INGLEWOOD SHIRE HANDBOOK

An Inventory of the Agricultural Resources and Production of Inglewood Shire, Queensland

Queensland Department of Primary Industries

November 1977

Queensland Government Technical Report

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An Inventory of the Agricultural Resources and Production of Inglewood Shire, Queensland

Compiled by: G. H. Malcolmson, District Adviser, Inglewood.

Edited by: P. L. Lloyd, Extenson Officer, Brisbane.

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FOREWORD

The Shire Handbook was conceived in the mid-1960s. A limited number of a series was printed for use by officers of the Department of Primary Industries to assist them in their planning of research and extension programmes.

The Handbooks created wide interest and, in response to public demand, it was decided to publish progressively a new updated series.

This volume is one of the new series.

Shire Handbooks review, in some detail, the environmental and natural resources which affect farm production and people in the particular Shire. Climate, geology, topography, water resources, soils and vegetation are described.

Farming systems are discussed, animal and crop production reviewed and yields and turnoff quantified. The economics of component industries are studied.

The text is supported liberally by maps and statistical tables.

Shire Handbooks provide important reference material for all concerned with rural industries and rural Queensland.

* They serve as a guide to farmers and graziers, bankers, stock and station agents and those in agricultural business.

* Provide essential information for regional planners, developers and environmental impact students.

* Are a very useful reference for teachers at all levels of education and deserve a place in most libraries.

I commend this series to students of agriculture and all whose business is associated with the land and rural people.

(V.B. Sullivan)
Minister for Primary Industries

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1. INTRODUCTION

1.1 INTRODUCTION

The Shire of Inglewood is situated on the southern border of Queensland, and lies between 28°15'S and 29°15'S latitude and the 150°45' and 151°45' longitude. The town of Inglewood is 260 km south-west from Brisbane. A locality map of the Shire is included on Map 5.

The area of the Shire is 5850 km^2, of which approximately 5 percent is devoted to crops and sown pastures. The remainder is native pasture grazing country (76 percent) running both sheep and cattle, and State Forest Reserves (19 percent), where grazing is restricted to cattle only.

Agriculture, wool growing and beef breeding are the major industries of Inglewood Shire. Other important industries are timber getting and milling and beekeeping. Mining is also undertaken on a small scale. The Shire is not well endowed with natural resources however, with the increased supply of stored water from the Glenlyon Dam, the comparatively cheap non-tobacco-quota land, and relative closeness to Brisbane, the Shire is well suited to expansion in areas such as horticultural and specialized field crops.

1.2 EARLY EXPLORATION AND SETTLEMENT

Amongst the foremost of Australia's explorers was Allan Cunningham, whose most important journey began at Segenhoe, the distant outpost on the Upper Hunter River and near the present town of Scone, on 30 April 1827. With the backing of the new Govenor of New South Wales, Ralph Darling, who was interested in the potential for settlement of the inland area between Bathurst and southern Queensland, Cunningham, with six men and eleven horses, journeyed northward.

After many discoveries, he was forced, because of the arid conditions of the drought sticken land, to turn more to the east. This led to his greatest discovery - the famous Darling Downs.

'He appears to have crossed the Dumaresq River (or Severn), near Beebo; then he swung a little east of Inglewood past Coolmunda, and just touched Bodumba Creek at its south-eastern corner. Continuing in a direction roughly parallel to the present railway line, he passed a little south of Durakai and Thane. From an elevated ridge near Thane's Creek, on June 1827, he got a glimpse of the Downs, which he named in honour of Governor Darling, and a few hours later, he camped on the bank of the Condamine, near south Toolburra.'[1]

Cunningham actually named only a narrow valley along Glengallan Creek about 29 kilometres long and three to five kilometres wide. Today, Darling Downs includes a district of over 64 750 km^2 stretching from the New South Wales border to the Bunya Mountains, and west to Miles and Talwood.

One important and relevant geographical feature in the area is the Macintyre Brook, which rises in the hills near Gore, about 60 kilometres east of Inglewood, and joins the Dumaresq River opposite Yelarbon, when then becomes the Macintyre River at Goondiwindi. It was named by Cunningham, after his friend at Segenhoe.

It was 13 years after Cunningham's return to Segenhoe with his valuable report to the Governor, and two years preceding official free settlement in Queensland, before any settlers moved to occupy the rich fertile flats of the Downs.

The first of these was Patrick Leslie, who made a reconnaissance with a convict, Peter Murphy, in 1840. Leslie followed Cunningham's tracks until he reached Catfish Creek, and then took a northerly direction, instead of Cunningham's north-easterly. Leslie came out at Sawpit Gully, about 400 metres from Deep Gully, crossed the Macintyre Brook and camped at Leslie's Flat, which was selected by Henry Slack Snr, in 1889.

As the route via Pikes Creek was too rough for his stock and drays, Leslie returned for his main party by a route roughly approximating that of Cunningham's outward

[1] *Centennial of Inglewood* - P.M.G. Historical Society 1972

journey. He crossed Canal Creek, Mosquito Creek, Canning Creek and Macintyre Brook near Inglewood, from there making to Brush Creek and the Severn River (Dumaresq) and back to Falconer's Plains.

However, the party did not settle near Inglewood, but finally at Toolburra, on 2 July 1840. This was the first permanent pastoral settlement in what is now the State of Queensland. George and Walter Leslie later settled at Canning Downs, about seven kilometres from Warwick.

Henry Slack, who married Catherine Earl Freestone on 15 May 1859, is reputed to be one of the first settlers in the Inglewood area. Their eldest son, Joseph, later to become the first Chairman of the Inglewood Shire Council, was the first white child born at Inglewood.

Official records indicate the Whetstone Consolidated Run, consisting of the Parishes Whetstone, Swithland, Eena and Moogoon East, was leased to an unknown person before 1847. Whetstone was leased by William Dumaresq in 1847, and it is thought his wife held Swithland the same year.

Alexander Campbell was lessee in 1851, while the valuation dated 5 February 1851 was made by Robert Abercrombie, and is No. 11 in the Land Commissioner's Record Book.

Philip Devine leased Whetstone Consolidated Run in 1858, although gravestones show his parents Charles Edward Devine who died on 10 March 1853, and Sarah Elizabeth Devine on 24 March 1853, were there much earlier.

Surveys, in the early days, were non-existent, a leaseholder taking watersheds as boundaries. For instance, Warroo, which was selected in 1842 by Frederick Bracker, had the choice of the watershed of what is now known as the Brook, or Bracker Creek. He chose Bracker Creek, giving him an area of 12 000 hectares. He arrived with his wife and infant son in 1848, and built a homestead. Fred Bracker is credited, prior to going to Warroo, with the growing of the first wheat, lucerne and maize on the Downs, and of making the first flour mill driven by horse-power. The flour mill was brought to Warroo and the station was self supporting, except for sugar, in its early days.

Amongst other historic stations founded in the 1840 to 1850 period, were Coolmunda, Bodumba, Glenelg, Brush Creek and Terrica holdings.

The proclamation of Queensland as a State in 1859, and the consequent Lands Act of 1860 resulted in the subdivision of many of these holdings. However, even at the turn of the century, Whetstone Run still consisted of more than 120 000 hectares.

Wool growing was the primary enterprise, although cattle numbers increased after 1860.

The first commercial settlement at Inglewood was called Brown's Inn, and was situated on the Leyburn Road, close to the junction of Macintyre Brook and Canning or Mosquito Creek. This was on the teamsters route to Leyburn, with a toll gate at Canal Creek. The toll was for repairs to the road.

The first survey of the town began on 15 April 1862, by L.F. Landberg, and a sale of lots was held at Warwick on 26 January 1865, of Lots 62 to 65, Portions 19 to 22, Parish of Inglewood, County Marsh, Darling Downs. These blocks were purchased by William Sutherland, and his descendants held the land for many years.

On 13 October 1862, Catherine Brown the proprietress of Brown's Inn bought allotments 1 to 5 of Section 1, and built the Royal Hotel. Other buyers were original settlers including Meiers, Evans, Freestone, Dowling, Smith, Lovell, Sutherland and Turnbull families.

When the town was surveyed, the name Brown's Inn was changed to Inglewood. The name was derived from Ingol, an aboriginal word for cypress pine, as a clump of these pines grew on the northern bank of the Macintyre Brook.

A move to change the name in 1906 met with strong opposition from local residents. The railway Department began to build a line to Inglewood in that year, and named the

station Parainga, but angry inhabitants pulled down the name sign, and insisted on the name of their choice. Eventually, the Railway Department complied with their wishes.

The local authority of Inglewood was proclaimed on 11 November 1879, with the town of Inglewood its headquarters.

The town of Texas was gazetted in 1875. The land was originally part of the Texas Station run. Sales of land were held in Stanthorpe in 1880, 1881 and 1883, but no land was sold. The first town lots sold were sold at Inglewood on 25 June 1889. In 1901 the population of Texas was 203. Texas was linked to Inglewood by rail on 3 November 1930.

Texas is divided into two parts. The older part of town is a low-lying area on the banks of the Dumaresq River and is known as Texas Flat. This area was flooded in 1890 and most of the inhabitants moved to a high ridge away from the river where the main town of Texas now stands.

Texas Station homestead lies about two kilometres away from the town. The first owners were Andrew R. and John F. Macdougall who lodged a lease claim on 13 February 1851. It appears however, that they had occupied the run from at least 1848.

In 1901 a State Tobacco Experiment Farm was established on a leased portion of Texas Station about five kilometres from Texas. This farm was operated for a short period by the first tobacco experimentalist appointed to the then Department of Agriculture, Mr. R.S. Neville. In 1953 a Tobacco Experiment Farm was established at Whetstone (see Section 8).

With the subdivision into farms, dairying gradually became an important industry within the Shire. A private cheese factory at Oman-ama, and later factories at Yelarbon and Texas were associated with this early development. The first butter factory was built in Goondiwindi, and cream was railed from the Shire to this factory. The cheese factory at Texas was converted to a butter factory in the 1930s. It closed down in 1955. The Inglewood butter factory, opened in 1941, was closed down in September 1960, due to the decline in production.

Tobacco has been grown in the area for more than 80 years. (A complete history of tobacco growing in Inglewood Shire is given in Section 6.3.) In the early days varieties producing leaf for air curing were grown, mainly around Texas. With the change in consumer demands from pipe tobacco to cigarette tobacco, the industry declined, but it revived in the 1930s partly because of introduction of varieties producing leaf suitable for flue curing and the manufacture of tobacco suitable for cigarettes, but principally as the direct result of the development of irrigation schemes. The incidence and intensity of summer rains was far too erratic to afford any reliability of production. Consequently, only those farms adjacent to the main streams had any access to irrigation and persisted.

The acreage planted to tobacco has varied considerably, with 426 hectares being grown in 1943-44, 218 hectares in 1948-49, to the record 972 hectares harvested from the 1960-61 crop. The crash in prices in 1961 resulted in an exodus of sharefarmers from the district and a severe reduction in area. The industry stabilized after 1965 following the introduction of an Australia-wide quota system.

The invasion of prickly pear early this century, particularly on the brigalow-belah soils, restricted agricultural development, and it was not until the release of the Cactoblastis in the late 1920s, that the potential of this country could be realized. Records indicate that the pear was planted on properties as a means of subdivision shortly after settlement first occurred in the 1850s.

Rabbits have been, and still are, a significant economic problem to the grazing industry of the Shire. Their numbers increased in the 1920s until by the early 1930s they had reached plague proportions. Numbers have been cut back by the use of myxomatosis, and, more recently, the poison '1080'.

1.3 TOPOGRAPHY

The Shire boundary to the south is the Dumaresq River, which also acts as the border between Queensland and New South Wales. This river becomes the Macintyre at Goondiwindi, the Barwon near Mungindi and eventually the Darling.

The eastern boundary of the Shire runs through the traprock area, which comprises the Macintyre Brook watershed, to the Herries Range, and then swings west, cutting the Inglewood-Millmerran road. From there, it runs south-west to near Yelarbon, and the junction of Macintyre Brook with the Dumaresq River.

The Shire is relatively flat, with small undulations becoming steeper towards the eastern traprock area. The elevations of the towns and localities in the Shire in comparison to centres nearby, are shown in Table 1.1

Macintyre Brook is the drainage line for the northern half of the Shire, and flows into the Dumaresq, which drains the remainder of the Shire, near Yelarbon. The Dumaresq then becomes the Macintyre River.

Table 1.1

Elevation of Towns and Localities
(m)

Inglewood	284
Texas	284
Oman-ama	331
Whetstone	265
Goondiwindi	218
Warwick	455
Stanthorpe	809
Cobba-da-mana	314
Yelarbon	245

Source: Queensland Railways Timetable 1977

1.4 GEOLOGY

The principal formations in the Shire are as follows:

The Palaeozoic Basement

This occurs on the eastern portion of the Shire and is continuous with the extensive massif of Palaeozoics that occurs near Warwick and Stanthorpe. There are cherts and silicified mudstones with limestone lens near Limevale and a small area of granodiorite near Texas.

The Mesozoic Sequences

The Bundamba Group appear to rest unconformably on the Palaeozoic basement particularly in the vicinity of Cobba-da-mana where they may be traced in a south-west direction almost to the border, with the irregular eastern margin resting unconformably on the old basement rock.

The Walloon Coal Measures rest directly on the Bundamba Group or the Palaeozoic basement as this variation is shown by the lack of conformity in the area. At Cobba-da-mana the basement is the Bundamba group, whereas on the Dumaresq River near Texas, they rest on Palaeozoic basement material. They can be best seen to the east of Inglewood extending as far as the Bundamba margin at Cobba-da-mana.

Other Walloon developments occur between Texas and Brush Creek on the Dumaresq River, particularly around Smithfield as is indicated by the undulating clay soils. The few outcrops near Borella are brown and pale yellow to almost white sandy mudstones that have been weakly lateritized in parts. The characteristic landscape of this formation is covered by grey clay soils but it is likely that some of these areas may not be derived *in situ* from the Walloon Coal Measures, but are a later Quaternary development as is found around Coolmunda.

The Blythesdale Group is characterized by stony lateritized sandstone ridges, deep sandy cypress and black pine forest areas, and light coloured shallow solonized soils carrying bull oak, which covers much of the central and northern sections of the Shire. Sandstones dominate the sequence but shales and sandy mudstones also appear to be fairly common.

Cainozoic Developments

Post laterite and recent deposits occur around Yelarbon as is shown by a low ridge north-east of Yelarbon which is composed of conglomerate and coarse grits. This is thought to underlie the Yelarbon 'desert' as shallow wells in the town penetrate water bearing gravels while to the north of Yelarbon near the margin of the desert, an earth tank has exposed white, fairly coarse, weakly cemented sandstone and grits.

Recent Alluvium

These are associated with functional streams and areas subject to frequent flooding and occur on both the Dumaresq River and the Macintyre Brook.

Sources of Information

1. P.M.G. Historical Society (1972) - *Centennial of Inglewood*

2. Isbell, R.F. (1957) - The Soils of the Inglewood-Talwood-Tara-Glenmorgan Region, Queensland. *Queensland Bureau of Investigation Technical Bulletin No. 5*

3. Lucas, K.G. (1960) - *in* Hill, D. and Denmead, A.K. (ed) - The Geology of Queensland. *Geological Society of Australia Vol. 7*

4. Anon. (1901) - Tropical Industries. Tobacco growing at Texas. *Queensland Agricultural Journal*. Nov. 1901 : 485-6

2. CLIMATE

2.1 GENERAL

Inglewood Shire experiences a temperate climate with hot summers and cold winters. At Inglewood, which has an elevation of 284 metres, daily temperatures range from 18°C to 32°C in summer and 4°C to 18°C in winter when frosts are common. Over 65 percent of the annual rainfall of 630 mm falls between October and March. An appreciable rainfall (100 mm) is received in winter and can be followed by thunderstorms between September and November. Thunderstorms occur also in December, January and February, some with devastating intensity.

There are two climate recording stations in the Shire. One is located at the Post Office, Texas, and the other is on the Department of Primary Industries' Inglewood Field Station at Whetstone, approximately 15 kilometres west of Inglewood. The Shire is well endowed with rainfall recording stations, and these are listed in Table 2.1. The locations of climate and rainfall recording stations are shown in Map 1.

Table 2.1

Rainfall Recording Stations in Inglewood Shire

CMB Number	*Station Name*	*Elevation (if available) (m)*	*Year Opened*	*Year Closed*	*Period of Record to 1974 (Years)*
041009	Bybera		1931		43
041034	Glenelg		1890		84
041047	Inglewood Post Office	284	1883		91
041048	Inglewood Forestry Reserve		1940		34
041064	Limevale Post Office		1921		53
041066	Maidenhead		1922	1949	27
041078	Oman-ama	331	1912	1948	32
041087	Riverton North	346	1950		24
041100	Texas Post Office	285	1881		93
041101	Texas Station	274	1887		87
041122	Yelarbon	238	1923		51
041125	Whetstone	265	1940	1964	24
041151	Silverspur		1903	1942	40
041164	Badgery Forestry Station	335	1965		9
041340	Inglewood Forestry		1968		6
041341	Inglewood Field Station		1968		6
041347	River View		1969		5
041375	Columba		1939		35
041376	Warroo Lagoons		1909		65
041377	Tummeraine		1936		38
041382	Riverton		1919	1954	35
041383	Mingoola		1889	1953	64
041384	Lesbrook		1911	1966	55
041385	Whetstone Weir		1898	1955	57

Source: Bureau of Meteorology - *Catalogue of Australian Rainfall and Evaporation Data, 1972* (and unpublished data)

2.2 RAINFALL

Long term records of rainfall are available for several locations in the Shire. The average monthly and annual rainfall for all stations in the Shire with more than 30 years records is shown in Table 2.2

The average annual rainfall for the Shire is about 625 mm with variations of only about 25 mm above and below that figure in different parts of the Shire.

During summer, the dominant rain producing influence is the north-easterly to south-easterly airflow which introduces moist unstable maritime air from the Pafific Ocean or the Tasman sea. This rainfall declines considerably with distance inland. Other summer

influences are essentially random in their occurrence and come in the form of thunderstorms and degenerated tropical cyclones.

In winter, the northward movement of the western systems produces airflows predominantly from the south-west to the south-east quadrant. The main influences in this season are the generally regular pattern of cold fronts which move across the region resulting in instability and moderate rainfalls on the plains country to heavy falls in the upland country to the east of the Shire.

Table 2.2

Average Monthly and Annual Rainfall for Stations in Inglewood Shire Based on all Years of Record to 1974

(mm)

(All stations with more than 30 years' record)

Station	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Year*
Bybera	85	68	51	29	32	37	35	33	35	60	62	98	624
Columba	97	73	52	32	28	43	34	37	37	68	67	82	651
Glenelg	86	69	56	37	37	47	44	38	43	63	64	83	663
Inglewood Forestry	96	84	50	35	36	38	34	38	39	69	57	91	669
Inglewood Post Office	86	73	60	32	40	44	42	34	41	57	66	81	656
Lesbrook[1]	76	65	52	28	30	43	39	28	33	51	60	73	579
Limevale Post Office	84	72	49	31	37	40	39	33	36	61	65	86	638
Mingoola[1]	92	64	51	26	36	49	46	38	47	61	64	76	642
Oman-ama[1]	73	54	45	32	29	50	39	29	33	49	66	76	553
Riverton[1]	76	74	51	27	33	45	47	33	45	71	65	73	641
Silverspur[1]	75	53	54	32	31	45	45	37	38	50	54	74	589
Texas Post Office	87	74	54	32	37	44	43	35	40	58	63	78	645
Texas Station	87	69	53	34	38	44	41	35	40	58	61	79	643
Tummeraine	86	73	52	29	31	38	35	38	36	66	60	85	630
Warroo Lagoons	77	69	50	35	35	45	42	35	39	60	66	86	637
Whetstone Weir[1]	66	60	52	27	32	42	40	33	38	48	58	63	558
Yelarbon	76	74	48	31	30	36	34	35	31	58	55	77	585

Source: Bureau of Meteorology (unpublished data)

[1] Station ceased recording (see Table 2.1)

The pattern of summer rainfall in the Shire shows a distinct westward decline while the pattern of winter rainfall is generally associated with elevation with the exception of an isolated area around Inglewood which experiences a slightly higher winter rainfall.

The monthly expectations of receiving a certain amount of rain are important to agricultural activity. The following graph shows the amount of rainfall which would be expected to be equalled or exceeded in 10, 50 and 90 percent of years at Inglewood Post Office, based on 91 years of record. For example, in June the rainfall could be expected to equal or exceed 6 mm in nine out of 10 years, 33 mm in five out of 10 years, and 102 mm in one out of 10 years.

2.3 TEMPERATURE

Temperatures in the Shire are recorded at Texas Post Office and Inglewood Field Station. Table 2.3 sets out the average monthly daily minimum and daily maximum temperatures recorded at Texas Post Office.

The percentiles in Table 2.3 are used to show the spread of temperature throughout the month. The 14 percentile of the maximum is that temperature which was not reached on 14 percent of days, or one day per week. The 86 percentile is that higher temperature which was not reached on 86 percent of days on six days per week, having being equalled or exceeded on the other one day in the week. In the case of minimum temperatures, the overnight temperature falls below the 14 percentile on an average of once per week and remains above the 86 percentile on an average of once per week.

In Texas the daytime temperature exceeds 36.1°C on an average of once each week

in December, and the night-time temperature falls below -2.8°C on an average of once each week in July.

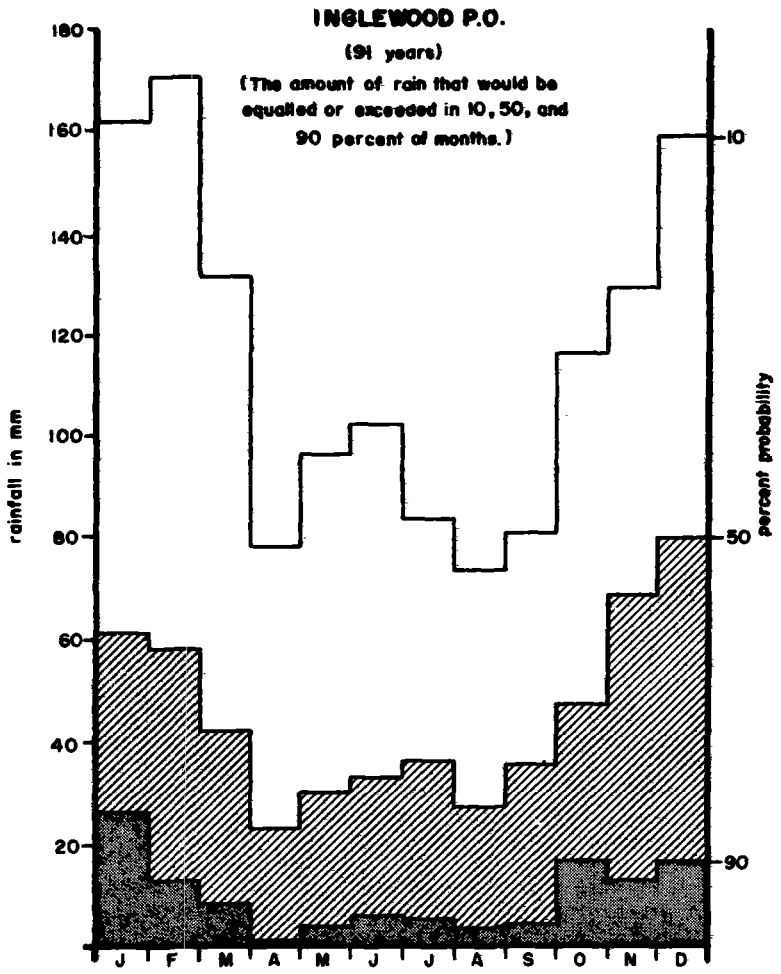

Table 2.4 sets out the percentage chance of receiving heavy or light frosts or warm, hot or very hot days based on data recorded at Texas Post Office. These temperature frequencies are the daily percentage chance of receiving more than or less than a specified temperature in a given month. Temperature frequencies as shown in Table 2.4 ignore consecutive runs of say, very hot days, in a single year and have no value in predicting heatwaves.

At Texas there is a 22 percent chance of receiving a hot day in December. As there are 31 days in December, one can normally expect that on about seven days in December the screen temperature will register 35°C or more. Similarly 29 percent of July days would normally register a heavy frost. December is the hottest month with most frequency of warm, hot and very hot days.

Table 2.5 sets out average monthly daily minimum and daily maximum temperatures recorded at Inglewood Field Station during the period 1953 to 1976.

2.4 HUMIDITY

The mean monthly 9.00 am and 3.00 pm relative humidities and mean monthly 9.00 am and 3.00 pm dew points for Texas shown in Table 2.6 are derived from mean monthly wet

Table 2.3

Temperatures - Texas Post Office

Month	Daily Minimum			Daily Maximum		
	Mean	Percentile		Mean	Percentile	
		86	14		86	14
January	17.7	20.7	14.0	31.5	35.1	28.8
February	18.1	21.8	14.9	30.7	33.9	27.9
March	15.0	18.5	12.2	31.0	34.0	18.7
April	10.3	13.8	6.0	27.2	29.5	24.8
May	6.3	10.6	2.3	22.3	25.4	18.4
June	4.0	7.7	0.1	19.6	22.3	16.5
July	2.9	8.7	-2.8	19.1	22.3	15.7
August	5.5	11.2	0.9	20.7	23.8	17.5
September	7.8	12.9	2.8	22.8	27.8	17.8
October	11.9	15.9	6.9	26.9	29.9	23.3
November	13.6	17.4	10.0	28.3	31.5	25.2
December	17.3	20.5	13.8	31.7	36.1	27.3
Year	10.9			26.0		

Source: Bureau of Meteorology - *Climatic Averages, Queensland, Metric Edition. August 1975*

Table 2.4

Temperature Frequencies - Texas Post Office
(Percentage chance of temperature not being attained (frosts) or being equalled or exceeded (hot days))

Based on recordings from 1969 to 1974

Month	Daily Minimum		Daily Maximum		
	Heavy Frost $\leq 0^{o}C$	Light Frost $\leq 2^{o}C$	Warm Day $\geq 30^{o}C$	Hot Day $\geq 35^{o}C$	Very Hot Day $\geq 40^{o}C$
January			74.6	15.6	
February			70.0	19.1	
March			65.3	7.4	
April		0.8	10.3	1.7	
May	3.9	11.0	0.6		
June	15.8	27.7			
July	28.6	45.9			
August	11.5	26.2			
September	2.3	10.9	2.9		
October			14.8	1.1	
November			36.3	5.0	
December			77.2	21.6	0.1

Source: Bureau of Meteorology (unpublished data)

and dry bulb temperatures recorded at Texas Post Office.

The relative humidity is the ratio of the actual amount of water vapour present in a unit of atmosphere to the quantity that would be present if the air was saturated at that temperature. Dew point is the temperature at which the amount of water vapour present in the atmosphere would be sufficient to produce saturation.

2.5 CLOUDINESS AND SUNSHINE HOURS

Sunshine hours are recorded daily at the Inglewood Field Station. Table 2.7 shows average daily sunshine hours experienced at Inglewood, by months.

