75,756	85,334	86,899
Tons	3,182	4,713	5,776	5,687	5,700	6,104	5,471	4,345	4,517	4,828
Lb. per Acre	157	132	137	141	141	143	143	128	119	124

Crops Manured 1960-61—

County Sturt 89% of cropped area manured at the rate of 120 lb. per acre.
County Buccleuch 95% of cropped area manured at the rate of 118 lb. per acre.
County Russell 86% of cropped area manured at the rate of 115 lb. per acre.