Table 2.5

Temperatures - Inglewood Field Station

Month	*Mean Daily Minimum* ^{o}C	*Mean Daily Maximum* ^{o}C	*Years of Record*
January	18.1	33.9	23
February	18.0	31.9	23
March	15.7	29.9	23
April	10.7	26.8	22
May	5.8	21.7	22
June	3.6	19.6	22
July	2.7	18.6	22
August	3.5	20.2	22
September	6.6	24.0	23
October	11.3	26.4	23
November	14.0	31.6	24
December	16.9	33.1	22

Source: Inglewood Field Station. Records

Table 2.6

Temperature and Humidity - Texas Post Office

Month	*9.00 am*				*3.00 pm*			
	Dry Bulb ^{o}C	*Wet Bulb* ^{o}C	*Dew Point* ^{o}C	*Humidity* %	*Dry Bulb* ^{o}C	*Wet Bulb* ^{o}C	*Dew Point* ^{o}C	*Humidity* %
January	25.4	20.5	18	62	30.0	21.4	16	44
February	24.9	20.1	17	63	29.1	21.4	17	48
March	23.4	18.1	15	58	29.4	19.3	12	35
April	18.8	14.5	11	60	26.0	16.4	8	33
May	13.5	10.9	8	71	21.3	13.9	7	40
June	9.8	8.1	6	78	18.6	12.1	5	42
July	9.3	7.1	4	71	18.1	11.3	4	39
August	12.1	9.5	7	70	19.8	12.6	5	39
September	15.7	12.1	9	63	21.6	13.8	6	37
October	20.2	15.6	12	59	25.5	17.1	11	39
November	22.5	17.0	13	55	27.1	17.9	11	37
December	25.0	19.5	16	58	30.3	20.5	14	38

Source: Bureau of Meteorology: *Climatic Averages, Queensland, Metric Edition, August 1975*

Table 2.7

Mean Daily Sunshine Hours - Inglewood Field Station
(nine years record)

Month	*Mean Hours of Sunshine per day*
January	9.25
February	9.45
March	8.30
April	8.60
May	7.37
June	7.05
July	7.30
August	8.05
September	8.75
October	9.11
November	9.72
December	9.10

Source: Inglewood Field Station. Records

2.6 EVAPORATION

Losses from a free water surface are recorded at Inglewood Field Station using a standard Class 'A' Pan evaporimeter. Table 2.8 shows average daily evaporation by months recorded at Inglewood Field Station.

Table 2.8

Evaporation - Inglewood Field Station
Average Daily (mm)
(From Standard Class 'A' Pan Evaporimeter)

Month	*1970*	*1971*	*1972*	*1973*	*1974*	*1975*	*1976*	*1977*	*Average*
January		5.3	5.9	6.6	6.3	7.1	4.7	6.2	6.0
February		4.4	5.6	6.0	7.3	6.8	5.0	6.3	5.9
March		4.4	5.5	6.2	5.0	4.6	4.3	3.6	5.0
April	4.4	3.6	3.6	4.6	4.1	3.8	4.3	3.4	4.0
May	2.4	2.6	2.6	2.9	2.5	2.9	2.6	2.4	2.6
June	2.0	1.8	1.9	2.1	1.5	1.9	1.2		1.8
July	2.1	1.7	2.5	1.7	2.2	1.8	1.9		2.0
August	3.4	2.3	2.5	2.0	2.8	2.5	2.7		2.6
September	3.4	3.0	4.1	3.3	3.2	3.6	3.5		3.4
October	4.6	5.3	4.8	4.9	4.4	4.6	4.2		4.7
November	5.8	5.3	5.8	6.0	5.8	6.4	5.9		5.9
December	5.8	6.4	7.7	6.6	7.0	6.8	8.2		6.9

Source: Inglewood Field Station. Records

2.7 FLOODS

As much of the intensive agriculture in the Shire is carried out on the alluvial flood plains of the Dumaresq River and the Macintyre Brook, floods have an important influence on agricultural activity in the Shire. Table 2.9 shows the flood frequencies recorded at Texas on the Dumaresq River and at Inglewood on the Macintyre Brook for years up to 1960. Table 2.10 shows the dates of the peak flood heights, and their severity, which have occurred at Texas and Inglewood.

Table 2.9

Flood Frequencies - Texas and Inglewood
(The number of times flood height was exceeded)

Month	*Texas (70 years)*	*Inglewood (36 years)*
January	9	2
February	11	3
March	6	1
April	2	-
May	2	-
June	11	-
July	10	-
August	3	-
September	4	-
October	8	1
November	9	1
December	7	-
Total	82	8

Source: Bureau of Meteorology: *Climatological Survey Region 6 - Western Downs, Queensland*

The data in Table 2.10 was taken from *Climatological Survey Region 6 - Western Downs, Queensland* published in November 1961, however, it has been updated to July 1977 with

heights adjusted to Australian Standard Flood Heights, the heights of new bridges and the heights of floods since 1960.

Table 2.10

Peak Flood Heights - Texas and Inglewood

Station	*Records Commenced*	*Peak Height*		*Height of Bridges*
		Level	*Date*	
Texas	1890	10.1 m	19 February 1956	3 m
Inglewood	1924	12.5 m	22 January 1956	6.6 m
Whetstone	1924	12.5 m	22 January 1956	3 m

Source: Bureau of Meteorology

The flood of 11 and 12 February 1976, which was caused by the degeneration of cyclone 'David' and which brought record floods to the Condamine River at Warwick, did not exceed the flood heights shown in Table 2.10. Peak heights of the 1976 flood were nine metres at Texas on 12 February 1976 and 11.7 metres at Inglewood on 11 February 1976.

2.8 CLIMATE IN RELATION TO AGRICULTURE

Rainfall is the most important factor influencing plant growth within the Shire and the incidence and reliability are more important than the total amount.

The mean and median annual rainfall values for the Shire are 625 mm and 600 mm respectively with around 36 percent of this falling in the winter months. Whilst the proportion of rainfall is greater during the warmer half of the year a moisture deficit, that is when evapotranspiration exceeds rainfall plus moisture storage, is experienced for about seven months of the year, November to May inclusive. This is mainly due to higher summer temperatures and the effect on dryland pastures and annual crops can often result in serious loss of productivity, especially in the traprock country. The relief and soil types (hard setting surfaces with low infiltration rates) in the traprock are such that the effectiveness of rainfall received is invariably very low, thus predisposing the area to more serious drought conditions.

The introduction of pasture species is restricted because of temperatures being too cool for most tropical species and rainfall too low for some major temperate and tropical species. Lucerne and medics are the most generally adaptable pasture species.

Successful grain production is largely determined by rainfall and soil types, not only from the point of view of fertility, but the moisture holding capacity of district soils. With the exception of patches of brigalow soil types the majority of the cropping area has low moisture holding capacity. In view of this situation and the high evapotranspiration, summer dryland cropping is a risky venture. This situation could change with the introduction of new varieties of crops incorporating such characteristics as drought tolerance.

Winter rainfall, whilst significantly lower than that received in the summer months, is more reliable, reasonably well distributed and has greater impact on winter cereal crops than its relatively low figures would indicate. The lower temperatures result in a greater proportion of effective rainfall, and as a direct consequence to this situation the emphasis is placed on winter grain production. For the five year period 1969-1974, approximately 83 percent each year, of the area set aside for annual cropping, was sown to winter crops.

The distribution of the annual rainfall in relation to the fallowing, planting and growing periods of the major winter crops is contained in Table 2.11.

From Table 2.11 using Dalby as a comparison, it can be seen that in Inglewood Shire, fallowing rains are somewhat less whilst planting and growing rains are more than at Dalby, which is the centre of the major grain growing district in the State.

Table 2.11

Rainfall (mm) Distribution in Relation to Winter Cereal Production

Centre	*Fallowing (December-April)*	*Planting (May-June)*	*Growing (July-October)*
Inglewood	332	84	174
Texas	325	81	176
Yelarbon	306	66	158
Goondiwindi	311	82	161
Dalby	359	74	167

Source: Bureau of Meteorology (unpublished data)

Frosts can assume considerable importance within the Shire. Late frosts can have serious affect on winter cereals and some early sown summer crops, whilst early frosts can equally have serious affect on late sown bean crops.

Sources of Information

1. Australia Bureau of Meteorology (1972) - *Catalogue of Australian Rainfall and Evaporation Data.* Melbourne

2. Australia Bureau of Meteorology (1975) - *Climatic Averages, Queensland Metric Edition.* Melbourne

3. Australia Bureau of Meteorology (1961) - *Climatological Survey, Region 6 - Western Downs, Queensland.* Melbourne

4. Australia Bureau of Meteorology, Brisbane. Unpublished data

5. Queensland Department of Primary Industries. Inglewood Field Station Records. (unpublished)

6. Wills, A.K. (1976) - 'Climate of the Granite and Traprock Area' in 'The Granite and Traprock Area of South-East Queensland'. *Queensland Department of Primary Industries, Division of Land Utilization, Technical Bulletin No. 13*

7. Isbell, R.F. (1957) - The soils of the Inglewood-Tara-Glenmorgan Region, Queensland. *Queensland Bureau of Investigation Technical Bulletin No. 5*

3. WATER RESOURCES AND IRRIGATION

3.1 GENERAL

The character of agricultural activity in Inglewood Shire is considerably affected by the supply of irrigation water from water storage developments in and near the Shire.

Rainfall in Inglewood is enough, in most years, for the production of broadacre grain crops. However the supply of irrigation water has enabled crops such as tobacco, lucerne and fruit to be grown in the Shire.

The main irrigation areas are located along the Dumaresq River, which forms the southern boundary of the Shire and the Macintyre Brook, which drains the centre of the Shire. Coolmunda Dam supplies irrigation water to Macintyre Brook and the recently completed Glenlyon Dam supplies water to the Dumaresq River through Pike Creek.

Inglewood Shire is not well endowed with underground water. Yields are small and water quality ranges considerably. This source of water is used mainly for stock watering in the Shire.

3.2 SURFACE SUPPLIES

The Macintyre Brook and the Dumaresq River and their tributaries are the main source of surface water within the Shire.

Macintyre Brook

Main tributaries of the Macintyre Brook are the Chain of Ponds, Bracker, Canning and Catfish Creeks. The Brook is a relatively narrow stream and natural storage in the stream during periods of nil flow is low. Rainfall on the catchment area can cause a rapid rise in the stream, and flooding can be a problem. In the 1940s and 1950s three small weirs were constructed along the Macintyre Brook in an endeavour to alleviate water shortages for tobacco. These are Greenup, Whetstone and Ben Dor weirs. A fourth weir was constructed solely to supply water for domestic and commercial use in the town of Inglewood. Details of these weirs are shown in Table 3.1, and their localities are shown in Map 1.

Table 3.1

Details of Weirs on Macintyre Brook

Purpose of Supply	*Name and Location (from junction with Dumaresq)*	*Height (m)*	*Storage Capacity Ml*
Urban	Inglewood - 55 km	2.4	190.34
Irrigation	Ben Dor - 18.7 km	5.6	734.00
Irrigation	Whetstone - 38.5 km	5.0	506.00
Irrigation	Greenup - 73.4 km	4.3	370.00
Total			1800.34

Source: Irrigation and Water Supply Commission, Brisbane

The total storage capacity of the three irrigation weirs (1610 Ml) did not provide an assured water supply for irrigation because of the fairly long periods of low flow in Macintyre Brook and its tributaries.

Investigations of the effect of a further six small weirs which could be constructed along the Brook, with a height of the vicinity of two metres showed that these six structures together would not increase the available supply by more than sufficient to irrigate a further 80 to 120 hectares. Because of this, no further consideration was given to this class of storage.

Water Supply Problems. The rapid expansion in tobacco production in the 1950s resulted in water supply problems which came to a head in 1960-61, with a record planting of 590 hectares of tobacco. This record planting coincided with an extremely dry summer. Water supplies were short and the quality of the available water was low. Tobacco sales

were disastrous for growers with a large quantity of leaf not sold. This resulted in many of the sharefarmers leaving the area, and a severe reduction in tobacco acreage in the following years.

This decline in tobacco production brought about a very depressed situation, not only in the rural community, but also in business activity and employment in the Shire.

A joint investigation by the then Department of Agriculture and Stock, and the Irrigation and Water Supply Commission was authorized, and a report on water conservation possibilities on Macintyre Brook was prepared. This report recommended construction of a dam below the junction of Macintyre Brook and Bracker Creek at 77.85 km.

Two other sites for a storage were also assessed in the preparation of this report, as is shown in Table 3.2 and Table 3.3.

Table 3.2

Details of Storage Sites on Macintyre Brook

Site	*No.*	*Height From Bed of Stream to Full Supply Level (m)*	*Storage Capacity (Ml)*	*Annual Assured Supply (Ml)*
Macintyre Brook (77.9 km)	1	16.0	75 250	20 350
Macintyre Brook (97 km)	2	22.4	27 750	12 950
Bracker Creek (3 km)	3	9.8	16 000	9 250

Estimated Capital Cost 1963

Site No.	*Total Cost $M*	*Per Ml of Storage $*	*Per Ml of Assured Supply $*
1	4.86	65	239
2	3.6	130	278
3	3.8	238	411

Source: Irrigation and Water Supply Commission, Brisbane

One disadvantage of the Macintyre Brook site (77.9 km) at Coolmunda is that the assured annual supply is only a small proportion of the storage capacity. This is because the Macintyre Brook catchment is a relatively dry one, with an average rainfall of only 620 mm, and subject to long periods of low rainfall and runoff which means that storage has to be carried over for several years at a time to meet irrigation requirements during these very long dry spells.

None of the sites was particularly attractive, as the storages were relatively small and the capital cost per megalitre of assured supply was higher than had been the case for any approved structure to that date.

The Coolmunda site was recommended because no other site provided sufficient storage and the site gave the lowest cost per megalitre of assured supply. Furthermore, the site controlled water from two catchments, and as Bracker Creek was a major contributor of poor quality water during low flow periods, it was considered advantageous to have this taken into storage. This enabled the low quality water to be diluted with better quality water rather than have this water used as unregulated flow in low flow periods, particularly when the flow was just sufficient to meet irrigation requirements.

The disadvantages of the site were that it inundated some 850 hectares of alluvial soil and a deviation of the railway and main road was required.

Construction of the dam commenced in 1963, and the dam was completed in 1968. Full capacity was reached in December 1970.

Details of the dam are given in Table 3.3.

Table 3.3

Coolmunda Dam Specifications

Type of Dam	Earth and Rockfill
Length of Dam	2286 metres
Height of Crest above stream bed	18.9 metres
Full Supply Level - above sea level	314.1 metres
Full Supply Level - above stream bed	16.1 metres
Total width of Spillway	107 metres
Net Length of Spillway Crest	89.6 metres
Spillway Gates (Counterbalanced, automatically operated)	7, each 12.8 metres long 11 metres high
Total Volume of Fill in Embankment	659 000 m^3
Volume of Concrete in Dam	31 500 m^3
Reservoir Area (full supply level)	1740 hectares
Length of Shoreline	30.6 km
Storage Capacity	75 200 Ml
Catchment Area	1735 km^2
Annual Average Rainfall	620 mm
Period of Construction	1963-1968
Cost	$6 900 000
Supply Available (annual)	16 100 Ml

Source: Irrigation and Water Supply Commission, Brisbane

Conditions of Supply. On completion of Coolmunda Dam, landholders were advised by the Irrigation and Water Supply Commission that a licence was required in which the landholder was asked to state the area intended to be irrigated, the desired water entitlement and the term for which the licence was to be issued, or renewed, up to a period of 10 years. A minimum period of three years was stipulated by the Commission.

No charge is made for water used solely for stock or domestic purposes, but a permit is required, and the pump size is limited to 75 mm.

Conditions of Licences. The irrigated area for which a licence is granted or renewed, is as requested by the landholder, except that:

(a) The licenced area must not be less than four hectares;

(b) Restrictions to the area irrigated on any one property may be applied when the total area of irrigation approaches 3200 hectares;

(c) All licences held by a landholder are grouped together for the purpose of measuring water use and determining payment; and

(d) The quantity of water licenced to be diverted each year, will normally be six megalitres per hectare licenced. In no case will the total water entitlement per landholder be less than 25 megalitres.

Pump Size. No limit was placed on the size of the pump, and the number of licenced pumps per landholder is not normally limited.

Meters. Up to three water meters per landholder are supplied, installed,

maintained and read by the Irrigation and Water Supply Commission, at its own expense, on licenced pumps. Any additional meters are supplied and installed at the landowner's expense, but the Commission will maintain and read these at its expense.

Water Charges and Payments. Water charges are $3.00 per megalitre. A review of these charges is made annually. A minimum lump sum payment is required for 75 percent (to the nearest megalitre) of the total water entitlement for each landholder at the current unit charge. This payment is required within one month of notification. When the use exceeds 75 percent of the entitlement, payment is required for the extra water used.

For the 1976-77 and 1977-78 years the minimum percentage for lump sum payment has been reduced to 50 percent as a concession to loss of production due to the 1976 flood.

Landholders who require more water than the entitlement, in any year, can apply for additional supply, providing sufficient water is available for other users.

Water entitlements cover a 12 month period, from 1 April to 31 March.

Water Quality. One of the main problems confronting tobacco growers on Macintyre Brook in the past has been the low quality of irrigation water available. High chloride levels were the main cause of this low quality water.

High chloride levels in irrigation water do not retard crop growth and development. However, with tobacco, these chlorides are absorbed very easily by the plant and accumulated in the leaf and resultant leaf quality is lowered.

In the Macintyre Brook prior to the building of Coolmunda Dam the chloride problem was accentuated during period of drought, when the use of supplementary irrigation was even more necessary. McNee and Skerman (1965) found that during a normal season chloride concentrations in the Brook ranged from 10 to 120 parts per million, depending on the sampling site. During a period of drought, figures as high as 540 ppm were obtained. The ideal chloride content of irrigation water for tobacco culture is below 25 ppm, although up to 40 ppm is acceptable.

The completion of Coolmunda Dam, and the effect of continued water releases from the dam, has levelled out the normal seasonal fluctuations in chloride levels in the Macintyre Brook, below the storage. Chloride analyses or water samples taken from the dam site indicate that levels between 25 ppm and 40 ppm can be expected, whereas samples taken at Ben Dor Weir are generally 10 to 20 ppm higher. There are numerous springs feeding low quality water in the Macintyre Brook downstream from Coolmunda Dam. This accounts for the progressive increase in chloride content downstream from the dam.

The chloride content of irrigation water from the Macintyre Brook will be in the 40 to 60 ppm range during periods of nil flow from the lower tributaries. When these tributaries flow or following releases from the storage, the chloride level can be expected to fall below 40 ppm.

The levels of sodium in the irrigation water from the Macintyre Brook are comparable with the chloride levels. This indicates a potential hazard in the continued use of this water for irrigation. Sodium absorption ratios of water samples from the Brook are normally between three and four. This irrigation water is also considered to be of medium salinity with levels between 130 and 330 ppm.

Irrigation practices will largely determine the effect of continued use of irrigation water on the silty clay loam soils. Trials have indicated that gypsum applications although showing some beneficial effect on the soil, can not be economically justified. The high cost of bulk gypsum and the need for large quantities (2.5 to 5 tonnes per hectare) has deterred any commercial use of the product.

Dumaresq River

The Dumaresq River Valley is formed by the confluence of four streams, Mole River and Tenterfield Creek (New South Wales) and Severn River and Pike Creek (Queensland).

They converge in the relatively small area known as Mingoola, about 55 kilometres west of Tenterfield (New South Wales), to form the Dumaresq River.

From Mingoola, the river is the border between the States of Queensland and New South Wales, and continues as such to its junction with the Macintyre Brook, where they both form the Macintyre River, some 183 kilometres distant.

In the upper reaches, there is a well defined valley which gradually broadens and flattens out, from the town of Texas in Queensland towards Goondiwindi.

Rainfall on the catchment area can cause a rapid rise in the river, and flooding can be a problem.

In the mid to late 1950s, three small weirs were constructed along the Dumaresq River, in an endeavour to alleviate water shortages. These are Bonshaw, Cunningham and Glenarbon. Details of these weirs are shown in Table 3.4. Map 1 shows their locations.

Table 3.4

Details of Weirs on Dumaresq River

Purpose of Supply	*Name*	*Height (m)*	*Capacity (Ml)*
Irrigation	Bonshaw	2.9	617
Irrigation	Cunningham	4.6	543
Irrigation	Glenarbon	2.7	353
Total			1513

Source: Irrigation and Water Supply Commission

The total storage capacity (1513 Ml) of the three irrigation weirs, along the Dumaresq River, did not provide an assured water supply for existing irrigation, because of the irregular flow in the Dumaresq River.

The Dumaresq-Barwon Border Rivers Commission, established under the New South Wales-Queensland Border Rivers Agreement, is responsible for the investigation, design, construction, operation and maintenance of water conservation works along the Border Rivers. As a result of its investigation of major storages on the Dumaresq River, the Commission in a report of March 1961, recommended that the first step in the provision of water conservation should be provided by the construction of a dam at 6.8 kilometres on Pike Creek.

The Glenlyon Dam, completed in 1976 on Pike Creek, a tributary of the Dumaresq River, will supply irrigation water to both States.

Construction of the Glenlyon Dam commenced in 1973, with costs being borne by the Queensland and New South Wales Government, with Queensland's apportionment of water being 48 500 megalitres which was calculated as half the assured annual supply measured at the Mingoola gauging station.

Table 3.5

Glenlyon Dam Specifications

Type of Dam	Earth and Rockfill
Catchment Area	1326 km^2
Capacity	261 000 Ml
Surface Area	1750 hectares
Length along Pike Creek	27 km
Height of Embankment above Bed	61 metres
Height of Spillway above Bed	49 metres
Length of Embankment Crest	449 metres
Width of Spillway	74.4 metres
Volume of Fill in Embankment	1 450 000 m^3
High Capacity Outlet Diameter	1500 mm
Low Capacity Outlet Diameter	600 mm
Average Annual Rainfall	650 mm

Quality of Water. In periods of low flow in the Dumaresq River, the sodium chloride content of the water increases significantly to levels at which it seriously affects the quality of tobacco leaf.

Without storage, the high level of sodium chloride is detrimental to tobacco leaf quality at certain periods but is satisfactory for other types of crops that could be grown in the area.

The result of storage of high flows and the release of this low salinity water (see Table 3.6) as required to maintain flows in the river and to meet irrigation demand is expected to considerably reduce the average level of salinity compared with that of the natural unregulated flow in certain periods.

Table 3.6

Water Quality Data
Border River and Tributaries

Date	Pike Creek Dam Site		Dumaresq River (Cunningham Weir)		Macintyre River (Goondiwindi)	
	Discharge (Cusecs)	Sodium Chloride Content ppm	Discharge (Cusecs)	Sodium Chloride Content ppm	Discharge (Cusecs)	Sodium Chloride Content ppm
19 January 1966					77	36
8 March 1966	0.91	36			3	
9 March 1966					31.5	52
21 September 1966			1050	22	1800	24
25 January 1967					115	40
6 April 1967	0.9	40				
24 August 1967					284	28
25 August 1967	3.3	42				
12 December 1967					13.3	32
14 December 1967	0.15	50				
4 March 1968	0.52	38				
16 July 1968			140	36		
17 July 1968	17.5	36			196	54
8 August 1968	20.4	34				

Source: Dumaresq Valley Irrigation Project - July 1969

3.3 UNDERGROUND SUPPLIES

The Shire may be considered as consiting of two groups of rocks, divided by the line Beebo-Inglewood-Millmerran. East of this line, there are old rocks, fairly hard for the most part, while to the west are the sandstones and shales of the Artesian Basin. The Artesian Basin sediments are overlain in some areas by the thin cover of unconsolidated clays and sands.

Old Rocks

The mudstones shales, slates, etc., of this group are Palaeozoic in age. For the most part, groundwater in these rocks is stored in fractures, joints and crevices.

Supplies vary in both quality and quantity. The supply ranges from nil to 1350 lph. Quality is usually suitable for stock use but can vary from domestic quality water to unsuitable for all purposes. Depth to the main aquifers varies between 30 and 60 metres.

Bores in these rocks should be located adjacent to creeks, gullies or major drainage lines, since these features control the recharge to the rock freactures, and hence the permanency of supply.

Artesian Basin, Rocks and Overlying Sediments

Where present, the sediments are about 27 metres deep and produce water from sands, weakly cemented sandstones and small gravels from about 16 metres on. Yields are usually a few hundred litres per hour and quality can often be poor.

The sandstones and shales of this sequence vary in depth from 0-46 metres at the eastern edge, to 155 metres at the western boundary of the Shire. The most commonly used acquifers are encountered in the range 65-128 metres.

Water quality is usually described as suitable for stock, but there is little analytical information available to indicate suitability for domestic use.

The supply available from the sandstones is variable, ranging from 200-4500 litres per hour. Towards the western boundary of the Shire occasional bores could yield small (trickle) flows.

3.4 IRRIGATION

3.4.1 Water Use

The area under irrigation in the Shire has increased steadily following the completion of the Coolmunda Dam in 1968, and will continue as growers become more experienced with irrigation. Increased areas of irrigation are expected along the Dumaresq River following the completion of the Glenlyon Dam.

Table 3.7 illustrates the increases in area of crops under irrigation from 1970-71 to that of 1975-76 water year.

The irrigation area includes double crop areas which were counted twice and also any area that was irrigated at least once was assumed to be an irrigated crop.

Table 3.7

Area Crops Grown Under Irrigation 1970-71 and 1975-76

Crop Irrigated	*Macintyre Brook*		*Dumaresq River*	
	1970-71	*1975-76*	*1970-71*	*1975-76*
Lucerne	365	208	350	450
Tobacco	142	165	120	160
Soybeans	-	88	-	150
Navy Beans	24	346	-	116
French Beans	-	72	-	-
Sorghum	24	202	-	218
Millet	-	-	-	20
Pumpkins	25	25	15	15
Wheat	20	-	160	-
Mung Beans	-	30	-	-
Barley	80	200	-	200
Horticultural Crops	36	81	-	20
Pastures	24	30	10	24
Winter Fodder Crops	214	n.a.	200	n.a.
Total	954	1447	855	1373

Source: Department of Primary Industries, Inglewood

Table 3.8 shows the amount of irrigation water used by irrigators since completion of the Coolmunda Dam, compared to the total water allocations applied for by property owners in these years. Whilst there has been an increase in water usage per hectare, it is still short of crop requirements, although supplies are available.

3.4.2 Irrigation Methods

Several systems of irrigation are now in use on Macintyre Brook and the Dumaresq

River. Initially, irrigation was concerned with the production of tobacco and it is only in recent years that extensive irrigation of other crops has occurred. The uneven topography of most of the irrigation soils on Macintyre Brook and the Dumaresq River has restricted the acceptance of flood systems of irrigation.

Table 3.8

Water Allocation and Use - Coolmunda Dam

Year	*Licencees (end of year)* No.	*Pumps Licenced* No.	*Dam Storage (end of year)* (Ml)	*Allocation* (Ml)	*Diverted by Farmers*[1] %	*Percent of Allocation* %	*Released from Dam* (Ml)
1968-69	n.a.	84	23 313	3 914	2 437	62	n.a.
1969-70	n.a.	82	24 423	3 793	2 181	58	n.a.
1970-71	n.a.	85	69 446	3 947	2 319	59	n.a.
1971-72	n.a.	90	66 609	4 331	3 122	72	n.a.
1972-73	56	94	63 649	4 629	4 997	108	10 825
1973-74	76	129	46 000	14 980	7 111	47	11 207
1974-75	76	132	74 400	15 417	4 946	32	4 856
1975-76	76	132	72 400	15 515	3 012	19	2 154
1976-77	75	132	75 200	15 232	3 862	25	4 979

Source: Irrigation and Water Supply Commission. Annual Reports
[1] Excludes water diverted for Inglewood town (280 Ml in 1976-77)

Furrow Irrigation

This was the first method used to irrigate tobacco. The small areas involved and the system of culture encouraged the practice of furrow irrigation, and until 1967 it was the only irrigation system used for this crop.

Water was lifted by pumps from the stream and, depending on the situation, was transferred by ditch or fluming to the site of the crop. Elevated galvanized iron fluming supported by poles and carried under roadways by a syphon system, was used to carry water to the higher stream terraces.

Control of irrigation water with this system was generally obtained by shovel and it is only in recent years that syphons have been used. The uneven topography of many paddocks produced erratic watering and checks in the furrow were used to help alleviate this problem.

The more recent trend is to do away with syphons and use 'gated pipes'. This latter system whilst more costly initially, proves its superior efficiency by allowing the farmer greater control of irrigation water flow rates on the more difficult soils where infiltration rates can be as low as two millimetres per hour.

Gated pipes also are labour saving and do away with head ditches, which are costly to construct and maintain.

Lateral water penetration in the silty loam soils is poor and the single V-shaped furrow is unsuitable for effective water distribution. A flat-bottomed or double V-shaped furrow is required to allow water to spread close to the row.

Surface sealing reduces the rate of penetration and long flow periods are required to ensure effective watering. Infiltration rates are satisfactory following a cultivation, but are very low when water is applied to uncultivated furrows. Furrow irrigation of many tall-growing field crops such as tobacco, grain sorghum, sunflowers is largely ineffective after the last cultivation stage. As the water requirement of most of these crops is highest at flowering, it is most difficult to maximize yields on these soils with furrow irrigation.

Spray Irrigation

The first spray irrigation plant was installed on Macintyre Brook in 1958. The

number of plants installed in the following 10 years was small and no major increase occurred until 1967 when 'towline' type plants and an assured future water supply became available.

Irrigation of field crops and lucerne has emphasized the importance of a simple system of spray irrigation which eliminates the need for excessive labour. At present, the 'towline system' is satisfying this requirement, although the capital cost is high ($500-$580) per hectare. The major problem with this system is the difficulty of shifting the line in a crop over one metre high.

A move to the sandier soils for tobacco culture and a realization of the importance of more effective irrigation on the silty clay loams has encouraged tobacco growers to change from furrow to spray irrigation. During the 1974-75 growing season, 290 hectares (56 percent) were grown under spray irrigation, 126 hectares of which is situated on the Macintyre Brook.

It has been necessary to design plants with low rate of application to obtain good moisture penetration and prevent excessive runoff and crusting on the silty clay loams. Most plants are designed to supply seven to nine millimetres per hour.

The introduction of the first travelling irrigator in 1972 resulted in a small increase to a total of five on four properties in 1975.

The main problem with spray irrigation is the high capital cost involved, particularly when low value crops and pastures are to be irrigated.

Other Systems of Irrigation

Border. The border check system is used on 10 properties commercially. The total area in 1975 was 275 hectares. The uneven topography of most irrigable soils restricts the use of this system due to the excessive grading that is required.

Solid Set. An overhead irrigation system, essentially designed for efficiency, timely operation and labour saving. High capital cost restricts the use of this system to high value crops. Two are currently in operation in the district.

Trickle. This system would appear to be eminently suited to horticultural crops, and three by two hectare areas of grapes and also one area of 40 hectares - pecan nuts - are now being watered with this system. The high capital cost ($2500 per hectare) will restrict its use to vines, orchards and high value vegetable crops. Trickle irrigation experiments are being conducted at the Inglewood Field Station (see Section 8).

Table 3.9 sets out areas irrigated in Inglewood Shire for the last four years according to type of crops irrigated, source of water and method of application of the water.

3.4.3 Irrigation Practices

The advantages of preplanting irrigation for crop establishment is now realized by irrigators, but the practice has been rare in the past. This has resulted in late plantings and problems with emergence, particularly with summer crops.

A high soil moisture regime is essential at planting as post planting pre-emergence irrigation on the silty clay loams causes severe crusting. Germination can also be affected by a wet crust developing following rain.

During heatwave periods, irrigation is required in 10 day cycles on the silty clay loams, and more frequently on the deep sands. Irrigation plants therefore must be designed to apply at least 50 mm per week or 75 mm every 10 days for summer crops.

3.4.4 Drainage

Some degree of levelling is required on most soils. Heavy grading should be avoided on the silty clay loams. Exposure of the subsoil causes patchy crop growth due to the poor and uneven water penetration, and the increased tendency of this exposed subsoil to crust. Less lasting damage is done by a series of light levellings which should be

carried out as early as possible prior to planting of the crop.

Table 3.9

Irrigation on Rural Holdings - Inglewood Shire

Particulars	*1972-73* *ha*	*1973-74* *ha*	*1974-75* *ha*	*1975-76* *ha*
Crops Irrigated				
Cereals (all purposes)	504	754	838	818
Tobacco	303	255	253	245
Fruit and vegetables	20	14	67	46
Other crops	182	169	316	215
Pasture Irrigated				
Lucerne	601	634	710	565
Other pasture	194	247	270	267
Total Area Irrigated	1807	2073	2454	2156
Source of Water				
Surface	1695	1985	2363	2074
Underground	112	88	91	82
Method of Application				
Furrows	66	74	59	120
Sprays	1511	1729	1998	1720
Flooding	191	237	360	309
Trickle	3	5	7	7
Multiple	35	28	30	-
	No.	*No.*	*No.*	*No.*
Holdings Using Irrigation	99	96	100	96

Source: Australian Bureau of Statistics

3.4.5 Irrigation Plants

Motors. Up to June 1975, 20 percent of the pumps on the Macintyre Brook were powered by electricity, whilst 25 percent of the motors on the Dumaresq River were powered by electricity.

Lower tariff charges, introduced in recent years, have resulted in a move to electric motors as electricity becomes more competitive with diesel fuel. Other irrigators are using mainly stationary diesel motors, which although considerably more expensive to buy than the electric motor, have had a much lower running cost, with their mobility an added advantage.

Mains. Asbestos cement mains are used in all the larger plants. Most of these mains are underground and do not restrict machinery. Main sizes are 15 cm and 20 cm depending on the area involved.

Pumps. Cetrifugal pumps are used and the size varies considerably. Generally, they are in the 100-200 mm range.

3.5 FUTURE IRRIGATION DEVELOPMENT

An increase in the area under forms of flood irrigation can be expected. The limitations have already been discussed, but one of the main advantages of this system will be the lower capital costs, and therefore a more economic use of water on grazing crops and pastures in particular. Another advantage is the ease and speed of applying water to a crop during periods of stress. The maintenance of a ground cover for example in the case of pastures, has reduced surface sealing of the silty clay loams. The area under spray irrigation will also increase. This increase will be associated with annual crops such as tobacco, and also where irrigation is required on the more uneven areas of the silty clay loams, and on the porous sands. Although initially the increase will utilize the 'towline' system it can be expected that other forms of spray irrigation such as 'solid set'

and 'travelling irrigators' will also increase.

If the acreage under fruit and vines increases, the 'trickle' system will also become more widely accepted.

Sources of Information

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8. Queensland. Irrigation and Water Supply Commission (1968) - *Macintyre Brook Irrigation Project. Coolmunda Dam.* (Pamphlet). Brisbane

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4. SOILS

4.1 INTRODUCTION

The soils of the Inglewood Shire have been broadly mapped at a scale of 1:2 000 000 in sheets 3 and 4 of the Atlas of Australian Soils (Northcote, 1966 and Isbell et al., 1966). However, separate sections of the Shire have been reported on in more detail. Isbell (1957) mapped part of the Shire west of 151°05'E longitude at the scale four miles to one inch (approximately 1:253 000) while Powell (1976) has mapped the Shire east of this longitude at the scale of 1:250 000. The accompanying soils map (Map 4) of the Shire is a composite of these more detailed reports.

The main groups of soils in the Shire are:

Soils developed on alluvium

Soils developed on limestone

Soils developed on sandstone

Soils developed on 'traprock'

Gravelly soils of mixed origin

Brigalow-belah soils

Sandalwood-poplar box soils

Tea tree-spinifex soils

There are minor areas of soils developed on granite at Mt. Bullanganang, Pikedale and Smithfield. They are predominantly gritty siliceous sands amongst rock outcrops or gritty texture contrast soils.[1]

These areas are marked on the map but granite soils have not been described in the text.

The main soil groups are discussed in more detail in Section 4.2. In this Section, Principal Profile Forms (Northcote, 1974) are given for many of the soils described (e.g. Gn 3.11, Dy 3.43).

4.2 MAJOR GROUPS OF SOILS

4.2.1 Soils Developed on Alluvium

MAP UNIT 1

This map unit can be found bordering the Dumaresq River and Macintyre Brook, and can be divided into two sub-groups:

Soils of the younger terraces and levees (regosols). These are dominantly deep, slightly acid to neutral, sandy-loams to silty-loams showing little profile differentiation. (Um 4.31, Um 6.12, Um 6.11) and silty clays (Uf 6.3) also occur. Vegetation is usually an open fringing forest of Murray River red gum, poplar box and occasionally coolibah and Moreton Bay ash. These soils are highly productive and easy to manage.

Soils of the older terraces and levees. These are much more extensive than the regosols and slope generally away from the stream. They are deep soils with slightly acid to neutral, light grey-brown or light brown loams, silty-loams or clay-loam surface soils to 30 to 60 cm overlying compacted, red-brown, alkaline, clay subsoils (Dr 2.42, Dr 2.63). Vegetation is usually a woodland dominanted by silver-leaf ironbark and poplar box, with occasionally rough-bark apple on the sandy areas. Cultivation and irrigation often lead to surface crusting and the development of pans. Most areas are subject to inundation by exceptional floods.

Fertility status is generally good for both sub-groups, however on the soils of the older terraces and levees there is a possibility of undesirable chloride accumulation with irrigation.

[1] See end of section for definitions

MAP UNIT 2

This map unit is found bordering the Dumaresq River upstream from Smithfield.

Dominant Soils

Dark brown structured earths[1] (Gn 3.23, Gn 3.25, Gn 3.42). Deep soils with a hard setting massive, brownish-black to dark brown, clay-loam surface soil commonly underlain by a pale A_2-horizon grading into a dark brown, blocky, neutral, to alkaline clay subsoil containing lime concretions.

Dark brown, texture contrast soils (Db 1.42, Db 1.43, Dy 2.42, Dd 1.43, Dd 3.23). Deep soils with a massive, greyish-yellow-brown, loam to clay-loam surface soil usually hardsetting, over a bleached A_2-horizon to 30 to 35 cm, over a greyish-yellow-brown to dark brown, blocky or columnar, alkaline clay subsoil. Lime may occur at depth.

Minor Soils

Dark loams (Um 1.43, Um 1.44, Gn 2.43). Deep, dark brown, massive, sandy-clay-loam to clay-loams of neutral pH, occasionally becoming more clayey and alkaline with depth.

Dark, hardsetting clays (Uf 6.31, Uf 6.32, Uf 6.33). Deep, black to dark brown clay becoming alkaline with depth. Lime concretions in subsoil are common. Clay colour may become browner with depth.

Vegetation is usually a cleared open forest of river red gum, white box and poplar box with minor rough-bark apple.

The hardsetting surface is a problem for cultivation and the impermeable, poorly drained, clay subsoils of the dark brown texture contrast soils restrict the soils cultivation and irrigation potential. Flooding can occur.

Soil fertility is generally good but salt accumulation, particularly in the dark brown texture contrast soil is a severe restriction.

MAP UNIT 3

This map unit is found bordering the Macintyre Brook east of Inglewood and bordering other streams surrounded by sandstone or traprock.

Dominant Soils

Yellowish-brown and brown, neutral to alkaline, texture contrast soils (Db 1.43, Db 3.12, Dy 2.12, Dy 2.42, Dy 3.43). Moderately deep to deep soils with a hardsetting, massive, brownish-black to dull yellowish-brown, loamy-fine sand to clay-loam, frequently gravelly, surface soil frequently underlain by a bleached A_2-horizon to 10 to 40 cm over a coarse blocky or columnar structured dull yellowish-brown or mottled brown, neutral to alkaline, clay subsoil.

Minor Soils

Soloths (Dr 2.41, Dr 4.41, Dr 4.22). Deep soils with a dark brown to brown, loamy-sand to fine sandy-loam surface soil over a pale or bleached A_2-horizon to 60 cm over a red-brown, acid, clay subsoil.

Red and brown, alkaline, structured earths (Gn 3.16, Gn 3.19, Gn 3.55, Gn 3.74). Deep soils with a dark brown to brown, loam, fine sandy to fine sandy-clay-loam surface soil usually underlain by a pale A_2- horizon grading into a reddish-brown, mottled brown or yellowish-brown alkaline, clay subsoil.

Sandy-loams (Uc 1.23, Uc 4.22). Deep soil with a brown to reddish-brown, fine sandy-loam to sandy-loam surface soil frequently underlain by a pale A_2-horizon over a brown, acid to neutral, sandy-loam subsoil.

[1] See end of section for definitions

Brown, grey and dark cracking clays (Ug 5.1, Ug 5.2, Ug 5.3). Deep soil with large hexagonal surface cracks and brownish-black or dark-brown, clay to clay-loam surface veneer over grey, brown to brownish-black, neutral to alkaline, clay subsoil, usually with lime at depth.

The vegetation in this map unit is variable with pure and mixed stands of poplar box, yellow box, brown box and rough bark apple occurring, much of it cleared.

The hardsetting surface and poorly structured clay subsoil of the dominant soil restrict long term cultivation prospects without irrigation. Soil fertility status is fair but nitrogen levels are low and subsoil sodicity is occasionally undesirably high.

4.2.2 Soils Developed on Limestone

MAP UNIT 4

These soils cover small areas around Limevale and The Pinnacle.

Dominant Soils

Red-brown, structured earths (Gn 3.13, Gc 2.22). Deep soil with a hardsetting, dark reddish-brown, clay-loam surface soil grading into a red-brown blocky, medium clay, subsoil containing manganiferous nodules and neutral to alkaline at depth.

Minor Soils

Dark red, hardsetting, calcareous clays (Uf 6.31). Moderately deep clay with a gritty, brownish-black to brown surface soil grading into a dark brown to brownish-black, blocky subsoil with powdery lime throughout.

Vegetation is dominanted by an open forest of brown box. These soils are suitable for cultivation but soil surfaces may be hardsetting and salinity levels may be high. Soil fertility status is fair.

4.2.3 Soils Developed on Sandstone

MAP UNIT 5

This association consists of both texture contrast soils and deep acid sands. The texture contrast soils consist of an acid, sandy, loose surface soil over a bleached sandy subsurface overlying a tough solonized, acid to alkaline, clay subsoil (Dy 2.41, Dy 3.43, Db 1.42, Db 1.43). The deep sands (Uc 1.23, Uc 2.12, Uc 2.31, Uc 2.34) and acid texture contrast soils dominate the upper slopes while the lower slope soils often contain alkaline clay subsoils.

The vegetation is dominated by cypress pine, with bulloak, narrowleaf ironbark, tumbledown gum and smooth bark apple (rusty gum) generally associated. The grass cover is sparse. These soils are low in available nutrients and are commonly laterized to some degree with ironstone concretions in the B-horizons.

The texture contrast soils are undesirable agricultural soils because of their low fertility, often very acid (pH 5.0-5.5) surface and impermeable clay subsoil causing impeded internal drainage and waterlogging.

Deep, light grey to light brown sands occur near Macintyre Brook and are usually at least two metres deep. The vegetation is usually cypress pine, black pine, smooth bark apple and silver leaf ironbark. This soil type offers scope for agriculture and horticulture, particularly under spray or trickle irrigation, although fertilizer requirements would be high.

MAP UNIT 6

The dominant soil is a deep texture contrast soil with an occasionally gravelly, loam to clay-loam surface soil over a bleached subsurface to 10 to 25 cm deep. This overlies a coarse blocky or columnar, grey-brown to reddish-brown, commonly mottled, neutral to alkaline, clay subsoil. (Dr 2.13, Dr 2.43, Db 1.42).

Vegetation is open forest dominated by bulloak with cypress pine, poplar box, narrowleaf ironbark and mallee box usually associated.

Hardsetting, weakly structured surfaces and impermeable subsoils make these soils unsuitable for agriculture. The soils are of low to very low fertility and subsoils contain undesirably high contents of magnesium and sodium.

MAP UNIT 7

These are shallow stony soils having numerous rock outcrops (Um 1.43, Uf 1.43). Where the parent rocks have been laterized, the soils have a redder hue.

The vegetation is an open forest of silver leaf ironbark, narrowleaf ironbark, poplar box and cypress pine. Wattle is present in some areas, and *Acacia cunninghamii* is the main species found.

Slopes and the shallow stony nature of the soils restrict agriculture. They are also probably soils of low fertility.

MAP UNIT 8

The dominant soil is a shallow to moderately deep texture contrast soil with a gravelly, massive, loamy-sand to light sandy-clay-loam surface soil over a gravelly bleached A_2-horizon to 25 to 40 cm. This abruptly overlies a reddish-brown to dull yellowish-brown, commonly mottled, blocky or columnar, acid, clay subsoil (Dy 3.41, Dy 4.41, Dr 5.41).

Vegetation consists of an open forest of very tall narrowleaf ironbarks among cypress pine with the occasional smooth bark apple (rusty gum) present.

These soils have no agricultural potential because of hardsetting surfaces, poor internal drainage, shallow soil depth and a high gravel content. Fertility status is low to fair, being very low in phosphorus and the subsoil has an undesirably high sodicity.

4.2.4 Soils Developed on 'Traprock'

These soils are shallow and are characterized by a high content of angular parent rock.

MAP UNIT 9

Dominant Soils

Shallow, gravelly, loams (Um 2.12, K-Um 2.12, Um 2.21, Um 5.51). Shallow, gravelly, massive loam to clay-loam with a brownish-black to brown surface soil over a brown or bleached, acid subsoil.

Shallow, gravelly, texture contrast soils (Dr, Dy, Db). Shallow, gravelly soil with a massive, brownish-black to dark brown, loam to sandy clay-loam surface soil over a bleached A_2-horizon with increasing gravel to 15 to 30 cm, over a coarse blocky or columnar, reddish-brown, brown to dull yellowish-brown, acid to neutral, clay subsoil.

Minor Soils

Shallow to deep, gravelly earths (K-Gn 2.41, Gn 2.11, Gn 3.11). Shallow to deep, gravelly soil with a massive, brownish-black to brown, sandy-loam to light sandy-clay-loam surface occasionally over a pale A_2- horizon grading into a massive or weakly structured dull yellowish-brown to reddish-brown, acid, clay-loam or clay subsoil.

Shallow, gravelly clays (Uf 6.31). Shallow, gravelly, blocky, red-brown clay with a thin (2 cm) dark brown clay-loam hardsetting surface veneer.

The vegetation varies with locality, with mixed and pure stands of cypress pine, tumbledown gum, narrowleaf ironbark, and silver leaf ironbark occurring. Shallow depth, rough terrain and rock outcrops make grazing or forest reserve the only possible land uses.

Fertility status is extremely variable but is more commonly low. Subsoil sodicity is commonly high in the gravelly texture contrast soils.

MAP UNIT 10

Dominant Soils

Shallow, gravelly, loams over clays (Dr, Dy, Db). Shallow to moderately deep soil with a gravelly, massive, brownish-black to brown, sandy-loam to clay-loam surface soil usually underlain by a bleached A_2-horizon to 10 to 30 cm over a brown, reddish-brown or yellowish-brown, clay subsoil.

Minor Soils

Shallow, gravelly loams (Um). These soils fit the description of the dominant soil *Shallow, gravelly loams* in Map Unit 9.

Deep, gravelly, texture contrast soils (Dy, Db). Deep, gravelly, massive, brownish-black sandy-loam to clay-loam surface soil over bleached A_2-horizon to 10 to 30 cm over reddish-brown to dull yellowish-brown, alkaline clay subsoil.

Vegetation is the same as for Map Unit 9. Cultivation may be attempted in limited areas where subsoil structure and soil depth and slope are satisfactory.

Fertility status is low to fair, often being low in phosphorus. Subsoil sodicity is undesirably high.

4.2.5 Gravelly Soils of Mixed Origin

MAP UNIT 11

These soils are characterized by a hardsetting stony surface and the presence of large amounts of gravel, ironstained quartz, and jasper-like siliceous material in the upper levels of the profile. They are shallow to deep texture contrast soils with fine sandy-loam to clay-loam surface soils over a bleached subsurface to 30 to 35 cm. This overlies a columnar brown to dull yellowish-brown, acid to alkaline clay subsoil. (Db 1.41, Db 1.42, Dy 2.41, Dy 2.42, Dy 2.43).

Vegetation is an open forest dominated by broadleaf ironbark, poplar box, some bulloak, cypress pine and smooth-barked apple (rusty gum).

The soils are undesirable for agriculture because of their hardsetting, gravelly surface, poor internal drainage and low fertility. Subsoils contain undesirably high contents of magnesium and sodium.

4.2.6 Brigalow-Belah Soils

MAP UNIT 12

The grey and brown clays are deep, strongly gilgaied soils with a self-mulching surface soil, commonly with gypsum and lime present and with acid or alkaline subsoils (Ug 5.24, Ug 5.25, Ug 5.34).

Associated with the clays are texture contrast soils with sandy-loam to clay-loam surface soils commonly over a thin bleached A_2-horizon to 10 to 30 cm. This overlies a commonly gravelly, coarse blocky or columnar, reddish-brown to greyish-brown alkaline clay subsoil, usually containing lime (Db 2.13, Dr 2.43, Dy 2.43).

Vegetation is brigalow with varying degrees of belah and some mulga and false sandalwood. Belah tends to dominate on the texture contrast soils. Fertility status is fair to good except where the surface soil is acid. Salt contents may be fairly high. Strong gilgai development may restrict cultivation. As the land is usually flat and clays have a fair water holding capacity, many areas are suitable for cereal crops where land can be successfully prepared.

MAP UNIT 13

Some of the texture contrast soils in Unit 12 could be classed in this association. This Unit is usually closely associated with the grey clay association (Map Unit 12). The soils are deep texture contrast soils with a clay-loam surface 5 to 13 cm deep commonly underlain by a thin (< 3 cm) bleached A_2-horizon. This is underlain by a brown to grey-brown, coarse blocky or prismatic brown to grey-brown, alkaline clay subsoil which may become acid at depth. Free gypsum and lime commonly occur in the subsoil (Db 1.33, Db 1.23, Db 1.13, Db 1.43).

Surface soil horizons have weak structure but clay subsoil structure is good. Drainage is fairly good and subsoils hold a fair range of available moisture. With a flat topography and only occasional slight gilgai micro-relief the soils are generally suitable for cereal crops.

Vegetation of this group is normally belah, with some brigalow, mulga and false sandalwood.

Fertility status is fair to good and subsoil salt may be moderate to fairly high.

4.2.7 Sandalwood-Poplar Box Soils

MAP UNIT 14

These soils occur on the outer fringes of the alluvial flats along Macintyre Brook and the Dumaresq River. Also drainage lines that flow through the grey clay gilgai areas almost invariably have narrow fringes of these weakly solodized solonetz soils. They are deep texture contrast soils with a clay-loam surface soil 5 to 15 cm deep, commonly underlain by a thin (< 3 cm) bleached A_2-horizon. The A_2-horizon abruptly overlies a grey-brown to brown, columnar, prismatic or coarse blocky, alkaline, clay subsoil which may become acid with depth. Lime may occur in the alkaline, clay subsoil (Db 1.43, Dy 2.43).

Very shallow gilgai development is found in these soils. The poorly structured, low water holding capacity clay-loam surface and impermeable poorly drained clay subsoils restrict agricultural use of these soils.

Vegetation is characterized by the presence of sandalwood, and is usually accompanied by poplar box and mulga. The soils normally have a short but fairly dense grass cover of *Chloris* spp.

The soil has a moderate fertility status with some subsoil salt accumulation.

4.2.8 Tea Tree-Spinifex Soils

MAP UNIT 15

These are very strongly alkaline soils, with a clay B-horizon of columnar structure and free sodium carbonate, found around Yelarbon and called the Yelarbon 'desert'. Much of the area has a clay pan appearance due to the removal of the surface soil by erosion.

The soils are deep texture contrast soils with a hardsetting, grey to light grey-brown loam to clay-loam surface soil commonly over a bleached A_2-horizon to 7 to 10 cm. This abruptly overlies a coarse columnar, alkaline, clay subsoil (Dy 2.43). Towards the margin of the area, less alkaline soils occur which are similar to the dominant soil in Map Unit 6 (Dy 3.43).

This association supports a stunted community of tea tree, sandalwood, bulloak, and mallee box with spinifex very prominent.

Soil conditions are unsatisfactory for almost any crop growth. These are highly alkaline soils with undesirably high amounts of sodium and magnesium. Free sodium carbonate may be present in the profile.

Definitions

Earths. Are soil profiles which gradually increase in clay content with depth. The texture differences between consecutive horizons or layers is less than 1½ texture groups, while the range of texture throughout the entire solum exceeds the span covered by one texture group (e.g., loam → clay-loam → clay). For definitions of texture groups see Northcote (1974).

Texture Contrast Soils. Are soil profiles which abruptly increase in clay content at the boundary of the A and B-horizons. The distance from the bottom of the A-horizon (topsoil) to the top of the main B-horizon (subsoil) occurs over a vertical interval of 10 cm or less, and there is a texture contrast of 1½ texture groups or greater between the A and B-horizons (e.g., loam over clay).

4.3 SOIL CONSERVATION

Erosion

Both water and wind erosion occur in the Shire.

Erosion caused by rain water runoff is mainly confined to the sloping cultivated land. The main types are sheet and rill erosion with some gullying in depressions where water concentrates.

Erosion caused by overflow flooding occurs on cultivated land adjacent to the Dumaresq River, the Macintyre Brook and other major streams and water courses.

On grassland, water and wind erosion results when the land surace is denuded of vegetation by overgrazing.

Wind erosion is mainly a problem of the lighter soil types (sands to sandy clay-loams). It can be severe in cultivation paddocks void of surface cover. The longer the length of the eroding surface, the worse the problem is. With increasing length more and more sand grains, transported by wind, bounce over the ground surface dislodging finer soil particles which in turn are blown away.

Conservation Requirements

In 1972 it was estimated that of the 29 000 hectares of cultivated land in the Shire, 11 500 hectares would require intensive soil conservation treatment. Most of the remaining 17 500 hectares of cultivation would require treatment of a simple and inexpensive nature. The total area of cultivated (crops, lucerne, and other sown pastures) land in the Shire in 1976 was still approximately 29 000 hectares.

Although soil erosion problems in the grazing areas of the Shire do occur, the main recommendations for soil conservation here is to maintain, or establish and maintain, good permanent ground cover. There is probably also a need for gully stabilization where natural water courses are unstable. In most cases however, the instability of watercourses is a very difficult problem due to the very high erodibility of the subsoils in these areas.

Intensive Treatment

Intensive soil conservation treatment is interpreted as a combination of stubble mulching, broad grass-legume-crop rotations and contour cultivation supported by contour banks at regular intervals.

This type of treatment applies to cultivated land on slopes steeper than three percent and on slopes between one percent and three percent if these slopes are very long, especially where gullies have already developed.

Simple Measures

Simple soil conservation measures are interpreted as a combination of stubble mulching (or stubble incorporation in flood prone areas), broad grass-legume-crop rotations, strip cropping, contour cultivation with or without grass strips (sometimes with the support of an occasional strategically placed structure) and contour renovation of pastures.

This type of treatment, where it concerns cultivation, applies to land on slopes of up to three percent. Strip cropping on sloping land must conform closely to the contour, while strip cropping on flat land may be carried out on the approximate contour.

Conservation Work Completed

At May 1976 a total of 3335 hectares of cultivation land had been treated with intensive conservation measures. At the same time, on a total of 343 hectares of grassland, level lines had been marked which serve as a guide for contour pasture renovation.

Major Needs

The major conservation needs in the Inglewood Shire could be stated as:

(a) Resolution of crop residue management problems and the acceptance of residue surface mulching techniques as one of the most important conservation measures to be adopted on cropping land (particularly on the lighter soils which are subject to wind as well as water erosion).

(b) Increased acceptance of the need and adoption of the practice of broad grass-legume-crop rotations related to the various soil types in the area.

(c) Acceptance of the fact that practices such as (a) and (b) are the backbone of conservation in the Shire. These practices where necessary supported by contour working, contour grass strips, contour banks or strip cropping or a combination of these improve the ability of a soil to absorb and store water. The availability of stored moisture for plants is also increased.

(d) Acceptance of the need to consider ground cover, shade, shelter and wind brakes as an important part of grazing management.

Future Development and Redevelopment

When planning the development of a property it should be determined, in the first place, how different types of land and different soils on the property can be best and most safely utilized. On the basis of a land capability assessment of each different parcel of land the type of enterprise and land use can be decided upon. Also, appropriate soil conservation measures can be planned to overcome the erosion hazard or potential hazard connected with a specific land usage. Land capability, type of land use and soil conservation measures to be adopted have a deciding effect on the property layout, e.g., location of fences, watering points, stock and vehicle access, etc.

Land Capability and Land Use

Land capability classification is the basis for land use planning. Land is made up of areas of different production potential, i.e. land capability units or land classes.

When classifying land it is necessary to determine the limitations to agricultural production for each land unit. The kind and severity of these limitations determine the type of land use a particular land unit is best suited to. The form of land use that ensures long term productivity is the one which should be practised.

Knowing the limitations of each land unit and the degree of erosion hazard to overcome, a selection of conservation measures can be prescribed.

Under the system of land capability classification adopted in Queensland, eight main classes are recognized. These classes are grouped into three broad classifications of use called land capability divisions. The eight classes fall into these three divisions and are shown in Table 4.1.

Limiting Factors

Factors affecting land capability are:

Available moisture holding capacity of the soil.
Effective soil depth.

Soil physical factors affecting crop growth.
Soil nutrient fertility.
Soil salinity or sodicity.
Topography.
Soil Workability.
Rockiness or Stoniness.
Surface microrelief (e.g., gilgai and gullying).
Wetness.
Susceptibility to water erosion.
Susceptibility to flooding.
Susceptibility to wind erosion.

The combination of limiting factors, but especially the severity of the limitations, determine the class of the land.

Table 4.1

Land Capability Divisions and Classes

Land Capability Divisions	*Land Capability Classes*	
Land Suitable for Cultivation	Class I	No special practices needed
	Class II	Special, but simple, practices needed
	Class III	Complex or intensive practices required
	Class IV	Suitable for occasional or limited cultivation only
Land not Suitable for Cultivation but Productive	Class V	Good land but with obstructions to cultivation not practical to remove (e.g., gilgais)
	Class VI	Moderately susceptible to deterioration, therefore requiring some restrictions in use (moderate grazing)
	Class VII	Highly susceptible to deterioration therefore requiring severe restrictions in use (light grazing)
Land not Suitable for Cultivation or Grazing	Class VIII	Suitable only for wildlife reserves and watershed protection

Source: Rosser, et al. (1974) - *A Land Capability Classification for Agricultural Purposes*

Patterns of Land Capability

For a broad land capability classification of the Shire, reference is made to the Land Capability Map (Map 5). The basis of this map is the Land Capability Map of The Granite and Traprock Area of South-East Queensland by A.K. Wills (Division of Land Utilization, Queensland Department of Primary Industries) which has been extended to cover the western part of the Inglewood Shire. Some modifications have been made to the original to suit the author's interpretation of the peculiarities of the Shire area.

The intention of this section is to highlight and explain the main variations in land capability within the Shire.

Class II land is found on the flood plains of Canning Creek and the Macintyre Brook. The main limitations to cultivation are occasional wetness and flooding. Soil physical problems and workability restrictions of the soils of older terraces and levee slopes of the Macintyre Brook, can be so severe that some areas would have to be downgraded to Class III and IV. Also the risk of severe flood damage could put low lying areas and narrow depressions into Class III or IV.

Class II land is also found along the western boundary of the Shire north of Yelarbon. This is the low sloping brigalow-belah country in that area. The main limitations are slight water erosion and a slightly restricted available moisture holding capacity of the soil. Severe gilgai and wetness downgrade some parts within this area to Class V.

Class II to III areas are mainly on the Dumaresq flood plain with a few minor alluvial strips along Oakey, Nanny and Bracker Creeks. The erodible surface structure of the soil combined with some relief make them slightly to moderately erosion prone. The risk of severe flood damage downgrades some areas into Class III or IV.

Class III land occurs east-north-east of Inglewood. This is brigalow-belah country where erosion risk is the main limitations arising out of moderate slopes or long slopes which allow runoff water to concentrate. The lower areas with severe gilgai are of Class V. Other Class III areas are found along a number of watercourses. Susceptibility to water erosion often combined with shallow effective soil depth, susceptibility to flooding and poor surface soil structure is the main limitation here.

Class III to IV and IV country is similar in its limitations to the previous class but stoniness is also significant. The difference between Class III, III to IV and IV is mostly in the degree of the limitations.

Class V land is very strongly gilgaied brigalow country. Wetness is the main limitation. As land levelling has for a number of years an adverse effect on the productivity of the soil and is also costly. The economics of it do not favour cultivation.

Class IV to VI land is concentrated around Warroo and Limevale. The main hazard is erosion through poor soil structure, but occasionally complicated by long slopes and location relative to steeper land units which discharge concentrated runoff onto these lower units. Soil depth, stoniness and poor moisture holding characteristics are also limitations in some areas. This is the last unit in which there is any chance of successful cultivation. However, this can only be conducted under careful controls to prevent deterioration of the land resource.

Class VI land is found mainly in the sandstone country north and south-west of Coolmunda Dam and between Limevale and Clarinda Station and Limevale and Magee Station. This is the better class of grazing land and is limited by the erosion potential of its shallow, stony, poorly structured soils.

Classes VI to VII, VII and VII to VIII are the lower grazing classes. They are successively more restricted for mainly the same reasons as Class VI. The traprock area in general and the sandstone country in the western sector of the Shire fall in this category of land classes.

Strictly speaking, the deeper sandy soils of the sandstone country of the Shire are arable soils and some areas are cleared and cultivated for crops, or for improved pasture establishment. However, the overall very low nutrient fertility of these soils combined with a very low waterholding capacity and a very high wind erosion potential makes this an unsafe and uneconomic proposition.

Timber production is really the only suitable form of land use but care should be taken that forestry tracks do not wash out.

Another problem in clearing this land is timber regrowth. To control it, it becomes necessary to cultivate for several years during which time couch grass invades.

Improved species do not persist because of the element deficiencies of the soil. Fertilization of improved pastures under similar soil and climatic conditions has proved uneconomical.

If the end result of timber clearing is regrowth or a solid mat of couch grass after a period of cultivation, the expenditure would certainly not be warranted. In the process severe erosion by wind or water or both is likely to occur. Contour banking for water erosion control would be another heavy cost.

Class VIII land has negligible productive potential. The land is often rugged and inaccessible. To ensure stability of this land, the vegetation should be preserved.

4.4 AREAS AVAILABLE FOR FUTURE DEVELOPMENT

The solodic soils are the only extensive areas within the Shire that have not been developed to any extent.

The hesitancy to develop these soils in the past has been justified because of the numerous problems often associated with these areas once cleared of original timber. Apart from the very low fertility and low water holding capacity of these soils, the main problems following clearing are their vulnerability to wind and water erosion and timber regrowth. Fortunately, a large percentage of this country is in State Forest Reserves and perhaps in reality it is a pity the remainder of the solodic soils were not also included as State forest reserve. These soils are more suited to timber production than agricultural or pastoral pursuits.

Future development is expected to be confined to the deeper, more arable sandy soils within the solodic group for specialist cropping. Apart from the above problems, the high development costs and low potential of the country prohibit large scale development for agricultural crops or pastures. The other major areas, namely the alluvial flats, brigalow and traprock country are reasonably well developed and further development will depend on technological and economic changes.

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5. VEGETATION AND FAUNA

5.1 INTRODUCTION

The vegetation of parts of the Shire has been described by Isbell (1957) and Pedley (1976). Map 2 shows the distribution of vegetation in Inglewood Shire.

In the western part of the Shire plant communities are similar to those of large areas of inland Queensland, but the vegetation of the southern part (and the adjacent portion of the Stanthorpe Shire) shows a distinct affinity with that of the north-western slopes of New South Wales and not with other parts of Queensland. Large areas of *Eucalyptus microcarpa* and *E. albens* are found only in this part of Queensland. Floristically the area is also unusual. For example, *Acacia flexifolia, A. lineata* and *A. montana* reach the northern limit of their ranges a little south of Inglewood.

The Shire is relatively flat with hills reaching 700 metres in the eastern part of the Shire with a gradual slope to the west. There is a decrease in annual rainfall from about 700 mm at the headwaters of Macintyre Brook to about 600 mm at Yelarbon. The occurrence of distinct plant communities is not correlated with topography and elevation or with climatic factors, but in general there is a definite relationship between the nature of the soils of the Shire and the plant communities.

Structurally (Specht, 1970) the vegetation ranges from open-forest to small areas of heath (near Inglewood) and hummock grassland (near Yelarbon). Natural grassland of economic importance does not occur.

White settlement of the Shire took place in the 1850s and since then all plant communities have been altered to some extent. Large areas of fertile land have been completely cleared and are cultivated. Much of the remainder of the Shire has been cleared or partly cleared for grazing; and selective logging of areas now reserved as State forests has altered the composition of communities which are otherwise untouched. Preferential grazing of palatable species and frequent burning to control unwanted woody plants has drastically altered the ground vegetation. Periodic fires must have been an ecological factor of some importance in eucalypt communities prior to the colonization of Australia by man and the exclusion of fire from areas now reserved as State forests has probably also affected the vegetation.

5.2 VEGETATION ASSOCIATIONS

An attempt has been made to describe plant communities as they probably were before disturbance. Detailed information is often lacking and the communities are therefore broadly defined. The map of the vegetation has been adapted from the vegetation map of Pedley and the soils map, and associated description of vegetation, Isbell.

5.2.1 Woodland

Eucalyptus crebra - E. dealbata

This woodland association predominates usually on upper slopes of traprock areas in the east of the Shire. The upper stratum 10 to 15 metres tall consists of equal proportions of *E. crebra* and *E. dealbata*. Occasionally on gentler slopes *E. creba* up to 25 metres tall predominates and in places along the Herries Range *E. sideroxylon* and *E. exserta* var. *parvula* occur.

The understory is usually not dense, but there are sometimes low trees of *Callitris columellaris* and between Inglewood and Texas *Acacia sparsiflora*. A well developed shrub layer of *Olearia elliptica, Jacksonia scoparia* and *Acacia* spp. occasionally occurs.

Eucalyptus crebra - Angophora costata

Unlike the community described above, this is usually a definitely layered woodland. The composition varies considerably from place to place but the upper stratum consists of about equal amounts of *E. crebra* and *A. costata* 20 to 25 metres tall. *Casuarina luehmannii* almost invariably predominates in a lower tree layer about 10 metres high, often with significant quantities of *Callitris columellaris*. The shrub layer which is often dense is rich in species, *Acacia* spp. (particularly *A. deanei, A. ixiophylla* and *A. semilunata*)

Daviesia spp. and *Leucopogon* spp. predominate. Ground cover is low.

Eucalyptus melanophloia

Woodland 12 to 18 metres tall of *E. melanophloia* and occasional *Angophora floribunda* are widespread on traprock in the southern part of the Shire, usually on intermediate slopes. On upper slopes *E. dealbata* is a conspicuous component of the community. *Callitris columellaris* forms a slightly lower patchy understory, probably much modified by fire. Shrubs of *Olearia elliptica* and *Cassinia laevis* sometimes occur on upper slopes but a shrub layer is not well developed except in a small area near Bonshaw where *Cadellia pentastylis, Geijera parviflora* and *Carissa ovata* occur. Ground cover of *Bothriochloa decipiens, Aristida ramosa* and *Cymbopogon refractus* is sparse.

The community grades into the *E. microcarpa-E. melliodora* association on lower slopes and *E. melliodora* is sometimes present.

Near Inglewood there are small areas of *E. melanophloia-Callitris columellaris* woodland with a shrub layer of *Geijera parviflora* and ground cover of *Dichanthium sericeum.* These are found only on basalt and are rather different in aspect and composition from other woodlands of *E. melanophloia.*

Eucalyptus populnea

E. populnea shrub woodland covers wide areas of inland Queensland. In Inglewood Shire it only occupies a small area on the western part, mainly only the Dumaresq River and Macintyre Brook, and most of it has been cleared.

E. populnea 10 to 20 metres tall, with occasional patches of *E. melanophloia* forms a rather open woodland often with scattered lower trees of *Acacia excelsa* and a patchy shrub layer of *Geijera parviflora, Eremocitrus glauca* and *Eremophila mitchellii.* The last species are often pests in grazing land. The ground cover has been much modified. *Bothriochloa decipiens* and *Aristida* spp. predominate with occasional patches of *Dichanthium sericeum* and *Chloris divaricata.*

Around Inglewood *Eucalyptus pilligaensis* is a conspicuous tree in an area which is transitional to the *E. microcarpa-E. melliodora* community described below.

Eucalyptus microcarpa - E. melliodora

Only remnants of this association remain. The upper stratum of *E. microcarpa* alone or of *E. microcarpa* and occasional *E. melliodora* is 10 to 20 metres tall. Over most of its range there are few shrubs in the community, but *Acacia ixiophylla* and/or *Cassinia laevis* sometimes form a dense layer one to two metres tall.

The ground cover is moderately dense and fairly uniform in composition. The most conspicuous species are *Bothriochloa decipiens, Cymbopogon refractus, Danthonia linkii* and *Dichelachne micrantha.*

Eucalyptus albens

E. albens occurs throughout the traprock area, but is usually only a minor component of the vegetation. In the area drained by Bracker Creek however, a distinct woodland of *E. albens* occurs on intermediate slopes. On upper slopes it merges with *E. crebra* woodland and on the lower slopes with *E. microcarpa-E. melliodora* woodland.

Structurally it resembles the *E. microcarpa-E. melliodora* association though only scattered subshrubs, *Pinelea parviflora* and *Olearia elliptica* occur. Ground cover is similar to that of the previous community.

In the rugged country at the headwaters of Bracker Creek, *E. albens, E. melanophloia* and *E. dealbata* form a woodland with a dense understory of *Acacia leiocalyx* and *Dodonaea attenuata.*

5.2.2 Open Forest

Acacia harpophylla - Casuarina cristata

The western part of the Shire might be considered part of the 'brigalow lands'. Almost all of the original vegetation has been cleared, and the description below has been derived from small relict patches all of which are disturbed to some extent.

The upper stratum consists of *Acacia harpophylla* and *Casuarina cristata* with a well developed shrub layer of *Geijera parviflora, Eremophila mitchellii* and less commonly *E. maculata* and *Carissa ovata.* The ground cover consists of short palatable grasses, mostly *Paspalidium* spp. and *Chloris divaricata,* and forbs (*Enchylaena tomentosa, Atriplex* spp., etc.).

After clearing *Dichanthium sericeum* usually becomes dominant.

Areas shown on the map as woodland of *Eucalyptus populnea* often include small areas of *Acacia harpophylla* open-forest.

5.2.3 Grassland

Open Hummock Grassland

A floristically and structurally interesting association occurs on the so-called 'desert' area surrounding Yelarbon. The community is developed on alkaline texture contrast soils with a shallow A-horizon.

The vegetation consists of large separate clumps of *Triodia irritans* var. *laxispicata* often separated by bare areas where the surface soil has been eroded. Scattered small low trees of *Melaleuca adnata* and *Eremophila mitchellii* occur.

Miscellaneous

South of Inglewood there are areas, too small to map, of heath. This consists of a dense shrub layer chiefly of *Leptospermum* spp. with scattered low mallee eucalypts, *Eucalyptus viridis* and *E. bakeri.* Heath-like vegetation of different composition also occurs south of Coolmunda Dam on sandy soils, but these have been largely cleared.

Species Mentioned in Text

Acacia deanei, Green Wattle
A. excelsa, Ironwood
A. flexifolia
A. harpophylla, Brigalow
A. ixiophylla
A. leiocalyx
A. lineata
A. montana
A. semilunata
A. sparsiflora
Angophora costata, Rusty gum
A. floribunda, Rough-barked Apple
Aristida ramosa, a Wire grass
Atriplex spp., Saltbushes
Bothriochloa decipiens, Pitted blue-grass
Cadellia pentastylis, Ooline
Callitris columellaris, Cypress Pine
Carissa ovata, Currant Bush
Cassinia laevis, Cough Bush or Wild Rosemary
Casuarina cristata, Belah
C. luehmannii, Bulloak
Chloris divaricata, Windmill grass
Cymbopogon refractus, Barbed-wire grass
Danthonia linkii
Daviesia spp.
Dichanthium sericeum, Queensland Blue grass
Dichelachne micrantha, Plum grass
Dodonaea attenuata, a Hop Bush
Echylaena tomentosa, Berry Saltbush
Eremocitrus glauca, Limebush
Eremophila maculata, Fuschsia
E. mitchellii, Sandalwood
Eucalyptus albens, White Box
E. bakeri, Baker's Mallee
E. crebra, Narrowleaved Ironbark
E. dealbata, Mountain Gum or Tumbledown Gum
E. exserta var. *parvula*
E. melanophloia, Silver leaved Ironbark
E. melliodora, Yellow Box
E. microcarpa, Brown Box
E. pilligaensis, Mallee Box
E. populnea, Poplar Box
E. sideroxylon, Mugga
E. viridis, Green Mallee
Geijera parviflora, Wilga
Jacksonia scoparia, Dogwood
Leucopogon spp., Beard Heaths
Melaleuca adnata, a Tea Tree
Olearia elliptica, Peach Bush or Sticky Daisy Bush
Paspalidium spp., Brigalow grasses
Pimelea pauciflora
Triodia irritans var. *laxispicata,* a Spinifex

5.3 POINSONOUS PLANTS

Plants poisonous to stock in the Shire include many of those discussed in Section 7.4, Weeds of Crops and Pastures. Their names are set out below.

Common Name	*Botanical Name*
Bathurst burr	*Xanthium spinosum*
crownbeard	*Verbesina encelioides*
climbing buckwheat	*Polygonum convolvulus*
curled docks	*Rumex* spp.
deadnettle	*Lamium amplexicaule*
dodder	*Cuscuta epithymum*
European bindweed	*Convolvulus arvensis*
flannel weed	*Sida* spp.
green amaranth	*Amaranthus viridis*
cotton bush	*Kochia* spp.
marshmallow	*Malva* spp.
mexican poppy	*Argemore ochroleuca*
mintweed	*Salvia reflexa*
noogoora burr	*Xanthium pungens*
pigweed (black)	*Trianthema portulacastrum*
rockfern	*Cheilanthes sieberi*
rosemary bush or cough bush	*Cassinia laevis*
spiny emex	*Emex australis*
thornapple	*Datura* spp.
variegated thistle	*Silybum marianum*
wireweed	*Polygonum aviculare*

5.4 FAUNA

The mammal and bird fauna of Inglewood Shire consists entirely of species widely distributed throughout eastern Australia, and includes some 25 mammal species and more than 120 species of birds. Six members of the kangaroo family occur, of which the grey kangaroo, the wallaroo and the red-necked wallaby are abundant and generally regarded as pests by the grazing community. The introduced rabbit is widespread, and during dry years is particularly troublesome. The feral pig is another unwelcome introduction. Among the birds, the Shire represents the eastern boundary of the range of several species includes the emu and the red-winged parrot. The attractive turquoise parrot occurs commonly, and the wedge-tailed eagle is one of the several raptorial species common in the Shire.

Coolmunda Dam has proved to be a significant addition to the waterfowl habitat of the Shire, and a wide range of waterbirds are associated with it including the pelican and most of the duck species found in southern Queensland with the wood duck probably the most abundant. During dry times, particularly, the dam serves as a valuable drought refuge for wetland species.

Species Mentioned in the Text

grey kangaroo	*Macropus giganteus*	red-winged parrot	*Aprosmictus erythropterus*
wallaroo	*M. robustus*	turquoise parrot	*Neophema pulchella*
red-necked wallaby	*M. rufogriseus*	wedge-tailed eagle	*Aquila audax*
rabbit	*Oryctolagus cuniculus*	pelican	*Pelecanus conspicillatus*
pig	*Sus scrofa*	wood duck	*Chenonetta jubata*
emu	*Dromaius novaehollandiae*		

As mentioned in Section 1.2, rabbits are a significant economic problem to the grazing industry of the Shire. Early control was by netting of paddocks, trapping, poisoning or fumigating, and finally ripping up of the burrows. This was a costly and time consuming task, but was the only effective means of control. Myxomatosis initially proved most effective, but unfortunately, resistance developed fairly quickly. In recent years, control has revolved around the use of a poison '1080' (sodium fluoracetate) distributed as a bait, followed by ripping of the burrows. Rabbit control is organized through the Rabbit Board, a section of the Land Department, which is responsible for rabbit control within the Shire.

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6. FARMING SYSTEMS AND PRACTICES

6.1 LAND TENURE

Most land in the Inglewood Shire is held under freehold tenure with leasehold tenure falling into categories of Perpetual Lease Selections (P.L.S.), Settlement Farm Leases (S.F.L.), Grazing Homesteads (G.H.), Grazing Farms (G.F.), Pastoral Holdings and mineral leases around Silverspur.

The bulk of the cypress pine forests in the Shire are held by the crown, and supervised by the Forestry Department.

6.2 LAND VALUATION

Recent land sales have shown a slight easing of values on that registered in the early 1970s.

The values Table 6.1 have been recorded from recent commercial transactions.

Table 6.1

Land Valuations - Inglewood Shire

Soil Type	*Value/ha* $		*Description*
	1969	*1977*	
Alluvials -			
Macintyre Brook	100-225	360	Most developed for grain and animal enterprises high potential - irrigation
Dumaresq River	200-300	375	
Traprock -			
Improved	25-40	50	Grazing areas with undulating country some cultivation
Unimproved	5-12	12	Grazing areas with some rugged country
Sandstones	5	17	Little developed, heavily timbered low potential
Brigalow-Belah Arable	125-200	200	All developed for grain and animal enterprises
Brigalow-Belah Grazing	25-75	65	Most developed for animal enterprises
Solodics	2-5	15	Grazing areas little to no potential

Source: Recorded from property sale listing for the Shire

6.3 HISTORY OF TOBACCO PRODUCTION IN THE INGLEWOOD SHIRE

Tobacco was first grown in the Inglewood Shire at Texas in 1881 by W. Mac Phillips. By 1883, this selector was cropping 5.6 ha and settlers were already talking about the Virginia of Australia. (By 1893, expansion in the southern Downs, including Killarney and Stanthorpe-Maryland, produced 208 tonnes of leaf off 292 ha.)

Following Mr. Mac Phillips success, the industry flourished and by 1896 tobacco production in the Texas district alone was 198 552 kg from 195 hectares. In the late 1880s, Messrs. Greenup Bros. erected a factory in the district and commenced to manufacture a brand of tobacco called 'Texas Gold Bar', which was extremely popular locally. The leaf from which this was manufactured was, for the most part, grown by Chinese, and was air cured and a bright colour.

All leaf grown at this time was either sun or air cured, and was mostly used for

pipe smoking, it being of a heavier class than that used for cigarettes. The bulk of the tobacco was produced by Chinese operating on the share system, the crop mostly being planted on rich alluvial flats.

In 1900, a tobacco expert, Mr. Neville from Kentucky, U.S.A., was appointed tobacco expert for Queensland, and experiments in fire curing of tobacco were conducted by this officer on a Government farm at Texas.

A well known tobacco manufacturing firm, the British Australasian Tobacco Company, was attracted by the success of cultivation of tobacco in the Shire. In 1910 this company purchased land at Texas for the purpose of growing tobacco by white labour on wages, under supervision of the Company's expert. Fire curing, air curing, flue-curing systems were tried, but the project was abandoned after a few years owing to labour difficulties and unfavourable climatic conditions, together with the ravages of blue mould.

The area cultivated for tobacco from this time waned considerably as growers did not adopt fire curing and were loathe to introduce flue-curing. The same decline in the industry took place elsewhere and may be attributed in a large measure to the change in public taste commonly experienced in all English speaking countries, when light, bright tobacco was sought after. This change, and the inauguration of flue-curing methods in lieu of the old or air drying methods of curing, revolutionized the industry. It then became necessary to give attention to the production of light, bright, tobacco leaf, suitable for flue-curing and this necessitated a drastic alteration in the practices previously adopted, which involved a changeover from the fertile soils to the sandy soils and light sandy loams of medium to low fertility, and the more general use of artificial fertilizers. This change commenced in 1930-31 and the area under tobacco rapidly increased throughout Queensland. Perhaps the most important factor in bringing about this sudden increase, was the rapid rise in import duty on tobacco leaf in 1930, from three shillings and sixpence to five shilling and tuppence, plus a primary duty of 10 percent. Other forms of primary industry were also feeling the effects of financial depression. At this time, growers in the Texas district turned their attention to the less fertile types of soil and the Chinese sharefarming was replaced by the employment of a large number of white persons.

The first peak in production was in 1932 when 670 hectares were planted. As was to be expected however, a large proportion of the leaf was of inferior quality, owing to the fact that many growers persisted in planting on unsuitable soil and also to the inexperience of a large number of new growers in tobacco cultural and flue-curing practices. This sudden boom was destined to halt due to the incidence of disease as well as the increasingly limited demand for low grade leaf. Persons endeavouring to produce leaf on unsuitable soils discovered, to their cost, that the industry (for them) was not profitable, and the inefficient grower was forced out of the industry for the same reason. This passing of both classes from the ranks of tobacco growers proved to be a big step in placing the industry on a more stable footing. With the passing of the boom period, the industry became stabilized and in the mid-1930s, leaf from the Texas district was the best to that date.

Production was then confined mostly to the Dumaresq River and Macintyre Brook, where crops were grown under irrigation. In 1936-37, an estimated 86 growers cultivated 237 hectares for flue-curing and 14 growers 28 hectares for sun and air curing. District yield was 204 000 kg. District production figures are presented in Table 6.2.

One report, written in the early 1930s predicted that 'while the more fertile soils of the alluvials of the Dumaresq River and the Macintyre Brook can be expected to grow heavy crops under irrigation, advantage in that direction is offset by a greater susceptibility to blue mould disease and liability to damage from hail storms.

'Tobacco lands in the Texas district are, it is understood, available around five pounds per acre - less for some unimproved. . . Variations will be decided by the amounts of improvements - clearing, grubbing, fences, buildings, etc. In the Texas district flue-curing barns are made of cypress pine logs, as are also bulk barns. Those 16 x 16 x 16 cost in the vicinity of 70 pounds each complete by contract. Bulk shed, according to size, would be from 50 pounds to 100 pounds. There is a number of barns on unsuitable land that could be bought cheaply for removal. Including the purchase price and cost of transport, it is thought that these barns could be erected at a cost of not more than 50 pounds each complete.

'An irrigation plant is a necessity in the Texas district, as the rainfall is usually insufficient and unreliable. The installed cost of a plant for, say, 10 acres would be 100 to 120 pounds, that of ditches being extra.'

History has shown therefore, that the main reasons for the fluctuations and instability in the industry were lack of water, the depredations of insect pests and diseases and unsuitability of soils. The incidence and intensity of summer rains was far too erratic to afford any stabilization in production. Only those farms adjacent to the main streams had any access to irrigation and persisted. The farms in the hilly areas away from the streams simply closed down. In those early years growers were not equipped with todays sophisticated equipment and chemicals with which to keep pests and diseases in check. Many of the soil types then in use had poor internal drainage and waterlogged readily when the rains did eventuate.

Since the 1930s, the persistence of tobacco production has been the direct result of the development of irrigation schemes.

For 30 years before 1960 the 'Texas district' ranked second in importance to Mareeba-Dimbulah in tobacco production. During this period, a number of weirs, Whetstone Weir (1951), Bendor Weir (1954) and Greenup Weir (1958) on the Macintyre Brook; and Cunningham Weir (1954), Bonshaw Weir (1958) and Glenarbon Weir (1959) on the Dumaresq River, were constructed to provide limited supplies of water for irrigation.

In 1968 Coolmunda Dam was opened on the Macintyre Brook, and in 1976 Glenlyon Dam was opened on Pike Creek, a tributary of the Dumaresq River. These major storages have improved both the quantity and quality of water available for irrigation; the downstream weirs now providing for intermediate control of water supply.

Since 1932, with irrigation and the sharefarming system, area planted to tobacco in the Shire increased to a second peak of 983 hectares in 1960. Severe marketing problems in that year culminated in a dramatic decrease in area to 120 hectares and many sharefarmers migrated from the district. These price reductions were a result of increased production of tobacco in other areas of the State, and greater selectivity by buyers for quality requirements. The variable chloride content of tobacco grown on the Macintyre Brook, especially in dry seasons, was the main argument in buyer resistance.

Production has now stabilized at a district quota of 481 tonnes produced off about 300 hectares on 46 registered properties, following the introduction of a Stabilization Scheme in 1965. A move to better soil types and improved production methods have accompanied this stabilization.

6.4 FARMING SYSTEMS

6.4.1 Introduction

Rural production systems in the Shire range from intensive complex systems involving multiple enterprises to more extensive type systems specializing in one or two enterprises.

The more intensive farming systems are based on land adjoining Macintyre Brook and Dumaresq River and use irrigation. They represent about one-third of the total number of holdings in the Shire.

The remainder of the agricultural land in the Shire is used predominantly for sheep and beef grazing, with extensive grain growing as a sideline on the more suitable soils.

The area east of a line running north-south from Oman-ama to Beebo, which is predominantly 'traprock' country, is traditionally fine wool producing country. In recent years some diversification into beef cattle has taken place. West of this line, which is predominantly 'brigalow-belah' and cypress pine country, has been and still is traditionally beef cattle and grain growing country.

Map No. 3 shows land use in Inglewood Shire indicating areas predominantly beef, predominantly sheep and a mixture of beef and sheep. Areas under State Forest Reserve are also shown.

Table 6.2

Tobacco Production - South-West Queensland

Year	*Area ha*	*Production kg*	*Year*	*Area ha*	*Production kg*	*Year*	*Area ha*	*Production kg*
1896	195	198 588	1923	81	72 087	1950	307	372 902
1897	235	210 984	1924[1]	22	32 847	1951	419	199 133
1898	211	139 557	1925[1]	22	32 847	1952	514	589 676
1899	272	300 499	1926	38	39 986	1953	478	530 593
1900	235	169 986	1927	40	40 840	1954	521	640 368
1901	280	254 878	1928	48	40 613	1955	622	603 685
1902	289	92 055	1929	52	79 676	1956	655	148 206
1903	309	29 821	1930	17	20 301	1957	799	660 971
1904	275	311 676	1931	273	59 586	1958	903	802 099
1905	304	403 680	1932	669	307 450	1959	916	583 652
1906	239	286 721	1933	334	219 677	1960	891	960 275
1907	172	111 512	1934	143	39 643	1961	984	683 387
1908	245	237 213	1935	283	113 399	1962	478	269 937
1909	188	157 067	1936	262	242 674	1963	590	507 615
1910	203	324 179	1937	265	204 119	1964	484	362 377
1911	203	191 726	1938	263	242 438	1965	266	254 755
1912	209	69 950	1939	277	296 415	1966	121	124 897
1913	189	154 420	1940	215	240 232	1967	157	203 798
1914	159	214 706	1941	333	378 455	1968	177	260 572
1915	104	49 426	1942	243	226 174	1969	217	306 078
1916	57	42 999	1943	435	482 068	1970	269	352 908
1917	64	15 829	1944	353	311 217	1971	312	383 254
1918	39	17 765	1945	243	226 174	1972	395	485 737
1919	66	46 679	1946	260	264 886	1973	346	487 291
1920	49	25 199	1947	328	395 602	1974	282	508 881
1921	49	46 805	1948	236	182 738	1975	290	475 555
1922	48	52 044	1949	220	284 648	1976	325	370 309

Source: [1] Head Office files, Department of Primary Industries - 1896-1937
[2] Statistical Register of Queensland - 1938-1942
[3] Queensland Agricultural Journal (August 1952) - 1943-1952
[4] Tobacco Leaf Marketing Board - 1953-1976

[1] The similarity in data here probably is the result of an original compilation error

There are very few properties with a single enterprise farming system. The principle identifiable systems with combined enterprises in Inglewood Shire can be classed under the following headings:

(a) Intensive agriculture - tobacco, beef, lucerne, grain, horticulture
- grain, lucerne, beef, horticulture

(b) Sheep and beef

(c) Beef and grain

(d) Other systems (dairying and pig raising)

Table 6.3 shows rural holdings in Inglewood Shire classified according to predominant activity in selected years to 1973-74. Table 6.4 shows activities on rural holdings and Table 6.5 shows rural establishments classified to predominant activity in 1975-76.

6.4.2 Intensive Farming Systems

Tobacco, Beef, Lucerne, Grain, Horticulture

These properties have a complete reliance on irrigation, and are scattered throughout the irrigation areas of the Shire. The major crop grown on these holdings is tobacco. Annual tobacco quotas range from 2900 kg to 47 550 kg per farm.

Property size varies from 20 hectares to 2900 hectares, with an average of about

120 hectares. There is no property in the Shire producing tobacco only, however on some holdings the sharefarmer grows tobacco only and the owner undertakes other activities.

Table 6.3·

Inglewood Shire - Rural Holdings Classified to Principal Activity
(classification done at irregular intervals)

Activity[1]	*Year*			
	1965-66 No.	*1968-69* No.	*1970-71* No.	*1973-74* No.
Beef cattle	38	38	70	87
Sheep	157	121	107	89
Sheep-cereal grain	15	25	23	7
Cereal grain	15	27	16	12
Dairying	9	7	6	3
Pigs	6	6	7	9
Tobacco	24	25	34	37
Fruit (including grapes)	2	1	1	1
Vegetables	1	-	-	1
Other[2]	8	4	2	3
Multipurpose[3]	24	33	19	32
Total Classified	229	287	285	281
Unclassified[4]	46	42	49	49
Total Holdings	345	329	334	330

Source: Australian Bureau of Statistics
[1] Holdings are typed to that activity which contributes 50 percent or more of the farm's estimated gross proceeds
[2] Other one main purpose, e.g. cotton, peanuts, etc.
[3] No single activity contributes 50 percent or more of estimated gross proceeds
[4] Holdings with estimated gross proceeds less than a certain figure ($1600 in 1965-66, $2000 in 1968-69, 1970-71 and 1973-74), and unused holdings

The majority of tobacco growing holdings have at least one or two, and several have four, additional enterprises run in conjunction with tobacco production. The four main enterprises undertaken on holdings where tobacco is grown are: beef (85 percent of holdings), lucerne (52 percent), grain (43 percent) and horticulture (35 percent).

The degree to which tobacco producers move into alternative enterprises is largely determined by the availability of land, labour, water allocation and time.

The predominance of beef as a sideline on tobacco holdings is because of the low labour input necessary. Properties with grain and horticultural sidelines are those with greater labour reserves (mostly in the form of family labour or sharefarmers) or are properties with small quotas that need less than total owner-grower involvement.

Grain, Lucerne, Beef, Sheep and Horticulture

Enterprises within this system vary in emphasis according to property size, soil suitability and also outside influences such as market demands. All enterprises however, are strongly influenced by availability of finance, machinery, labour and managerial expertise.

This system is based entirely on irrigation and, until recently, the main enterprise combination was a rotation of lucerne (five years) and fodder and grain crops (three years) before returning back to lucerne. No strict rotation pattern was adopted.

In recent years, unstable beef markets and static demand for lucerne hay during a period of escalating production costs, have strongly influenced producers to move to alternative enterprises. These are usually more intensive enterprises with higher values per unit area. They include leguminous grain crops (navy beans), vegetables (beans, pumpkins) and fruit (watermelons, grapes, pecan nuts). The improvement in the main highway

to Brisbane (now three to four hours) has also made it easier to market these crops.

Table 6.4

Inglewood Shire - Major Activities on Rural Holdings, 1975-76

Activity	*Number of Holdings*
Total number of rural holdings	316
Holdings running - meat cattle	285
- milk cattle	3
- sheep	166
- pigs	31
Holdings with - sown pastures (excluding lucerne)	67
- lucerne only	95
- sown pasture/lucerne mixed	130
Holdings growing - cereal crops	170
- other crops	68
- field crops	188
Holdings double cropping	15
Holdings growing - vegetables	12
- orchard crops	5
- any crop	191
- vineyards	8
- wheat for grain	64
- oats for grain	19
- oats for green feed	71
- barley for grain	70
- grain sorghum for grain	51
- millets for grain	11
- tobacco	37
- navy beans	16
- forage sorghum green feed	17
- beans	5
- pumpkins	5
- tomatoes	3
- apricots	4
- grapes, table	8
Holdings using irrigation	96

Source: Australian Bureau of Statistics (published and unpublished data)

At the present time, production of these more intensive alternative crops is secondary to the main activities of lucerne, coarse grains and beef production. However, if the present trend continues there will be a definite change of emphasis in the foreseeable future. During the 1970-71 season, 17 percent of producers in this system had embarked on more intensive activities, but during the next four years to the 1974-75 season, the number had more than doubled to 44 percent.

Several factors were involved in this sudden change, the main one being the collapse in the beef market, but also coinciding with this event was the sudden interest being shown by food processors for Dwarf French beans and potatoes, along with the high demand for grain. The processors have found the district suitable climatically, relatively free of diseases and in close proximity to their factories and market outlets.

Producers, on the other hand, have found a highly productive economic alternative, especially with Dwarf French beans, and little to no additional capital outlay in machinery (machinery is owned and operated by the companies). Also these crops require significantly less water than lucerne, which is of major importance amongst producers in low annual water allocations along the Macintyre Brook (max 430 Ml).

In conjunction with other enterprises, sheep are run on a number of properties for both wool and prime lamb production. The interest in prime lambs bred or introduced (store lambs) from northern New South Wales and south-west Queensland in recent years has fluctuated along with the market.

Table 6.5

Inglewood Shire - Agricultural Establishments Classified According to Industry Class 1975-76

Principal Activity	*Number of Establishments*[1]
Cereal grain	27
Oilseeds	2
Sheep-cereal grain	16
Meat-cereal grain	35
Sheep-meat cattle	30
Sheep	69
Meat cattle	31
Milk cattle	3
Pigs	12
Fruit (including vines)	2
Vegetables	3
Multipurpose and other n.e.c.	9
Tobacco	26
Total Rural Establishments[2]	265

Source: Australian Bureau of Statistics

[1] Until 1973-74, rural holdings were classified according to the main type of activity. From 1974-75 the basic economic unit has been changed from 'holding' to 'establishment'. These establishments generally coincide with the holding unit and are classified, according to the Australian Standard Industrial Classification, into industry classes.

[2] This figure will disagree with total rural holdings to the extent to which rural holdings are run together as agricultural establishments and the existence of rural holdings with mainly non-agricultural operations. The figure underestimates the actual number of separate agricultural units in the Shire as the operations of sharefarmers are included in the activity of the holding in which they are located.

In addition to the irrigation area, on individual holdings may be dryland cropping and pasture land of varying area. The arable land area is used both for opportunity cereal grain production and oats for grazing whilst the pasture land is used specifically for beef and sheep production. The emphasis on winter crop production in the Shire is because of the more effective winter rainfall for dryland crops in comparison to the erratic nature of the predominantly summer rainfall.

6.4.3 Sheep and Beef Cattle

This system is predominant to the east of an imaginary line from Oman-ama to Beebo on the New South Wales border. The country is known as the 'traprock' and has shallow gravelly loam soils over clays (solodics). These soils have low inherent fertility. Pockets of 'brigalow' country (grey and brown cracking clays) occur on the western extremity of this area.

The pasture productivity of the 'traprock' country is poor and is not good cattle country. Winter feed difficulties that occur in this country are more critical in cattle than in sheep. Wool, therefore, has predominated as the main source of income, with limited prime lamb production. Cattle have contributed little to farm incomes, although their numbers on sheep holdings in this area rose significantly in the early 1970s.

The major reasons for this latter development were the wool slump in the early 1970s, the use of urea-molasses and phosphate supplements, establishment of lucerne and annual medics and rising prices for cattle. In addition, the majority of holdings were too small to consider further increases in sheep numbers to offset narrowing profit margins for wool production and many growers found that finance was more readily available for buying cattle than it was for increasing sheep numbers. Table 6.6 shows rural holdings in Inglewood Shire classified according to size of sheep flock and size of meat cattle herd.

Cattle numbers in this eastern section of the Shire have eased slightly following the 1974 drought and low beef prices since 1973-74. Many producers who would have preferred to return to wool production completely were prevented by their commitments to cattle. A small number in this group have turned to crops on the deeper soils on lower slopes and

valley floors.

Table 6.6

Inglewood Shire - Rural Holdings Classified According to Size of Sheep Flock and Size of Meat Cattle Herd

Size of Sheep Flock	*Size of Meat Cattle Herd*								*Total With Cattle*	*Total with No Cattle*	*Total Holding*
	1 - 49	*50 - 99*	*100 - 199*	*200 - 299*	*300 - 399*	*400 - 499*	*500 - 999*	*1000+*			
1 - 99	2	2	6	4		2	4		20		20
100 - 499	9	6	8	5		1	4		33	1	34
500 - 999	4	7	2	2	1	1		1	18	1	19
1000 - 1999	7	10	7	6	5	1	2		38	4	42
2000 - 2999	2	2	9	3			1	1	18	4	22
3000 - 3999	2	1	3	1	2				9	1	10
4000 - 4999	2	3	1	2		2	1		11		11
5000+	1		2	1				3	7	1	8
Total with Sheep	29	31	38	24	8	7	12	5	154	12	166
No Sheep	35	36	24	18	5	5	6	2	131	19	150
Total Holdings	64	67	62	42	13	12	18	7	285	31	316

Source: Australian Bureau of Statistics (unpublished data)

Table 6.6 indicates that of the 316 holdings in Inglewood Shire at 31 March 1976, 154 had both sheep and beef cattle, 150 did not have sheep and 31 did not have beef cattle. Only 12 holdings ran sheep without beef compared with 131 holdings running beef without sheep, while 19 holdings had neither sheep nor beef cattle.

Most holdings running both sheep and cattle run less than 2000 sheep together with less than 200 cattle. Nearly all properties running over 4000 sheep also run herds of cattle. Table 6.7 shows that most holdings with more than 4000 sheep have 3000 hectares or more of land.

Wool still provides the main source of income in this farming system and most (60 to 70 percent) of this production is derived from wethers brought in from western Queensland and New South Wales. The main aim of this is to obtain a larger framed animal than is produced locally for higher fleece weights. Most wethers are purchased at the two to four tooth stage.

Property sizes are extremely variable, as shown in Table 6.7, with the bulk between 1600 and 3600 hectares. Merino is the predominant breed, with small numbers of British breeds kept for prime lamb production.

Sheep are run on native pasture and supplemented where possible with lucerne, annual medics and oats. Where cattle are present on sheep properties, they are usually run together as cattle will utilize rank grass growth. Cattle can compliment sheep enterprises in this country at little extra cost and with only a small reduction in sheep stocking rates but the profitability of this additional enterprise can be reduced considerably if the proportion of cattle exceeds four percent of total stock numbers.

6.4.4 Beef and Grain

In the western half of the Shire, apart from the Macintyre Brook irrigation area, the farming system is almost entirely one of beef and grain production. Livestock production is mainly from breeding on native pasture country and some fattening on winter crop, mainly oats, as the opportunity permits. In recent years (1974-76) grain production has predominated because of the high market prices for most grains and the current slump in the beef market. Grain production is mainly winter cereal crops and opportunist summer cropping such as sunflower, millets and sorghum.

Table 6.8 shows rural holdings in Inglewood Shire classified according to the size of the holding and the size of meat cattle herd. As only 31 rural establishments depended

on meat cattle for the main part of their income in 1975-76 (see Table 6.5) meat cattle production is very much a sideline activity in Inglewood Shire.

Table 6.7

Inglewood Shire - Rural Holdings Classified According to Area of Holding and Size of Sheep Flock

Area of Holding (ha)	*Size of Sheep Flock*									*Total*
	1 - 99	*100 - 499*	*500 - 999*	*1000 - 1499*	*1500 - 1999*	*2000 - 2999*	*3000 - 3999*	*4000 - 4999*	*5000+*	
1 - 99	1	1								2
100 - 199	3	3								6
200 - 299	3	5	1							9
300 - 499	3	5	3	2						13
500 - 999	1	6	6	6	3	1				23
1000 - 1999	6	8	5	5	7	6	2			39
2000 - 2999	3	3	1	6	9	8	5	1	1	37
3000 - 3999		1	1	1	1	4	2	7	2	19
4000 - 4999		1	1		1	2	1	1	2	9
5000+		1	1	1		1		2	3	9
Total	20	34	19	21	21	22	10	11	8	166

Source: Australian Bureau of Statistics (unpublished data)

Table 6.8

Inglewood Shire - Rural Holdings Classified to Size of Holding and Size of Meat Cattle Herd

Size of Holding (ha)	*Size of Meat Cattle Herd*								*Total*
	1 - 49	*50 - 99*	*100 - 199*	*200 - 299*	*300 - 399*	*400 - 499*	*500 - 999*	*1000+*	
1 - 99	16	3		1					20
100 - 249	16	10	8	2					36
250 - 499	11	17	11	9		1			49
500 - 999	9	14	13	8	2		1		47
1000 - 1999	4	7	10	10	3	6	6		46
2000 - 2999	4	8	12	5	6	2	6		43
3000 - 3999	3	4	3	4		1	2	1	18
4000 - 4999	1	1	3	3	1	1	2	1	13
5000+		3	2		1	1	1	5	13
Total	64	67	62	42	13	12	18	7	285

Source: Australian Bureau of Statistics (unpublished data)

6.4.5 Other Systems

Inglewood Shire was once a large dairying area, with butter factories at Inglewood and Texas. In 1944-45 there were 188 holdings running 9473 dairy cattle with over 250 000 kg of butter produced at the two factories. In 1975-76 there were three commercial dairy farms running 131 dairy cattle. In addition there were 442 house cows and heifers on 104 holdings in the Shire.

With the decline in dairying there has also been a reduction in the number of holdings running pigs. Pig production in the Shire is no longer tied to dairying, being fed mostly on home grown or locally purchased grain and protein supplements. At 31 March 1976 there were 31 holdings in the Shire running 2526 pigs. Nearly 60 percent of these pigs were run on five holdings running over 100 pigs. Only three holdings in the Shire rely on pigs for the major part of their income.

Sources of Information

1. Queensland Department of Primary Industries - Brisbane and Inglewood Field Station (records and files)

2. Australian Bureau of Statistics (unpublished data)

3. Australian Bureau of Statistics - Part 'B' - Rural Production (several years)
   - Agricultural Industry - Section 1. 1975-76
   - Statistical Register of Queensland

4. Queensland Agricultural Journal (August 1952)

5. Queensland Tobacco Leaf Marketing Board

6. Waterson, D.B. (1968) - *Squatter, Selector and Storekeeper. A history of the Darling Downs 1859-1893.* Sydney University Press. Sydney

7. CROP, PASTURE AND ANIMAL PERFORMANCE

7.1 AGRICULTURAL CROPS

Intensive agricultural cropping within the Inglewood Shire is largely confined to those properties adjoining the Macintyre Brook and Dumaresq River and tributaries of these streams where varying areas of land on individual holdings are suitable for cultivation. The grey-brown clay soils in the north and western sectors of the Shire are used for extensive cropping.

Crops grown in the Shire include wheat, barley, oats, linseed, grain sorghum, sunflower, grain millets, forage sorghums. In 1975-76, the area of crops in Inglewood Shire totalled 17 095 hectares. This was made up of 15 835 hectares of cereal crops, 1164 hectares of other crops (mainly tobacco), and 96 hectares of fruit and vegetables.

Where irrigation is available, tobacco, navy beans, soy beans, green beans are produced, while cotton, mung beans, cowpeas and vegetables can also be grown. Irrigation of crops in Inglewood Shire is discussed in Section 3.4 and areas of crops irrigated are given in Table 3.9. Lucerne, which is grown as an irrigated crop for hay in the Shire is discussed in Section 7.3.3.

7.1.1 Winter Crops

Wheat

Wheat is the most important cereal crop grown in the Shire even though there has been some fall off in interest in recent years years. Table 7.1 shows wheat production in Inglewood Shire for the last seven years and for selected years prior to 1969-70.

The introduction of wheat quotas in 1969 contributed to some of the recent decrease in area, especially within the irrigation area where property owners were allocated quotas ranging from as low as 3 to 27 tonnes.

The crop is normally sown between May and July, with a preference for late May-early June sowings.

Planting rates vary, but in recent years the trend to lighter planting rates (22 to 27 kg/ha) has been accepted.

New varieties of wheat are continually being introduced to the district, but over the past five years Gatcher and Timgalen have been the major varieties grown. Other varieties which have been grown during the same period are Festiguay, Mendos, Spica, Windebri, Tarsa, Gamut, Eagle and Oxley.

Wheat yields are relatively low and the average for the 1967 to 1973 period was approximately 0.88 t/ha.

The major factors affecting wheat production in the Shire are soil moisture, nutrient deficiencies and weeds (weed problems are discussed in Section 7.4). Several other factors that limit production occasionally are frost and hail damage, insect pests and diseases.

Stress from insufficient soil moisture is a frequent occurrence with local wheat crops, particularly during the critical flowering period on the lighter textured soil. This stress has an adverse affect on yield, and also on grain quality, resulting in 'pinched' grain.

Fertilizer usage is largely restricted to superphosphate on the grey-brown soils. The alluvial soils, except in isolated cases, are reasonably well endowed with phosphorus.

Nitrogen is the main deficiency on the alluvial soils but is rarely used as a fertilizer in dryland crop situations. Fertilizer usage is shown in Table 10.2.

On-farm grain storage is virtually non-existent except for temporary mesh silos and this situation has arisen because of the close proximity of adequate storage facilities at the State Wheat Board Depots.

These silos are situated at:

Site	*Type*	*Capacity t*
Inglewood	Horizontal bulk storage (Perrin type)	2 721
Texas	Horizontal bulk storage (Perrin type)	2 721
Yelarbon	Horizontal bulk storage (Perrin type)	3 265
	Vertical concrete-steel silos (6)	10 448
Total Storage		19 155

Source: State Wheat Board

These storages, namely Yelarbon and Texas, are also used by wheat producers in neighbouring Shires.

Table 7.1

Inglewood Shire - Wheat Production

Year	*Area ha*	*Production t*	*Yield t/ha*	*Growers*
1944-45	649	391	0.603	n.a.
1954-55	3 016	3 010	0.998	61
1959-60	2 501	2 789	1.115	66
1964-65	6 241	10 752	1.723	103
1969-70	10 006	7 975	0.797	110
1970-71	9 294	5 128	0.552	96
1971-72	9 074	10 064	1.109	101
1972-73	7 307	5 033	0.689	69
1973-74	5 291	5 039	0.952	59
1974-75	4 645	3 618	0.779	52
1975-76	5 803	7 734	1.333	64

Source: Australian Bureau of Statistics

Barley

Although a relatively minor crop in the Shire, barley does play an integral part in crop rotations, particularly on the irrigable soils. Elsewhere in the Shire the crop is grown on a wide range of soil types, but more particularly on the very marginal solodic and sandstone-type soils. Both these soil types have modest fertility levels and moisture retention ability and barley has shown more potential than any other winter cereal crops, both as a grain and a fodder crop.

Table 7.2 shows barley for grain production in Inglewood Shire for the last seven years and for selected years prior to 1969-70.

The climatic conditions (hot and dry) experienced during the 'finishing' stage of growth are not conducive to producing a malting quality grain. Instead, they favour the development of a thin, coarse-skinned, vitreous grain.

Since the 1971 season Clipper has been the sole malting variety acceptable by the Barley Marketing Board and comprises almost 100 percent of the total area sown for grain purposes. Small areas of black barley are sown for grazing.

Variety trials conducted at the Inglewood Field Station have indicated that the new feed lines from the Waite Agricultural Institute, South Australia, may have some

application at Inglewood (table 7.3).

Table 7.2

Inglewood Shire - Barley Production

Year	*Area ha*	*Production t*	*Yield t/ha*	*Growers*
1944-45	8	5		n.a.
1954-55	94	90	0.963	n.a.
1959-60	239	245	1.026	n.a.
1964-65	268	454	1.693	n.a.
1969-70	1206	1114	0.923	36
1970-71	1247	834	0.669	34
1971-72	1994	1868	0.937	50
1972-73	1111	781	0.703	36
1973-74	1458	1140	0.782	40
1974-75	2416	2613	1.082	50
1975-76	4073	5191	1.274	70

Source: Australian Bureau of Statistics

Table 7.3

Inglewood Field Station - Barley Variety Trials

Variety	*Yield in kg/ha*	
	1974	*1975*
W.I.2355	4248	2995
Lara	4120	3007
W.I.2197	4103	2636
W.I.2352	3604	2729
Bussel	3584	2673
Clipper	3505	2289
Ketch	3428	2419
Prior	2878	2512

Source: Inglewood Field Station records

Barley is sown from May to August at a planting rate of 25 to 30 kg/ha. Irrigated crops are sown at 55 kg/ha.

Yields are dependent on soil fertility and moisture availability; the Shire average for the 1967 to 1973 period was 0.94 t/ha. Irrigated crops have yielded in excess of 4 t/ha.

The Barley Marketing Board controls the marketing of the crop and, by agreement, the State Wheat Board supplies the handling and storage facilities at three centres - Inglewood, Texas and Yelarbon.

The only disease of any significance that has affected barley locally in recent years is powdery mildew. Clipper, originally tolerant to the disease, has in recent years lost this tolerance, but it does appear to have the ability to recover and not suffer as severely as the previous malting barley, Prior.

7.1.2 Summer Crops

Grain Sorghum

Sorghum is the main summer grain crop in the Shire but climatic conditions are such that it is only marginally suited to the area. Compared with the central Darling Downs, the summer rainfall pattern is not reliable, available moisture holding capacity of the soil

is lower and heatwave conditions are more common.

The area sown to grain sorghum annually is anything but stable and fluctuates according to the success or failure of the winter cereal crops and price of the grain.

In recent years, there has been an increase in area sown, as a result of the current beef situation and high grain prices. Fortunately, summer seasonal conditions during this period have been reasonably favourable, providing fair returns.

Table 7.4 shows grain sorghum production in Inglewood Shire for the last seven years and for selected years prior to 1969-70.

Table 7.4

Inglewood Shire - Grain Sorghum Production

Year	*Area* *ha*	*Production* *t*	*Yield* *t/ha*	*Growers*
1945-55	440	730	1.658	n.a.
1959-60	274	240	0.878	n.a.
1964-65	442	274	0.620	n.a.
1969-70	354	405	1.145	n.a.
1970-71	1046	3157	3.018	22
1971-72	2022	2305	1.140	39
1972-73	1713	1204	0.703	28
1973-74	961	714	0.743	17
1974-75	3192	2784	0.872	59
1975-76	2012	3003	1.493	51

Source: Australian Bureau of Statistics

Numerous varieties are grown and, apart from small areas of Alpha, the entire crop is sown to hybrids. The main varieties sown are Texas 610, Yates NK212 and Dekalb E57.

Yields vary greatly depending mainly on seasonal conditions although soil fertility is also a major limiting factor. Commercial crops average around 1 t/ha. In ideal conditions, yields up to 3 t/ha have been produced.

Main plantings commence in September and continue through to January with the most successful being planted in the mid-summer period. These crops are growing when the incidence of rain is high and flower during the cooler late summer months.

Apart from moisture stress, other factors limiting crop production are midge and birds. Sorghum midge has been reasonably active in the past five years, particularly in late sown crops.

Bird damage can be very severe particularly in small isolated crops adjoining the heavily timbered areas which are common in the western half of the Shire. Feral pigs can also cause damage in these areas.

Most of the grain sorghum produced is marketed through the Queensland Grain Growers Association Grain Sorghum Export Committee scheme whilst smaller quantities go interstate through grain merchants.

Sunflower

Sunflower production in the Shire is extremely small and the continual failure of crops in recent years together with falling prices resulted in negligible sowings in 1975-76.

Table 7.5 shows sunflower production in Inglewood Shire for the past five years.

The climatic conditions experienced in the Shire are such that growing the crop involves a large element of risk. In addition to this, two other discouraging aspects of sunflower production are firstly that failed crops provide no worthwhile grazing and,

secondly, seed lost during the harvesting process can become a serious weed problem in subsequent winter cereal crops, especially at harvesting. Damage from birds can also be heavy.

Table 7.5

Inglewood Shire - Sunflower Production

Year	*Area ha*	*Production kg*	*Yield kg/ha*	*Growers*
1971-72	474	219 540	463	9
1972-73	1117	372 000	333	18
1973-74	393	105 000	267	6
1974-75	266	103 000	387	6
1975-76	141	133 000	943	[1]

Source: Australian Bureau of Statistics
[1] Less than five growers

Yields vary greatly, from nil to 1000 kg/ha with an average of around 400 kg/ha.

Grain Millets

White French millet is the major variety planted and even then on a minor scale.

The crop's performance is akin to most summer growing crops in that it is susceptible to the erratic nature of the climatic conditions of the Shire.

White French millet is sown mainly in the mid-summer period and yields from such plantings can be as high as 2 t/ha. Millet production is given in Table 10.1.

Average yields however, are generally in the vicinity of 0.75 t/ha.

Navy Beans

During the past five years there has been an increase in area sown to navy beans. Table 7.6 shows navy bean production in Inglewood Shire in the last seven years. Much of this increase is due to the great adaptability the crop has shown to both the difficult climatic conditions experienced and the soils, particularly those irrigable soils adjacent to the Macintyre Brook.

Table 7.6

Inglewood Shire - Navy Bean Production

Year	*Area ha*	*Production kg*	*Yield kg/ha*	*Growers*
1969-70	99	42 638	431	n.a.
1970-71	56	9 979	181	n.a.
1971-72	36	21 319	592	n.a.
1972-73	52	48 000	923	n.a.
1973-74	111	114 000	1027	n.a.
1974-75	161	151 000	940	8
1975-76	315	152 000	483	16

Source: Australian Bureau of Statistics

The potential of navy beans in the Shire is high and if the current high demand and prices hold, then further increases in area sown are likely.

The optimum time of planting is from mid-January to the first week of February. Planting undertaken during this period permits the crop to flower and mature in the cooler months of March-April, thus avoiding the heatwaves often experienced in mid-summer, and damage from frosts in late April-May.

Under irrigation it is important to plant sufficient seed to give a good even start. The aim should be to achieve a plant density of at least 125 000 plants per hectare. To achieve this plant population, a sowing rate of 35 kg/ha will be necessary. Row spacing of 70 cm is essential to obtain high yields.

Fertilizer requirements are high and nitrogen at rates of 100 to 150 kg/ha is recommended. Except in isolated cases, phosphorus is not required.

Two main varieties grown under irrigation are Gallaroy and Selection 46. Of the two, Selection 46 is preferred because of its higher yielding ability. Table 7.7 shows yields obtained from navy bean varieties at Inglewood Field Station.

Table 7.7

Inglewood Field Station - Navy Bean Variety Trials
(kg/ha)

Variety	*1968*	*1970*	*1971*	*1975*	*1976*
Selection 46	1569	2145	2285	1979	2675
Gallaroy	1508	1959	1478	1772	2515
Selection 61	1522	2712	1211		
Selection 45	1383	2136	1962		
Kerman	1217	1251	1898	975	2363
Selection 21	1562				
Selection 23	1476				
Burnia	1402				
Cal. Small White	1517				
Selection 44				2451	2629
Selection 51				2039	2365
Selection 39				2111	2282
Selection 40				1486	1943
Selection 52				944	2192

Source: Inglewood Field Station records

The greater susceptibility of Selection 46 to split or crack during the harvesting process has confined annual plantings to 50 percent of the total area of navy beans.

The yields are dependent on the timeliness of irrigation, especially during the critical flowering period. The importance of having adequate soil moisture during its flowering is borne out in a series of trials conducted at the Inglewood Field Station and outlined in Table 7.8.

Table 7.8

Inglewood Field Station - Irrigation of Navy Beans Trials
(Yield of Grain - kg/ha)

Treatment	*1969*	*1970*	*1971*	*1972*
No irrigation	1858	399	626	1448
Irrigation at flowering	2615	1040	1161	2237
Full irrigation-schedule	2574	1105	1457	2495

Source: Inglewood Field Station records

The Navy Bean Marketing Board at Kingaroy controls the marketing of the crop.

Soybeans

Table 7.9 shows soybean production in Inglewood Shire for recent years. Interest in this fairly new crop has waned to some extent. Two local problems with this crop are irrigation methods and water requirements.

The irrigation method commonly practised is sprinkler irrigation using the 'end

tow' or 'towline' technique to move the pipelines. This technique presents some difficulty as moving the lines through the crop around flowering and later results in crop damage. Secondly, crop water requirements are high and irrigators with small water allocations from Macintyre Brook have found it difficult to justify economically using the amount and frequency the crop requires.

Apart from these factors the crop is suited to the locality and the results from Departmental variety trials and commercial findings have confirmed this opinion. Results of trials are shown in Table 7.10. Yields range from 1 to 5 t/ha with Shire averages around 1.4 t/ha.

Table 7.9

Inglewood Shire - Soybean Production

Year	*Area ha*	*Production t*	*Yield t/ha*	*Growers*
1969-70	12	19	1.601	n.a.
1970-71	12	19	1.601	n.a.
1971-72	12	19	1.601	n.a.
1972-73	113	105	0.929	n.a.
1973-74	103	146	1.417	n.a.
1974-75	135	238	1.763	5
1975-76	91	128	1.407	6

Source: Australian Bureau of Statistics

Planting commences in December and may continue through to mid-January. Varieties sown are mainly Bragg and Davis, with Hill for late sowings.

Table 7.10

Inglewood Field Station - Soybean Variety Trials
(kg/ha)

Variety	*1971-72*	*1972-73*	*1973-74*	*1974-75*	*1975-76*
Bragg	1955	2085	3198	3235	3725
Davis	1740	2375	2818	3319	3515
Hampton	1838	2208	2776		
Wills	1663	2115	2561	3447	3387
Hill	1638	1938	2452	2731	3258
Hood	1771	2203	2267		
Semmes	1928	1980			
Leslie	1928	1785			
Pickett	1740	1671			
Dare	1688				
Semstar	1500			nil	3439
Hinn	1446				
70-50 (Flegler)		2307	2910	3107	3650
HR-1 (Collee)		1724	2276	2906	2748
HR-2		1826	2058		
Bossier				3114	3406
Ruse				3047	2758

Source: Inglewood Field Station records

Cotton

Cotton has been grown in the Inglewood Shire over the years but never for any length of time. The most recent attempts at production occurred in 1973-74 and 1974-75 seasons when about 160 hectares were grown. The overall yields were disappointing at about 2.5 bales per hectare. The main problem was the difficulty in meeting the crops water requirements from squaring onwards on the crusting soils.

Tobacco

Tobacco has been grown in the Shire since 1881, and the industry has waxed and waned over the last 96 years. A history of tobacco production in the Shire is given in Section 6.3. During the last 10 years the development of two irrigation schemes within the Shire, together with the advent of specialized equipment and chemicals with which to keep pests and diseases in check, has resulted in a firm consolidation of the industry within the Shire. The stabilization Scheme of 1965 fixed district tonnage to approximately half of the peak district production of 945 tonnes. This quota is produced from approximately 300 hectares and satisfies the District Stabilization Quota requirement of 481 tonnes from 46 quota-holding properties. Individual property quotas are fixed.

Economics of production is forcing a modernization of the industry. Antiquated labour-demanding systems, renovated temporarily during the revival, now require ultimate replacement, and major changes in production methods within the district are being implemented especially because of low supply, inferior quality and high cost of labour.

Recent technical advances in the form of weedicides, desuckerants, specific machinery etc., have reduced labour requirements substantially, thus allowing for larger individual crop areas. Spray irrigation has largely replaced flood methods with subsequently improved crops.

Since 1974, price rises have increased the national average from 252 c/kg to 346 c/kg and this has materially assisted in the present mechanization trend on farms. Improved yields, (district average - 1640 kg/ha in 1975) are also assisting to increase net profits. The cost of production may vary quite considerably from farm to farm.

Soil types in use vary from silty loams to pure sands on cypress pine ridges. A 16 percent higher price (1973) from crops grown on sandier soils has resulted in a substantial move away from the tighter silty loams previously cultivated for tobacco.

Individual growers average five to eight hectare crops with a firm trend towards large planted areas as overhead costs, particularly machinery and permanent labour, continue to increase.

This trend is also reducing the number of sharefarmers. The owner usually supplies land, buildings and equipment to the sharefarmer in return for 22½ percent to 25 percent of the gross return of the crop. The sharefarming system is itself a major consequence of intensive cultivation of a specialized crop within an extensive agricultural system.

Table 7.11 shows tobacco production in Inglewood Shire for the last seven years and for selected years prior to 1969-70. Shire figures may vary from those given for south-west Queensland in Table 6.1 because of different crop periods and also because some tobacco growers are in neighbouring Shires.

Table 7.11

Inglewood Shire - Tobacco Production

Year	*Area ha*	*Production t*	*Yield kg/ha*	*Growers*
1944-45	216	194	899	32
1954-55	602	661	1097	50
1959-60	821	760	925	69
1964-65	292	256	878	39
1969-70	235	333	1418	35
1970-71	261	312	1196	35
1971-72	301	382	1270	37
1972-73	303	461	1521	39
1973-74	254	364	1433	37
1974-75	252	338	1341	35
1975-76	262	351	1339	37

Source: Australian Bureau of Statistics

7.1.3 Other Crops

Small areas of millets, canary, linseed, mung beans and cowpeas have been grown for grain. However, fluctuating demands and prices for these products have generally hampered grower interest. Yields have also been quite erratic because of seasonal conditions and lack of knowledge in management techniques.

In 1975-76 there were 82 hectares of French White millet grown for a total yield of 59 tonnes, giving an average yield of 720 kg/ha. In addition, there were 145 hectares of other millets and panicum grown for a total yield of 45 tonnes, or 310 kg/ha. These crops were produced by seven growers.

Apart from barley and grain sorghum, the main irrigated cash crops produced in the Shire are tobacco, navy beans, soybeans, green beans and cotton. Areas of crops irrigated are given in Table 3.9.

7.1.4 Fodder Crops

Winter fodder crops are of more importance to the annual feed programme than summer fodder crops, as this is the period of the year when high quality feed is at a premium. Native pasture production is also at a low ebb.

The area sown is restricted because of limited suitable land in individual properties.

The area sown also fluctuates from year to year, depending upon seasonal conditions. Table 7.12 shows annual crops grown for green fodder in Inglewood Shire in the last five years. Total area has declined in recent years due to the drop in cattle prices.

Table 7.12

Inglewood Shire - Hay and Green Fodder Production

Year	*Annual Crops Used for Green Fodder*							*Hay from Annual Crops*	
	Wheat	*Oats*	*Barley*	*Grain Sorghum*	*Forage Sorghum*	*Other*	*Total*		
	ha	*ha*	*ha*	*ha*	*ha*	*ha*	*ha*	*ha*	*t*
1971-72	265	3490	770	430	393	325	5674	6	43
1972-73	298	5021	623	81	798	405	7226	279	447
1973-74	496	3800	992	847	607	495	7237	28	112
1974-75	486	3354	374	508	557	407	5686	33	76
1975-76	386	2210	255	495		137	3483	154	426

Source: Australian Bureau of Statistics

Oats is by far the most popular crop for grazing purposes. The late maturing varieties Algerian, Cooba and Camellia make up the bulk of annual plantings with smaller areas sown to Belar, Benton, Bentland and Saia. Many other varieties are grown but their area is relatively small. Availability of seed often determines the selection, rather than any recognized differences in grazing yield potential.

Planting of oats commences in late February to late March. Further plantings, depending on the rainfall, available land and property need, will be made in May and even as late as July and August. Late plantings will often provide feed into the late spring.

The fodder produced annually from oats largely depends on seasonal conditions, soil fertility, variety, presence of weeds, etc. Crops sown on the more fertile soils (brigalow) north-east of Inglewood, in average seasons, are highly productive, whereas under similar climatic conditions, crops on the traprock and poorer sandstone areas are often lower in yield, due to low soil fertility. With an estimated four years in 10 failure rate, stockmen are generally reluctant to use fertilizer.

An indication of what could be expected when fertilizer is used, is summarized in Table 7.13 which shows trial results from the neighbouring Stanthorpe Shire. This trial was

conducted on winter fodder crops at 'Verri', Glen Aplin, in 1971. Soils are granitic. The years experienced fair winter rain.

Table 7.13

Stanthorpe Shire - Winter Fodder Crops Trials
(planted 21 April 1977)

Crop	*Date Harvested*	*No Fertilizer*		*P (22.5 kg/ha)*		*P (22.5 kg/ha) + N (59 kg/ha)*	
		Yield kg/ha	*Protein %*	*Yield kg/ha*	*Protein %*	*Yield kg/ha*	*Protein %*
Cereal Rye	1/7	2464	17.5	3485	16.6	4 498	21.0
Oats (Bentland)	5/8	2652	12.9	3800	11.2	5 985	15.6
Oats (Camellia)	31/8	2070	9.2	5000	9.4	10 555	12.0
Barley (Cape)	5/8	1800	16.1	2625	20.5	5 806	20.1
Oats (Algerian)	10/9	2052	8.3	3100	8.1	4 811	10.7
Golden Tares	10/9	1523	25.5	2168	30.0	2 330	28.6

Source: Department of Primary Industries, Warwick

Irrigated winter fodder crops are equally productive where well supplied with necessary nutrients, especially nitrogen. These crops are highly productive and will fatten beasts at the rate of five head per hectare. Leaf and stem rust rarely becomes a significant problem.

The role of summer forage crops in the Shire has been a relatively minor one. Two reasons for this are:

(a) The main growing period of the native pasture species is during the summer period and only on rare occasions do the pastures fail to meet stock requirements;

(b) Cultivation areas are relatively small on individual holdings and the area available for annual cropping is invariably diverted to winter forage crop production.

More summer fodder cropping, particularly leguminous types, could play a useful role in supplementing the native pastures as well as assisting in alleviating gaps (late summer-early winter and spring) in the feed year programme.

A change in emphasis of types of summer fodder crops could also be beneficial.

Approximately 70 percent of the area sown to summer fodder crops is planted to hybrid sorghum varieties. The remaining area is evenly divided to grazing millets, cowpeas and lablab bean.

Whilst hybrid sorghums (fodder) have a place, the diversion of some of this area to lablab bean or Caloona cowpeas is warranted.

Strategically placed summer leguminous crops, in addition to sugardrip, could alleviate protein shortages in the late summer-early winter period and provide a better means of maintaining bodyweight in cattle until early sown oat crops are available for grazing. The other important consideration is they do not require nitrogenous fertilizer.

7.2 HORTICULTURAL CROPS

Horticulture crops are mainly a sideline industry for farmers in the Inglewood Shire. The main crops are grapes, apricots and green beans. Other crops such as potatoes, pumpkins, melons (water and rock), peaches, and plums are grown in small areas.

Grapes

In 1975-76, the area of grapes in the Shire was 14 hectares. Table grapes have proved to be a profitable sideline for the present growers with areas of from one to three hectares. This is due to the earlier harvest of this crop in comparison to Stanthorpe which is the main production area.

On the sands, harvesting can commence from the first week in January, whereas on the silty loams it is normally a few weeks later. Grapes in this Shire along with other Western Downs grape producing areas have a secure early market until mid-February when the main Stanthorpe crop commences.

The main variety grown is Muscat Hamburg which has proved superior to other commercial varieties in this area. A regular spray programme is required to control pests and diseases. White ants and nematodes can be a problem. Nematodes can be controlled by fumigating or by using nematode resistant rootstocks which are readily available.

Some light table wines are made from the late portion of the crop. Quantity of wine made depends on the price of these late grapes. The Department of Primary Industries is investigating the potential for a wine industry in this area. Early trial results look promising.

The grape area can be expected to expand because there is a market for early table grapes. Unfortunately, the peak activity periods for grape growing clash with those for other intensive row crops which are grown by farmers in the Shire.

Apricots

Apricots have also proved to be a profitable enterprise. Favourable climatic conditions (fewer spring frosts), availability of irrigation, and early maturity in comparison with Stanthorpe makes this crop an attractive proposition. There are about seven hectares of apricots grown in the Shire.

Four varieties can be grown with varying harvest periods as follows:

Glengarry	-	First two weeks in November
Newcastle	-	Last two weeks in November
Trevatt	-	First two weeks in December
Moorpark	-	Mid-December

Fruit fly is the most important pest but control measures for scale, freckle, mites, brown rot, etc., need to be taken as required.

Peaches, nectarines and plums can be produced. But at present only a few trees are in commercial production and expansion could coincide with the main Stanthorpe harvest.

Vegetables

The main vegetables grown are green beans, watermelons, rockmelons, pumpkins and potatoes. Green beans are mainly grown for processing. Most other vegetables are grown in small areas.

Dwarf French Beans

Commonly referred to as green beans, this crop was first introduced to the Shire during the 1974-75 summer season.

Most contracts are with food processing firms for autumn produced crops. Plantings commence in late January and continue at the rate of five hectares per day until the contracted area is sown. During the 1974-75 summer 137 hectares was sown. The performance of these plantings has been most satisfactory with yields ranging from 4500 to 6000 kg/ha with an overall average of approximately 5000 kg/ha (payweight).

The 1976 seasons crop saw a slight reduction in area sown, principally because one Company (Edgells) withdrew from the area. Yields in 1975-76 dropped to a Shire average of a little over one tonne per hectare.

Future expansion within the Inglewood Shire will largely depend upon the future demand for beans and the availability of land for bean production in close proximity to the Brisbane based companies.

The only Company operating in the Inglewood Shire during the 1975-76 season was Wattie Pict.

The horticulture statistics for the Inglewood Shire are listed in the following tables:

Table 7.14

Inglewood Shire - Area and Production Figures for Tree Fruit Crops Grown during the 1975 - 76 Season

Crop	*Bearing Trees*	*Non-bearing Trees*	*Total Trees*	*Production kg*
Apricots	1520	20	1540	25 000
Peaches	-	50	50	-
Plums	-	100	100	-
Nectarines	-	30	30	-
Pecan Nuts	-	230	230	-

Table 7.15

Inglewood Shire - Estimated Area and Production Figures for Grapes Grown during the 1975-76 Season

Crop	*Area Bearing ha*	*Area Non-bearing ha*	*Total Area ha*	*Production kg*
Grapes (table)	14	2.5	16.5	84 482

Table 7.16

Inglewood Shire - Area and Production Figures for Vegetables Grown during 1975 - 76 Season

Crop	*Area ha*	*Production t*
Green beans	35	38
Pumpkins	20	57
Melons (water and rock)	7	4
Other Vegetables	5	-
Total	67	

7.3 PASTURES

Pastures in Inglewood Shire can be classified in terms of the major soil types as soil type bears an important relationship to pasture species and productivity in the Shire. The most widely occurring soil type is the traprock-derived soils, covering most of the eastern half of the Shire, next is the sandstone-derived solodic soils which cover the major part of the western half of the Shire and include most State forest areas. Relatively smaller areas of grey-brown clay soils, carrying brigalow-belah vegetation, occur along the western boundary of the Shire, while alluvial soils occur throughout the Shire but mainly along Macintyre Brook, Dumaresq River and Bracker Creek. A very small area of alkaline 'desert' soils occur near Yelarbon. See Map 4 for a detailed distribution of soils in the Shire.

7.3.1 Native Pastures

Traprock

The location of the areas of 'traprock' soils in the Shire is identified on Map 4. This area comprises most of the eastern half of the Shire and includes the major areas of native pasture in the Shire.

The country varies in topography from flat land to undulating and hilly terrain. The soils are basically poor in inherent fertility and structure and the ground cover is generally sparse (basal area < 10 percent). Moisture infiltration is low and runoff is high. The effectiveness of the rainfall is therefore low, resulting in poor pasture productivity. The area is thus very susceptible to drought conditions.

The main species of native pasture in the traprock region are Queensland blue grass (*Dicanthium sericeum*), pitted blue grass (*Bothriochloa decipiens*), slender bamboo grass (*Stipa verticillata*), love grass (*Eragrostis* spp.), slender rats-tail grass (*Sporobolus elongatus*), spear grass (*Stipa* spp.) and *Chloris* spp., particularly *C. divaricata* and *C. venticulosa*.

Native pasture production is confined to a five month period from November through to March. Even during this period, pasture production is of a fair to low quality and will only enable cattle to improve condition, rarely to the stage of finishing. After March, pasture quality rapidly deteriorates, with protein shortage from April through to September. Energy supply also becomes critical in mid to late winter and there is generally no improvement in this until November. The country is therefore, more suited to wool production with cattle grazing confined to store production except in favoured localities.

On unimproved traprock, carrying capacities are extremely low for both sheep and cattle. On the other hand the annual dry matter production from timber treated country (improved traprock) averages about 1000 kg/ha. This pasture production will support about 1.5 dry sheep equivalents (DSE) per hectare.

Sandstone-Solodics

The solodic woodland normally grows harsher, less productive species of native pastures in which wiregrasses, especially many-headed wiregrass (*Aristida caput-medusae*), predominate, with minor occurrences of ridge grass (*Enneapogon avenaceus*) and some love grasses (*Eragrostis* spp.). These light soils provide very poor winter grazing because of the poor types of grasses and the virtual absence of winter crop or other supplementary feed is provided.

In Inglewood Shire, most of the sandstone-solodic soil type areas are covered by State Forest Reserves (see Map 3). These areas are scattered throughout the Shire, but principally in the north and west of the Shire. The State Forest Reserves are available for cattle grazing only, under special forestry leases. Sheep damage the regenerative growth of the tree species. Pasture productivity varies widely, but generally of very poor quality and quantity. Average stocking rates are approximately one beast to 10 hectares.

Grey-Brown Clays

These areas are situated to the north and west of Inglewood and include the brigalow-belah association. Areas are not very large and are usually heavily timbered with brigalow regrowth. Cleared areas are devoted almost entirely to winter grain and fodder production. Native pasture species within the brigalow-belah association are brigalow grass (*Paspalidium caespitosum*) and minor *Chloris* spp.

Alluvials

Alluvial country is scattered throughout the Shire. A large number of properties have some alluvial frontage country. Broken areas in this country not suitable to annual cropping support mainly pitted blue grass, slender bamboo grasses, love grasses and spear grass. Carrying capacities on this country are quite high (1:4 hectares) and these areas are suited to cattle breeding.

Yelarbon 'Desert'

This is a small area of spinifex-tea tree country situated just north of Yelarbon. Although this area is used for livestock production, carrying capacities are extremely low.

7.3.2 Sown Pastures

Pasture improvement using introduced pasture grasses and legumes did not become significant until the mid-1950s. Initial attempts using temperate species such as rye

grasses, phalaris, cocksfoot, white clover, subterranean clover, and lucerne were not particularly successful. Persistence was poor and productivity low, except in above average rainfall years. These species, apart from lucerne, are no longer used under dryland conditions but areas could be planted where irrigation is possible.

In more recent years greater success has been obtained using the subtropical grasses buffel, green panic and Rhodes grass, with lucerne and annual medics.

Eighty percent of the Shire's sown pastures are on traprock soils, 14 percent on recent alluvia, three percent on grey-brown soils (brigalow-belah) and three percent on the sandstone-solodic soils.

Traprock

The hilly terrain and shallow, hardsetting soils of low fertility impose major limitations to pasture development in this region. Areas which readily lend themselves for pasture improvement are small and usually confined to valley floors and in most cases are set aside for lucerne and oat production.

The main species being used is lucerne. Production and persistence is quite satisfactory on the deep soils of the valley floors but is only fair on the shallower hillside soils. Lucerne responds quickly to rain but during hot, dry periods in mid-summer it wilts and drops its leaves very quickly.

On average, lucerne stands persist for about two to three years, then the area progressively reverts back into native pasture. In many situations where the initial land preparation for lucerne sowing has been thorough, eliminating all original native pasture species, and where the subsequent lucerne stand has weakened and died out because of intensive grazing, low fertility or climatic soil conditions, the return of native grass species is slow and is generally dominated by excessive weed growth. The consequences of such recession can be serious, often resulting in loss of production, overstocking adjoining areas, soil erosion and extra cost in restoring the area into a more stable state.

Lucerne introduced into native pastures with minimum tillage (sod-seeding), whilst having similar production life to that planted into well prepared seedbed conditions, does not subject the land to the same magnitude of problems. Using this method, there is a considerable saving in initial pasture establishment costs and sucker management practices. This will result in a more stable, uniform and productive pasture, relatively free from undesirable weed species and soil erosion.

The benefits native pasture species derive from introduced *Medicago* species are not well documented for this area, but in a small observation area located near Texas, it has been found following analyses of samples taken at regular intervals throughout the year, that the native grass species benefit significantly both in dry matter yield and nitrogen content where associated with annual medics. Evidence from this area showed that up to 57 kg/ha of N per year was available to the grass from the medics.

To reclaim areas originally sown to lucerne, which subsequently died out, buffel grass has been used to great advantage, along with lucerne and barrel medic (*Medicago sativa* cv. Jemalong) to establish more permanent and productive ground cover in areas suffering from weeds and little native grass cover.

Based on trials at Texas, it has been estimated that the development of one-sixth of a unit area to lucerne allows stocking rate to be raised from one sheep per 0.8 hectare to approximately one sheep per 0.5 hectare. However, in view of the cost and short life of lucerne on such soils, it may be more economical to introduce annual medics as a cheaper and more persistent alternative. In addition the stocking rate had a major effect on wool production whilst the proportion of lucerne to native pasture had only a minor effect, with the exception of the one winter when large quantities of lucerne were available. The proportion of lucerne appears to be more significant in the production of quality feed for lambing ewes, and fattening, than wool production.

Sandstone-Solodic Soils

On the more difficult bulloak-cypress pine country west of Inglewood, minor pasture development has taken place by introducing green panic, Rhodes grass, buffel grass and medic species. But because of the poor fertility and regrowth problems experienced on

such country, pasture development is expected to remain slow and insignificant.

Grey-Brown Soils

These soils are basically reserved for grain and annual fodder crop production, but during the early 1970s, when beef prices were reaching new peaks, some of this land was sown to improved pastures. Introduced species were mainly green panic with buffel grass, lucerne and annual medics.

Alluvial Soils

Pasture development on these soil types had not been extensive and to a large extent is based on lucerne. Since the 1960s however, improved pastures comprising temperate pasture species have been established and maintained under irrigation. The productivity from these pastures has not been good and the maintenance costs, especially the irrigation requirements, are very high. In recent years, subtropical species such as green panic, Rhodes grass and Bambatsi have been sown under dryland conditions. Pasture development on these soils is not likely to expand rapidly because of interest landholders have in these areas for grain cropping.

7.3.3 Lucerne for Hay Production

Early records indicate that lucerne on the river alluvia was grown as a dryland grazing crop after the turn of the century. Today over 60 percent of the crop is irrigated and used principally for the production of quality hay.

The potential productivity of lucerne from irrigated stands in the Shire is comparable with yields obtained in recognized lucerne growing areas such as the Lockyer Valley in south-east Queensland.

A large quantity of the lucerne hay produced is sold to neighbouring districts and particularly the dairying areas on the north cost of New South Wales.

Seed production assumed importance in the late 1940s and seed valued at $20 000 was produced on the Macintyre Brook in 1956, prior to the 'flood'. In recent years seed production has received only minor attention. Yields of lucerne seed around 400 kg/ha are not uncommon.

The first spray irrigated lucerne stand on the Macintyre Brook was grown in 1958 and on the Dumaresq River country in 1952. The areas under irrigation have gradually increased to an estimated 540 hectares and 600 hectares on the Macintyre Brook and Dumaresq River respectively.

The only commercial cultivar grown is Hunter River, but there are indications that Siro Peruvian gives higher yields under irrigation, particularly in the winter period. However, its persistence is poor, and trials have indicated that stands are thinner and yields are lower than those of Hunter River after several years.

Witches Broom and root rot have caused severe losses in some years. In such situations, invasion by weeds and grasses is rapid and further reduces the yield and quality of lucerne produced.

Insect pests, such as jassids and leaf roller cause damage occasionally, but rarely warrant chemical control. White-fringed weevil, present in lucerne stands adjacent to the Dumaresq has caused considerable damage and presented the greatest entomological threat to this crop before the advent of spotted alfalfa and blue alfalfa aphids in 1977.

Table 7.17 sets out details of lucerne and other pasture production in Inglewood Shire for the last five years.

Although the official statistics in Table 7.17 show total lucerne yield in the Shire to average only around 8.5 t/ha, irrigated lucerne stands used purely for hay production normally have yields ranging up to 15 t/ha. The average shown in Table 7.17 includes stands which are not irrigated and also stands which are grazed for part of the year. Table 3.10 shows that in 1975-76, 565 hectares of lucerne were irrigated out of a total of 898 hectares cut for hay.

Table 7.17

Inglewood Shire - Sown Pastures Area and Production

Year	*Pasture Cut for Hay During Year*				*Area of Sown Pasture @ 31 March*	
	Lucerne		*Other Pasture*			
	Area ha	*Production* t	*Area* ha	*Production* t	*Pure Lucerne* ha	*Other Sown* ha
1971-72	1130	9296	106	494	3558	5 719
1972-73	1080	9774	122	467	3416	6 481
1973-74	936	6255	56	178	1657	10 256
1974-75	1118	9639	92	262	1880	10 597
1975-76	898	6889	46	140	1517	5 048

Source: Australian Bureau of Statistics

7.4 WEEDS OF CROP AND PASTURE

Most weed problems which occur in the Inglewood Shire are common to other adjoining districts of the Southern Downs Region.

Weeds vary in their incidence and intensity depending upon many factors, some of which are climatic conditions, soil types and cultivation, crop and pasture management.

There are many weed species present and collectively they have substantially reduced potential crop and pasture yields and in some cases have been suspected of poisoning stock.

Crop rotations involving winter and summer fallows and diversion to pastures where the weed problem is most severe are the means most commonly adopted by local producers. Whilst these methods must be encouraged there are situations when the use of chemicals could be most beneficial. Chemical weed control is still not widely accepted and this reluctance to spray undesirable plants in crops and pastures has led to substantial financial losses in production.

7.4.1 Weeds of Cultivation

Alluvial Soils

Perhaps the most important weed pest on these soils is the perennial weed nutgrass (*Cyperus rotundus*). Almost without exception, nutgrass affects all crops whether they are grown under irrigation or raingrown conditions. The effects range from almost complete failure to establish to serious losses of yield and quality from established crops.

Control measures are based largely on crop rotations, with smaller use of herbicides on selective crops.

Chemical control measures of nutgrass are economically justified in such crops as tobacco and bean even though such measures at this stage, are only of temporary nature. The effective chemical control diminishes after approximately three to four weeks, but is generally sufficient to allow such crops to attain a stage of growth where they in turn are capable of suppressing the weed problem.

A major weed of weakened lucerne stands is couch grass (*Cynodon* spp.). This greatly affects yield and quality of hay produced.

Datura spp. (*D. ferox* and *D. stramonium*) and noogoora burr (*Xanthium pungens*) are also of major significance on these soil types. The presence of such weeds on properties not only seriously affects yields and quality of product produced, but also restricts what crops are grown. Timely use of chemical sprays where possible will provide season long control, but careful planning of the crop rotation system is necessary to avoid damage from residue chemical if the following crop is a susceptible one such as tobacco, beans, lucerne,

sunflower, etc.

Wild oats (*Avena ludoviciana* and *A. fatua*), turnip weed (*Rapistrum rugosum*) and climbing buckwheat (*Polygonum convolvulus*) are major weeds present in most winter crops, and are often countered by various management practices including some use of chemicals.

Brigalow Soils

Crops on these soil types suffer from many of the above annual weeds present in the district, but the major weeds of concern are New Zealand Spinach (*Tetragonia tetrogonoides*), mintweed (*Salvia reflexa*) and European bindweed (*Convolvulus arvensis*) also brigalow suckers (*Acacia harpophylla*) and limebush (*Eremocitrus glauca*). Control of these pests can seriously interrupt annual cropping programmes especially European bindweed.

Traprock Soils

Weeds of concern in annual crops grown on these soil types include many of the ones listed previously with the exception of New Zealand Spinach, European bindweed and nutgrass.

One common weed pest that is present in addition to many others is mayne's pest (*Verbens tenuisecta*).

Other weeds of importance in summer and winter crops are:

Common Name	*Botanical Name*
amaranth, green	*Amaranthus viridis*
barnyard grass	*Echinochloa crus-galli*
bathhurst burr	*Xanthium spinosum*
blue heliotrope	*Heliotropium amplexicaule*
black pigweed	*Trianthema portulacastrum*
couch	*Cynodon dactylon*
crownbeard	*Verbescina encelioides*
crowsfoot grass	*Eleusine indica*
docks	*Rumex* spp.
dodder, common	*Cuscuta epithymum*
dead nettle	*Lamium amplexicaule*
feather top rhodes grass	*Chloris virgata*
fat-hen	*Chenopodium album*
hexham scent	*Melilotus indica*
liverseed grass	*Urochloa panicoides*
mallows	*Malva* spp.
mustards	*Sisymbrium* spps.
mexican poppy	*Argemone ochroleuca*
redshank	*Amaranthus cruentus*
saffron thistle	*Carthamus lanatus*
stink grass	*Eragrostis cilianensis*
summer grass	*Digitaria ciliaris*
spiny emex	*Emex australis*
variegated thistle	*Silybum marianum*
wild radish	*Raphanus raphanistrum*
wireweed	*Polygonum aviculare*

7.4.2 Weeds in Pastures

Brigalow

Weeds most prevalent in these situations are brigalow regrowth (*Acacia harpophylla*), limebush (*Eremocitrus glauca*) and pear (*Opuntia* spp.).

The degree of incidence varies according to the early development of the area and subsequent management. For example, areas cropped for some years following timber removal are relatively free from such problems.

Traprock and Associated Country

Weeds invading pastures in these areas are both of an annual and perennial nature. The incidence of both depends to a large degree on climatic conditions and pasture management.

Cotton bush (*Kochia* spp.), Rosemary or cough (*Cassinia laevis*), couch grass (*Cynodon* spp.), galvanized burr (*Bassia birchii*), flannel weed (*Sida* spp.), and nettle (*Urtica* spp.), blue heliotrope (*Heliotropium amplexicaule*), horehound (*Marrubium vulgare*), and mayne's pest (*Verbena tenuisecta*) are the most prevalent weed species present.

Timber seedling regrowth is also a problem following removal of the original vegetation. The use of sheep at high stocking rates periodically has alleviated some of the problem, but on cattle dominant properties this system is not practical. Also with the high cost of labour and chemicals, the economics of controlling timber seedling growth is questionable.

7.5 BEEF CATTLE

Beef cattle numbers in the Inglewood Shire in 1976 were 59 376. Their distribution is shown in Map 3. Beef cattle production within farming systems is described in Section 6.4. Table 7.18 shows numbers of beef cattle in Inglewood Shire in recent years and for selected years prior to 1969-70.

Table 7.18

Inglewood Shire - Beef Cattle Numbers

Year (31 March)	*Number of Beef Cattle*	*Holdings with Beef Cattle*
1945	35 006	n.a.
1950	30 661	n.a.
1955	31 939	221
1960	31 851	236
1965	36 840	272
1970	36 716	274
1971	44 665	283
1972	50 407	284
1973	57 401	296
1974	53 928	301
1975	57 939	294
1976	59 376	285

The Inglewood Shire is largely a store producing district with the exception of the irrigation areas fronting the Dumaresq and Macintyre Rivers. A small number of cattle are also fattened on dryland oats and improved pastures such as lucerne medics, buffel grass and green panic.

Cattle numbers per property depend on the size of the holdings and the manager's interest, but can vary from 50 to 2000 head. Table 6.6 shows holdings in Inglewood Shire classified according to the size of holding and size of meat cattle herd. Table 6.7 shows holdings cross-classified to meat cattle herds and sheep flocks.

The dominant breed in the area is Hereford (and Poll Hereford). Together these make up 60 percent of Shire numbers. The rest are made up of Shorthorns five percent, Angus five percent, Brahman crossbreds 10 percent, and the remaining 20 percent are mostly other British breed or dairy crosses, with a sprinkling of European breeds. Table 7.19 shows beef cattle in Inglewood Shire classified by breed as at 31 March 1973. A number of stud herds exist, the majority of which are British breeds.

Although Bos Indicus crossbred cattle have shown considerable advantages in handling the rougher types of country in the Inglewood Shire, their numbers have shown an

exceptionally slow increase. This is largely due to the market prejudice against store crossbred cattle, many of which go to southern buyers from New South Wales.

Table 7.19

Inglewood Shire - Breeds of Beef Cattle on Rural Holdings
(at 31 March 1973)

Breed	*Breeding Cattle*		*Calves (under one year)*	*Other (one year or more)*	*Total*	*Holdings*[1]
	Bulls	*Cows & Heifers*				
Straight Breeds -						
Bradford	19	66	82	1	168	13
Brahman	16	117	68	10	211	10
Droughtmaster	2	18	4	55	79	[2]
Hereford	581	18 946	11 509	3 159	34 195	173
Santa Gertrudis	24	308	243	32	607	21
Shorthorn	65	1 070	532	107	1 774	26
Other	141	3 838	2 142	868	6 989	30
Total Straight Breeds	848	24 363	14 580	4 232	44 023	214
Crossbreeds -						
British-British	5	1 140	773	214	2 132	36
Brahman-British	13	1 108	892	226	2 239	21
Other Tropical-British	13	917	521	677	2 128	16
European-Other	9	43	96	2	150	6
Beef-Dairy Breeds	10	1 531	1 113	233	2 887	50
Other	62	2 228	986	566	3 842	70
Total Crossbreeds	112	6 967	4 381	1 918	13 378	161
Total All Beef Cattle	960	31 330	18 961	6 150	57 401	296

Source: Australian Bureau of Statistics

[1] Generally the sum total of holdings reporting various breeds exceeds the total number of holdings with beef cattle because individual holdings frequently have more than one breed

[2] Number of holdings small, generally less than five

Store Cattle

Store cattle are mainly sold as weaners or yearlings and are turned off in the autumn to spring period. Store sales are held in Texas, Warwick and Goondiwindi.

Fat Cattle

The majority of fat cattle are sold in the spring months either at auction or direct to the meatworks at Wallangarra and Tenterfield.

A significant trend over recent years has been towards a younger age of turnoff. A survey of Dumaresq River beef producers (1976) shows the types of turnoff favoured by producers at that time.

Table 7.20

Dumaresq River - Type of Fat Cattle Turned Off

Type of Fat Cattle Turned Off	*Percent of Producers*
Vealers	52
Yearlings	37
Two-year-old steers	20
Bullocks	9

Source: Department of Primary Industries records

Stocking Rates

Stocking rates for cattle vary with the amount of property development and type of country, but average figures could be as listed below:

Description	*Beasts per Hectare*
Cypress-bulloak country	1 to 12-20
Traprock - native pastures	1 to 5-7
improved pastures (i.e. medics, etc.)	1 to 2
Frontage country	1 to 3
Brigalow - developed	1 to 3-4

The poorer classes of country are usually used for breeding purposes whilst cattle are fattened on frontage country (on lucerne, irrigated oats and native medics) and some brigalow areas (dryland oats). Quite often owners have both a breeding and fattening property.

Dryland oats on the lighter soil types is usually a risky proposition for fattening cattle, particularly younger stock which require a longer finishing period. This is due to a reduced moisture holding capacity on these soils and therefore, high risk of crop failure. On the other hand irrigated oats can support good gains (1.14 kg/hd/day) for extended fattening periods (up to 140 days).

The advantages of using younger cattle for fattening have been demonstrated recently by Gulbransen (pers. comm.) at Hermitage Research Station near Warwick. He recorded a 20 percent advantage in efficiency (carcase gain per hectare) of weaner cattle (9 to 12 months) as compared to yearling steers (21 to 24 months) on dryland oats for 100 days. The ability to finish younger cattle however, presents a higher risk situation and irrigation is usually necessary.

With the collapse of export markets for beef, the trend of fatteners has been to go for younger cattle for the local trade. These are usually at a premium price round September-October. The economics of fattening different age cattle however, must be examined in the light of industry circumstances each year.

Breeder herd performance also varies with the type of country. With the poorer soil types such as traprock and limited cultivation, branding rates as low as 60 percent are common. Likewise breeder mortalities are high (three to seven percent) owing to the prolonged winter dry spells and frosts which give native pastures a very low nutritive value.

This situation can be improved through sound breeder herd management practices such as seasonal calving (August to November), strategic weaning (usually before the end of May) and the culling of non-pregnant cows prior to the onset of winter. A winter feed supplementation programme is also required to reduce mortalities and increase brandings. This involves the use of protein, and energy supplements such as hay or grain. The economics of such programmes however, rely on a high market value for the extra store cattle turnoff achieved.

Urea-molasses supplements are commonly used early in the winter feeding programme However, recent trial work on traprock country in the neighbouring Stanthorpe Shire (Llewelyn 1975, at 'Mt. Malakoff' and Nolan et al. 1974 at 'Calm Downs') has been unable to demonstrate significant responses to urea-molasses. On the other hand some responses have been achieved to true-protein supplements such as meat meal(Nolan, etc., 1974). The large influence of energy deficiency of these native pastures has been an important finding in the above work.

A breeder herd survey of a number of traprock properties in both the Inglewood and Stanthorpe Shires in 1974-75 (see Winter Feeding Approaches - Stanthorpe Beef School Papers 1975) showed also the considerable benefit of improved pastures particularly medics in providing a diet adequate to lift branding percentages into the 80s and 90s.

It was suggested there that strategic use of improved pastures showed the best long term approach to improvement in breeder performance. However, drawbacks include the high initial cost of such development and area limitations in terms of pasture sites.

Breeder performance on river frontage properties is usually of a higher standard than that on the traprock and cypress-bulloak areas and 80 percent brandings with minimal breeder mortality rates (one to two percent) are commonly achieved. Similarly these areas support good liveweight gains on irrigated oats with all classes of stock (up to 1.36 kg/day).

Phosphorus deficiency in cattle can occur on the lighter soils particularly the solodics and sometimes on traprock areas. However, traprock soils tend to be marginal and widely variable in this respect.

The overall importance of sodium deficiency is not known but is often suspected.

From a disease point of view, cattle are probably no worse off in the Inglewood Shire than elsewhere. The Shire is a tick free area but lice can cause considerable problems during poor winters if cattle are in backward condition. Internal parasites which occur are mainly summer species with the Barbers pole worm being the main offender. Cattle are usually drenched as weaners or before going on to crop. Some riparian properties also experience fluke problems, particularly along the Dumaresq.

7.6 SHEEP

Table 7.21 shows sheep numbers and wool production in Inglewood Shire for the last seven years and for selected years prior to 1969-70. Table 7.22 shows lambing performance in Inglewood Shire for the same years.

Table 7.21

Inglewood Shire - Sheep Numbers and Wool Production

Year (31 March)	*Sheep Numbers No.*	*Sheep Shorn No.*	*Wool Obtained kg*	*Fleece Weight kg*	*Holdings With Sheep No.*
1945	401 592	414 700	1 189 366	2.87	184
1955	325 968	326 843	1 055 249	3.23	216
1960	419 716	437 469	1 486 520	3.40	236
1965	447 217	453 402	1 733 565	3.82	228
1970	411 989	416 080	1 657 692	3.98	215
1971	356 691	383 644	1 485 077	3.87	206
1972	323 010	329 987	1 389 000	4.20	198
1973	310 833	302 908	1 288 000	4.25	184
1974	275 707	278 146	1 157 000	4.16	176
1975	280 640	268 000	1 078 000	4.03	169
1976	292 302	273 000	1 233 000	4.51	166

Table 7.22

Inglewood Shire - Lambing Percentages

Year	*Ewes Mated No.*	*Lambs Marked No.*	*Lambs Marked to Ewes Mated %*
1944-45	96 054	46 583	48.5
1954-55	70 086	43 035	61.4
1959-60	112 469	67 687	60.2
1964-65	114 655	82 752	72.2
1969-70	103 232	76 552	74.2
1970-71	96 759	57 026	58.9
1971-72	67 230	43 549	64.8
1972-73	69 179	43 778	63.3
1973-74	69 645	49 892	71.6
1974-75	61 657	38 079	61.8
1975-76	64 198	44 686	69.6

The traprock soils generally produce lighter wool weights but of good quality tending towards fineness in comparison with the better class soils where wool is inclined to be heavier, bulkier and carrying vegetation faults and dust.

Lamb marking percentages are approximately 85 percent on the developed traprock and 60 to 65 percent on the undeveloped country. Rams are joined in the autumn and spring, but autumn is favoured where lamb production is important. Lambs are turned off between 14 and 16 weeks where possible.

Factors affecting wool and lamb production are either as a direct or indirect result of seasonal conditions. External parasites, both lice and blowflies, and internal worm parasites, can prove troublesome most seasons.

Diseases and natural predators are only of very minor economic importance.

Lambing problems do occur, particularly where sheep are on good feed, but are of no greater economic importance in this Shire than elsewhere.

Stocking rates are quite varied throughout the Shire, but on average are as follows:

	Dry Sheep Equivalents (DSE)
Undeveloped traprock	1:0.8 hectare
Developed traprock	1:0.6 hectare
Improved brigalow and alluvials	1:0.4 hectare

The location and nature of wool production systems in Inglewood Shire are discussed in Section 6.4.3. Table 6.6 shows rural holdings in Inglewood Shire classified according to size of sheep flock and size of meat cattle herds at 31 March 1976. It is of interest that only 12 holdings in the Shire ran sheep without cattle at that date, and most of these had less than 4000 sheep.

7.7 PIGS

The pig population of 2600 suggests that about 5000 pigs would be sold per year. These would have a farm gate value of approximately $300 000 at current values.

Pigs are sold on a dressed weight basis in Toowoomba, Brisbane and Casino and by auction in Warwick, Toowoomba and Brisbane. The majority are sold as baconers but some are sold as porkers and stores.

Thirty holdings have pigs. This is 10 percent of the total holdings in the Shire. Table 7.23 sets out pig numbers in Inglewood Shire in recent years and for selected years prior to 1969-70. In most cases the pig unit is a rather insignificant sideline. On these holdings the pigs are fed on homegrown grain of feed quality, with some grazing and purchased protein meals, and are reared outdoors.

On 12 holdings in Inglewood Shire in 1975-76 the pig enterprise contributed a significant proportion of the total income. These units produce 70 percent of the total pig production of the Shire.

In the large pig production units pigs are housed intensively and fed on homegrown or locally produced grain and purchased protein meals.

The motivation for keeping pigs usually springs from a desire to increase income through intensification and often represents a particular interest on the part of one member of the family.

The largest unit in the Shire is the 'Raby Park' Landrace and Large White stud of P. & N. Batterham running approximately 100 sows at Limevale.

There is no indication of a marked change in the role of pig keeping in Inglewood Shire in the near future.

The efficiency of production is reduced in many sideline units in which pigs are reared outdoors. These limitations are listed below:

(a) Feral boars disrupting planned breeding programmes;

(b) Foxes and crows attacking newborn piglets;

(c) Sunburn reducing the reproductive efficiency of sows;

(d) Food wastage - especially in wet weather;

(e) Dust irritating respiratory systems and harbouring mange mites;

(f) Impracticability of intensive husbandry techniques.

Indoor units overcome most of these factors but cost upwards of $1000 per sow to construct in a unit designed to produce baconers.

Housing needs to be designed to overcome high summer temperatures, especially for breeding stock and low winter temperatures, especially for piglets.

Intensive baconer producing units require a minimum of 30 gallons of water per sow per day.

The following levels of productive efficiency should be obtainable or exceeded in well managed intensive units:

Pigs weaned per litter	8
Litters per year	2
Dressed weight at 26 weeks	60 kg
Feed used per kilogram of carcass produced	5.5 kg
Prime carcass gradings	90%

Table 7.23

Inglewood Shire - Pig Production

Year	*Number of Pigs*	*Holdings with Pigs*
1945	1476	79
1955	1506	62
1960	1049	39
1965	1715	34
1970	2080	37
1971	2399	35
1972	2664	50
1973	2783	46
1974	2635	37
1975	2127	31
1976	2526	31

Source: Australian Bureau of Statistics

7.8 BEEKEEPING

Eight beekeepers live in the Shire and operate about 1300 hives with a total average annual production of about 100 tonnes of honey. The major producers are three commercial apiarists who operate 1100 hives in partnership.

In years of blue-top and broadleaved ironbark honey flows the area is utilized by as many as 60 migratory beekeepers from south-east Queensland and from northern and central New South Wales. The areas mainly utilized are in the State forests, but private property is widely utilized as well. During these peak periods the area may support 25 000 beehives. Heavy honey flows from these two species occurs about each third year. During the intervening years the sandy areas are utilized during winter to maintain colonies, many of the shrubs and small bushes forming the ironbark and cypress pine forest undergrowth are important pollen producers.

The agricultural and cleared areas are often utilized by beekeepers during spring and early summer to obtain a build-up in colony strength. Important pollen producers flowering at this time are wild turnip, wild radish and blue heliotrope.

Mallee box is a useful autumn flowering species which produces a crop of honey in some years. Many beekeepers treat this species with caution as it has the reputation of occasionally causing dwindling in apiaries. That is, bee numbers in hives drop dramatically and apiaries are weakened to the extent that they are commercially useless for the number of months it takes them to recover.

Narrow-leaved ironbark is a species that is common in most areas of south-east Queensland but is generally considered to be of minor importance as a honey producer. Large stands of narrow-leaved ironbark occur in Inglewood Shire and in this area the tree has the reputation of being of medium to major importance as a honey and pollen producer.

The two species of greatest importance to beekeepers in the Inglewood Shire are bluetop ironbark and broadleaved ironbark. These two species flower regularly and produce large crops of first grade honey.

A number of species utilized by beekeepers for honey production occur in the Shire. The species are set out in Table 7.24. These species are used from year to year, depending on budding, etc.

Table 7.24

Inglewood Shire - Useful Honey Flora

blue gum	*E. tereticornis*
blue heliotrope	*Heliotropium amplexicaule*
bluetop ironbark	*E. nubilis*
broadleaved ironbark	*E. siderophloia*
brown box	*E. microcarpa*
caley's ironbark	*E. caleyi*
lucerne	*Medicago sativa*
mallee box	*E. pillagaensis*
narrow-leaved ironbark	*E. crebra*
tumble-down gum	*E. dealbata*
wattles	*Acacia* spp.
white box	*E. albens*
wild radish	*Raphanus raphanistrum*
turnip weed	*Rapistrum rugosum*
yellow box	*E. melliodora*

Sources of Information

Agricultural Crops

1. Inglewood Field Station (trials results)

2. State Wheat Board (storage capacities)

3. Australian Bureau of Statistics. Queensland Bulletins.
   (i) Part B - Rural Production (several years to 1973-74)
   (ii) Agricultural Industry, Sections 1 and 2, 1974-75
   (iii) Winter Growing Grains and Seeds, 1975-76
   (iv) Summer Growing Grains and Seeds, 1975-76
   (v) Miscellaneous Crops, 1975-76
   (vi) Hay and Green Fodder, 1975-76

Horticultural Crops

1. Department of Primary Industries, Stanthorpe

2. Australian Bureau of Statistics. Queensland Bulletins.
   (i) Fruit Crops, 1975-76
   (ii) Vegetables, 1975-76

Pastures

1. Lee, G.R. and Rothwell, W.E.M. (1966) - *Queensland Journal of Agriculture and Animal Sciences.* 23(2):287

2. Swann, I. (1976) - 'Native Pasture' and 'Improved Pasture' *in* Wills, A.K. (ed) *Granite and Traprock Area of South-East Queensland*

3. Malcolmson, G.H. (1976) - 'Irrigated Lucerne for Hay' *in* Wills, A.K. (ed) *Granite and Traprock Area of South-East Queensland*

4. Australian Bureau of Statistics. Queensland Bulletins.
   (i) Hay and Green Fodder, 1974-75 and 1975-76
   (ii) Part B - Rural Production (several years to 1973-74)

Beef Cattle

1. Department of Primary Industries, Warwick

2. Llewelyn, D. (1975) - *Winter Supplementation of Grazing Cattle with N.P.N. or Protein* Final Report of Beef Cattle Husbandry Branch Trial No. WRK-CH444-BF

3. Nolan, et al. (1974) - reported by Leng, R.A., Kempton, T.J. and Nolan, J.V. in A.M.R.C. Review (in press 1977)

4. Stanthorpe Beef School (1975) - Papers. Available at D.P.I., Warwick

5. Australian Bureau of Statistics, Queensland Bulletins.
   (i) Part B - Rural Production (several years to 1973-74)
   (ii) Agricultural Industry, Section 3, 1974-75
   (iii) Livestock on Rural Holdings, 1975-76
   (iv) Beef Cattle Breeds, Queensland, as at 31 March 1973

Sheep

1. Department of Primary Industries, Warwick

2. Australian Bureau of Statistics, Queensland Bulletins.
   (i) Part B - Rural Production (several years to 1973-74)
   (ii) Agricultural Industry, Section 3, 1974-75
   (iii) Sheep and Wool Production, 1975-76

Pigs

1. Department of Primary Industries, Warwick

2. Australian Bureau of Statistics, Queensland Bulletins.
   (i) Part B - Rural Production (several years to 1973-74)
   (ii) Agricultural Industry, Section 3, 1974-75
   (iii) Livestock on Rural Holdings, 1975-76

Beekeeping

1. Queensland Department of Primary Industries, Entomology Branch, Brisbane

2. Blake, S.T. and Roff, C. (1958) - *The Honey Flora of South-Eastern Queensland.* Dept. Agric. and Stock. Qld Gov. Printer, Brisbane

8. REGISTER OF RESEARCH PROJECTS

8.1 INGLEWOOD FIELD STATION

This property was purchased in 1953 as an existing tobacco farm, by the tobacco industry. Under the administration of the Department of Primary Industries, it was named Inglewood Tobacco Experimental Station and developed and staffed 'to undertake research into tobacco production problems'. The property of 29 hectares is located at Whetstone.

Following the decrease in district tobacco production from 1961 to 1964, activity on the Station remained static until 1968 when the Agriculture Branch of the Department of Primary Industries assumed full responsibility for the Station whereafter it was renamed, Inglewood Field Station. Activities were reorientated into general agriculture with investigational work being carried out in soil problems and irrigation techniques, and crops such as navy beans, soybeans, wheat, barley, etc. Horticulture Branch have also established a Wine Grape Variety Trial and are investigating processing tomatoes. A small orchard has been established to demonstrate varieties of stone fruit and systems of trickle irrigation.

The Station provides office facilities for district extension staff in general agriculture and tobacco. Laboratory space is also available for visiting experimentalists. Quarterly meetings of the Macintyre-Dumaresq Irrigation Advisory Committee (convened jointly by the Department of Primary Industries and Irrigation and Water Supply Commission) and other Departmental meetings are held in a conference room at the Station.

Inglewood Field Station is an official climate recording station for the Bureau of Meteorology. Instruments presently in operation at the Station include temperature recording equipment for both screen and earth temperatures, a rain gauge, a wind recorder, an evaporimeter and a sunshine recorder. Measurements are taken daily by Station staff.

8.2 DEPARTMENT OF PRIMARY INDUSTRIES

8.2.1 Inglewood Field Station

Project No.	*Project*		*Officer in Charge*
Tobacco			
	Varietal trial	1960-61	
	Blue mould resistant strain trial	1961-62	
	Nitrogen and Potassium interaction trial	1962-63	
	Hail reclamation trial	1962-63	
	Phosphate time of application trial	1963-64	
	Potash time of application trial	1963-64	
	Nitrogen time of application trial	1963-64	
	Desuckering trial	1964-65	
	Weedicide trial	1965-66	
Wheat			
INW-C24-AB	Varietal trial	1966-67	J. Kerr
INW-C24-AB	Population study	1967-68	"
INW-C30-AB	Varietal trial	1969-70	"
INW-C30-AB	Varietal trial	1970-71	"
HRS-C117-AB	Varietal trial	1971-72	G.H. Malcolmson
HRS-C117-AB	Varietal trial	1972-73	"
Barley			
INW-C32-AB	Varietal trial	1968	J. Kerr
INW-C32-AB	Varietal trial	1971	"
INW-C32-AB	Varietal trial	1972	G.H. Malcomson
HRS-C117-AB	Varietal trial	1973	"
HRS-C117-AB	Varietal trial	1974	"
HRS-C99-AB	Varietal trial	1975	"

Project No.	*Project*		*Officer in Charge*
Navy Beans			
INW-C23-AB	Varietal trial	1968	J. Kerr
INW-C23-AB	Varietal trial	1969	"
INW-C29-AB	Nitrogen fertilizer trial	1969	"
TBA-C156-AB	Irrigation frequency trial	1969	J. Gunton
TBA-C156-AB	Irrigation frequency trial	1970	"
INW-C29-AB	Nitrogen fertilizer trial	1970	J. Kerr
INW-C29-AB	Nitrogen fertilizer trial	1971	"
INW-C23-AB	Varietal trial	1971	"
TBA-C156-AB	Irrigation frequency trial	1971	J. Gunton
	Plant population trial	1972	"
TBA-C200-AB	Nitrogen time of application trial	1973	"
TBA-C221-AB	Type of nitrogen trial	1974	"
INW-C23-AB	Varietal trial	1976	G.H. Malcomson
INW-C23-AB	Varietal trial	1976-77	"
Soybeans			
WRK-C104-AB	Varietal trial	1971-72	G.H. Malcomson
WRK-C104-AB	Varietal trial	1973-74	"
WRK-C104-AB	Varietal trial	1975-76	G. Gibson
Grain Sorghum			
	Varietal trial	1968-69	J. Kerr
Maize			
	Fertilizer trial	1964-65	
Cotton			
	Varietal trial	1958-59	B.A. Rodda
	Varietal trial	1959-60	"
	Fertilizer trial	1961-62	"
HORTICULTURE			
No II	Wine grape varietal trial	1970	K. Winks
	Tomato (processing) varietal trial	1975	R. McMahon
PATHOLOGY			
PPTVIII	*Ascochyta arida* control of tobacco	1970-71	I. Hughes
PPTVIII	*Ascochyta arida* control of tobacco	1971-72	"

SPECIAL PROJECTS - 1967-77

Crops (Studies at Inglewood Field Station)

1. Characteristics of irrigable soils on Macintyre Brook
2. Soil properties correlation in the Macintyre Brook area
3. Emergence of various summer and winter crops on crusting Inglewood soils
4. Navy bean emergence on crusting soils of Macintyre Brook
5. Navy bean emergence with various planting methods
6. Navy bean emergence with chemical ameliorants
7. Measurements of crust strength on Inglewood soils
8. Soil amelioration under irrigation on Macintyre Brook
9. Ageing in lucerne stands on Macintyre Brook
10. Chemical amelioration effects on emergence on crusting Inglewood soils
11. Infiltration study of different furrow shapes

Project No.	*Project*		*Officer in Charge*

Pastures

1. Grazing trial - supplementary lucerne for wool production (Texas)
2. Barrel medic management and regeneration trial (Texas)
3. Special testing (Karara)
4. Lucerne fertilizer trial on traprock (Texas)
5. Grazing trial - pasture (Rhodes grass) fattening - summer and winter grain cropping (Inglewood Field Station)
6. White Fringed Weevil (larvae) control x chemicals (Beebo)

8.2.2 Trials on District Properties in Inglewood Shire

Wheat

	Fertilizer trial	1962-63	D. Smith
	Fertilizer trial	1963-64	"
	Phosphate prediction trial	1963-64	"
	Varietal trial	1964-65	"
	Phosphate prediction trial	1965-66	"
INW-C6-AB	Phosphate, Nitrogen prediction trial	1965-66	"
INW-C7-AB	Phosphate residue trial	1965-66	"
INW-C16-AB	Phosphate, Nitrogen trial	1966-67	"
INW-C20-AB	Phosphate fertilizer residue trial	1967-68	J. Kerr
INW-C30-AB	Varietal trial	1967-68	"
QWRI-C12-AB	Nutrient screening trial (2)	1974	M. Grundon
	Residual effect (2)	1975	"

Barley

QWRI-C12-AB	Nutrient screening trial	1974	M. Grundon

Navy Beans

INW-C23-AB	Varietal trial	1974-75	G.H. Malcolmson

Soybeans

WRK-C104-AB	Varietal trial	1974-75	G.H. Malcolmson

8.3 C.S.I.R.O.

Nutrient studies of soils from Terrica Station (1967-68)

8.4 LANDS DEPARTMENT

Timber control trials

8.5 FORESTRY DEPARTMENT

1. Timber control trials
2. Cypress growth rate and production trials
3. Introduced species (slash pine, etc.) adaptation and production trial

Sources of Information

1. Inglewood Field Station records

9. OTHER PRIMARY INDUSTRIES

9.1 FORESTRY

Forestry is one of the main industries in the Shire. The Forestry Department controls all millable trees in State forests and timber reserves. The Department has an office at Inglewood.

The total area of these reserves in the Shire is 109 554 hectares. The size of each reserve is given in Table 9.1 and the location of reserves is shown in Map 3.

In addition to these areas, the Crown, through the Forestry Department, owns and controls the harvesting of all timber on areas held under leasehold tenure, such as Grazing Farms, Grazing Homesteads, etc. Only timber on freehold land, or a lease which may ultimately be Freeholded such as Agricultural Farms or Prickly Pear Selections, may be used or controlled by the owner.

Reafforestation work is carried out only in areas reserved as State Forests. Reafforestation in the Shire is mainly concerned with the protection, regeneration and growth of cypress pine. Treatment involves thinning and removal of unwanted species and the construction of firebreaks and roads to protect and provide access to the timber.

Table 9.1

Inglewood Shire Forestry Reserves

Reserve (Parish)	*No.*	*Area ha*
Texas	13	2 181
Sands	79	20 300
Tandan	81	29 230
Devine	101	4 665
Greenup	120	1 681
Texas	132	981
Badgery	167	11 080
Gunyan	176	1 050
Bringalilly	341	35 770
Arcot	182	2 547
Texas	110	69
		109 554

Source: Forestry Department, Inglewood

There are four mills in the Shire, mainly milling cypress pine, supplying work for over 100 employees.

Timber from the Shire is sold in south-east Queensland and northern New South Wales. Large quantities, especially cypress pine, go to the Sydney area for house building.

Table 9.2 shows the production of timber milled in Inglewood Shire in recent years.

9.2 MINING

The old Silver Spur Mine, 11 km east of Texas, produced considerable amounts of silver, lead, gold and copper, the zinc contents remaining in the slag dumps. Existing workings to a depth of 152.5 m offer possibilities for further prospecting but dewatering and reconditioning of the mine would be necessary. In recent years interest has been displayed periodically by various mining organizations. At the Toolcambi mine a few kilometres north of Texas small shoots of oxidized copper ore have been worked. A limited production of fine grey marble has been won from deposits at Limevale near Texas.

Limestone has been quarried for extensive deposits south of Gore. To the north and north-east of Inglewood, numerous small manganese deposits have been prospected, and a small tonnage of metallurgical and chemical ore has been produced.

Table 9.2

Inglewood Shire - Timber Milled[1]
(Crown supplies only)

Year	*Cypress Pine* m^3	*Hardwood* m^3	*Sleepers* *No.*
1969-70	16 252	nil	30 391
1970-71	12 565	855	35 916
1971-72	14 458	1 032	47 204
1972-73	15 452	1 523	40 745
1973-74	14 917	1 482	nil
1974-75	11 100	569	319
1975-76	8 948	1 178	2 775

[1] True volume. For the years to 1973-74 volumes have been converted from 'hoppus' using factor of 1.27 units true volume to 1 unit 'hoppus'.
Source: Department of Forestry, Inglewood

Sources of Information

1. Queensland Department of Forestry, Inglewood

2. Department of Mines, Queensland (1976) - *Queensland Mining Guide*. Consolidated Print. Co., Brisbane

10. OTHER SHIRE STATISTICS AND GENERAL INFORMATION

10.1 OTHER RURAL INDUSTRY STATISTICS

Table 10.1

Inglewood Shire - Area and Production of Major Crops

Crop	*1971-72*		*1972-73*		*1973-74*		*1974-75*		*1975-76*	
	Area ha	*Prod. t*	*Area ha*	*Prod. t*	*Area ha*	*Prod. t*	*Area ha*	*Prod. t*	*Area ha*	*Prod. t*
Total area used for crops	20 000		20 000		17 000		18 000		17 000	
Total area of lucerne	3 558		3 416		1 657		1 880		1 517	
Total area of other sown pastures	5 719		6 481		10 256		10 597		5 048	
Grains and seeds -										
Wheat	9 07[illegible]	10 064	7 307	5 033	5 291	5 039	4 645	3 618	5 803	7 734
Barley	1 994	1 868	1 111	781	1 458	1 140	2 416	2 613	4 073	5 191
Grain sorghum	2 0[illegible]2	2 305	1 713	2 304	961	714	3 192	2 784	2 012	3 003
Sunflower	474	220	1 117	372	393	105	266	103	141	133
Navy beans	36	21	52	48	111	114	161	151	315	152
Soybeans			113	105	103	146	135	238	91	128
Millets	68	25	273	54	255	36	465	157	227	104
Tobacco	301	382	303	461	254	364	252	338	262	351
Annual Hay Crops	6	43	279	447	28	112	33	76	154	426
Green Fodder Crops -										
Oats	3 490		5 021		3 800		3 354		2 210	
Wheat	265		298		496		486		386	
Barley	770		623		992		374		255	
Sorghums	823		879		1 454		1 065		495	
Other	325		405		495		407		137	
Pastures for Hay -										
Lucerne	1 130	9 296	1 080	9 774	936	6 255	1 118	9 639	898	6 889
Other	106	494	122	467	56	178	92	262	46	140
Total area of vegetables	23		10		6		94		67	
Total area of orchards	13		9		10		7		11	
Total area of grapes	13		14		18		15		16	

Source: Australian Bureau of Statistics

Table 10.2

Inglewood Shire - Application of Artificial Fertilizer to Crops 1975-76

Pastures and Crops Fertilized	*Area Fertilized*	*Quantity and Type of Fertilizer Used*				
		Super.	*Straight Nitrogenous Type*			*Other (incl. Potash)*
			Urea	*Sulphate of Ammonia*	*Other*	
	ha	*t*	*t*	*t*	*t*	*t*
Lucerne	106	15	11			
Other pastures	106	25	5			
Wheat	229	22	10			
Oats	208	29	16			2
Barley	952	94	50			
Grain sorghum	218	17	9	15	3	
Other cereals	72	13	1			2
Vegetables	37	6	5			2
Fruit	2	1				
Grape vines	6	1	1			1
Other crops	380	53	40	3	8	105
Total	2316	276	148	18	11	112

Source: Australian Bureau of Statistics (unpublished data)

10.2 DEMOGRAPHY STATISTICS

Table 10.3

Inglewood Shire - Population Trends
(Population at Census dates)

Census (30 June)	*Inglewood*	*Texas*	*Yelarbon*[1] *(part)*	*Balance*	*Total Shire*
1933	631	756	n.a.	2910	4297
1947	800	858	n.a.	2399	4057
1954	1026	939	n.a.	2476	4441
1961	1058	1266	n.a.	2544	4868
1966	953	1230	n.a.	2954	4184
1971	974	1096	29	1546	3645
1976	1094[2]	917[2]	21[2]	1197[2]	3229

Source: Australian Bureau of Statistics
[1] Portion of Yelarbon within Inglewood Shire. Total population of Yelarbon at 30 June 1976 was 286 (preliminary)
[2] Preliminary figures

10.3 STATE GOVERNMENT SERVICES TO PRIMARY PRODUCERS

10.3.1 Department of Primary Industries

Service	*Location*	*Service*	*Location*
Agriculture	Inglewood Field Station	Pathology	Toowoomba
Apiculture	Entomology Branch, Brisbane	Pig Husbandry	Warwick
Beef Cattle Husbandry	Warwick	Research (irrigated crops)	Inglewood Field Station
Economist	Warwick & Goondiwindi	Sheep Husbandry	Warwick
Engineering	Toowoomba	Soil Conservation	Warwick
Entomology	Toowoomba	Standards	Toowoomba
Horticulture	Stanthorpe	Stock Inspector	Inglewood

10.3.2 Irrigation and Water Supply Commission

Service	*Location*
Water Offices	Coolmunda Dam & Glenlyon Dam
District Office	Warwick

10.3.3 Other Services

Service	*Location*
Agricultural Bank	Stanthorpe
Forestry Department	Inglewood
Lands Department	Toowoomba
National Parks & Wildlife Service	Hermitage, via Warwick

Sources of Information

1. Australian Bureau of Statistics (various publications)

2. Queensland Department of Primary Industries, Inglewood

11. ECONOMICS[1]

11.1 INTRODUCTION

11.1.1 Present Situation in Inglewood Shire

Farming is by far the most important activity in the Inglewood Shire. In recent years the gross value of crop production has exceeded the gross value for livestock and livestock products. The last five years has seen the gross value of crop production steadily increase while the gross value for livestock products and especially livestock has fluctuated markedly.

The area under cultivation appears stable at around 20 000 hectares while the area sown to lucerne has halved over the last five years. The area sown to other pasture has fluctuated; influenced mainly by the recent low returns to livestock and the high returns to crop, especially the winter grain crop. The area used for vegetables, orchards and grapes has more than doubled in recent years.

Some 3300 hectares are irrigated in the Inglewood Shire. Cereals, lucerne and tobacco are the main crops (in terms of area) irrigated. Spray irrigation is the most common method of application and in particular, travelling irrigators are the most popular as they require a lower labour input.

The high capital costs and the high production costs associated with irrigation are forcing many irrigators to look for crops with high returns. As a result increased plantings of navy beans, soybeans and vegetables have occurred at the expense of the lower return crops of winter cereal and summer sorghum.

In the early 1970s (up to 1973) there was a marked swing out of sheep and into cattle. This trend reflected the prices received for cattle and wool at that time. 1974 saw a decline in both sheep and cattle numbers while smaller increases have occurred in cattle numbers since 1974. It is thought that this latter increase is mainly due to producers holding cattle in anticipation of better prices. However, 1977 figures indicate that producers have changed this attitude of holding cattle back from sale.

Sheep numbers have increased over the last three years. However, this increase is expected to level off as the effects of overseas purchases of live sheep, especially wethers, become evident.

The number of rural holdings with cattle, first increased from 1970 onwards but is now decreasing, while the number of rural holdings with sheep have been declining steadily since 1970 - a reflection of increasing production costs, especially labour.

Table 11.1

Inglewood Shire - Estimated Gross Value of Rural Production
($'000)

Year	*Crops*	*Livestock*	*Livestock Products*	*Total*
1971-72	2202	1619	1248	5148
1972-73	2378	2504	2325	7207
1973-74	2342	3098	2042	7483
1974-75	2836	1363	1699	5899
1975-76	3700	1564	1918	7182

Source: Australian Bureau of Statistics
(Note: The estimated gross value in local authority areas is derived by applying the State average unit value of production for each commodity or livestock item to the physical volume of production originating in the area, and aggregating to major industry groups. While the figures provide an indication of the trends in rural production for Shires, the degree of accuracy for specific areas depends on the deviation of actual local prices from State averages.)

[1] As at September 1977

11.1.2 Gross Margin Analysis

When comparing alternative uses for cropland and pasture, a technique known as 'Gross Margin Analysis' can be employed. A gross margin is simply a measure of profit and provides a common basis for comparing and choosing between alternative activities. In this section, the activities examined are crops, sheep and cattle in the Inglewood Shire.

The gross margin for an activity is given by the gross income (yield times prices received) less those costs incurred in production (variable or direct costs). Variable costs are those costs which vary directly with the size and/or level of production, and include such items as: fuel, fertilizer, chemical sprays, machinery repairs, seed and direct labour costs. Not included are the Overhead and Fixed Costs which occur whether production takes place or not. These include rates and rent, interest and loan repayments. The gross margin for an activity indicates the contribution which that activity will make towards meeting overhead expenses and providing a profit.

To enable comparisons to be made between activities all gross margins should be expressed in the same units (e.g. dollars per hectare) and preferably in terms of a common limiting resource such as land, labour or capital.

Direct comparisons should not be made between the gross margins of different activities without first taking into consideration other controlling factors such as the availability of suitable labour, the capital requirements and the management level necessary for good performance.

The gross margins in this section are based on current and average values for such parameters as commodity prices and yields. With changing prices and production conditions these gross margins will need to be recalculated before any decision can be made with respect to the most profitable activity.

11.2 AGRICULTURAL CROPS

A wide range of summer and winter grain crops, lucerne and tobacco are grown in the Inglewood Shire. Barley, wheat and sorghum are grown under both irrigation and dryland conditions while sunflower, french white millet, navy beans, soybeans, french beans, lucerne and tobacco are only grown under irrigation.

The gross margins for the grain crops are set out in Table 11.2 (irrigation) and Table 11.3 (dryland). The gross margins for lucerne and tobacco are dealt with separately.

11.2.1 Production and Cost Data for Grain Crops

Yields

Yields are based on district averages.

Prices

Prices are grain prices obtained from the Queensland Graingrowers' Association, the Navy Bean Marketing Board and various seed merchants.

Land Preparation Costs

Land preparation costs will vary according to the operation, soil conditions and size of plant. For this exercise, the costs are based on a 45 kW drawbar power (60 D.B.H.P.) tractor and include fuel and oil, repairs and maintenance. The operations are:

	Cost $/ha
1 plough	5
1 scarify	3
1 scarify or 1 disc + pre-emergent spray	3
1 plant	3
	14
2 interrow cultivations for row crops	6
	20

Seed

Seed planting rates and prices are based on existing recommendations and current seed prices:

Crops	*Planting Rate kg/ha*	*Seed Price $/kg*	*Cost/ha $/ha*
Irrigated			
Barley	55	0.14	7.70
Wheat	68	0.14	9.52
Sorghum (hybrid)	11	1.00	11.00
Sunflower (hybrid)	11	3.50	38.50
French white millet	11	0.27	2.97
Navy beans	35	0.65	22.75
Soybeans	68[1]	0.40	27.20
French beans	88	1.80	158.40
Dryland			
Barley	25	0.14	3.50
Wheat	25	0.14	3.50
Sorghum (hybrid)	2	1.00	2.00

[1] Planting rate per kilogram for soybeans varies as the number of seed per kilogram varies. The optimum rate is 300 000 plants per hectare

Fertilizer

Fertilizer rates are those recommended and current prices (delivered to Inglewood) are used:

Nitrogen (N)	35 c/kg
Phosphorus (P)	86 c/kg

Pest Control

Herbicides	- Pre-emergent	
	Atrazine	$4.00/litre
	Treflan	$7.60/litre
	- Post-emergent	
	2,4-D amine 50	$1.76/litre
Insecticides	- Monocrotophos	$6.52/litre
	Lannate	$6.09/litre

Spraying

Spraying for weed and insect control

Boom	$2.50/ha/application
Aerial	$3.00/ha/application

Irrigation

Charges are based on Irrigation and Water Supply Commission water charges and on average pumping costs.

Crop	*Annual Water Requirement (Ml/ha)*	*Water Cost ($3/Ml) ($/ha)*	*Pumping Cost ($9/Ml) ($/ha)*
Barley	2.3	6.90	20.70
Wheat	2.3	6.90	20.70
Sorghum	4.6	13.80	41.40
Sunflower	4.6	13.80	41.40
French white millet	3.0	9.00	27.00
Navy beans	2.3	6.90	20.70
Soybeans	4.6	13.80	41.40
French beans	3.0	9.00	27.00

Harvesting

Charges are based on local control rates which vary from crop to crop. Harvesting of french beans is the responsibility of the processing firm.

Dryland cereals	$15.00/ha
Irrigated cereals	$18.00/ha
Sunflower	$30.00/ha
Navy and Soybeans	$38.00/ha

Freight

Rail

Barley from Inglewood to Warwick	$ 3.60/t
Wheat from Inglewood to Brisbane	$12.35/t

Road

Sorghum, millet, sunflower, soybeans from Inglewood to Toowoomba	$12.00/t
Navy beans from Inglewood to Kingaroy ($18.00/t less rebate $8.00/t)	$10.00/t

Levies

Levies for hail damage insurance.

Barley	$ 2.00/t
Wheat	$ 1.50/t

11.2.1 Gross Margins for Irrigated Crops

Table 11.2

Gross Margins for Irrigated Crops

Gross Margin/Crop	*Barley*	*Wheat*	*Sorghum*	*Sunflower*	*French White Millet*	*Navy Beans*	*Soybeans*	*French Beans*
Yield t/ha	3.5	2.5	5.0	2.0	2.0	1500 kg/ha	2.5	5200 kg/ha
Price $/t	75.0	105.0	70.0	160.0	90.0	46.0 c/kg	160.0	14.5 c/kg
GROSS REVENUE $/ha	262.50	262.50	350.00	320.00	180.00	690.00	400.00	754.00
Land preparation	14.00	14.00	20.00	20.00	14.00	20.00	20.00	20.00
Seed	7.70	9.52	11.00	38.50	2.97	22.75	27.20	158.40
Fertilizer N	28.00	28.00	35.00	21.00	29.75	35.00		35.00
P						8.60	6.60	8.60
Herbicide								
Atrazine			13.44					
Treflan				10.72		10.72	10.72	10.72
2,4-D	2.99	2.99	1.94		1.94			
Insecticide								
Monocrotophos			4.56					
Lannate (3)						25.58	25.58	25.58
Boom spray	2.50	2.50	5.00		2.50	7.50	7.50	7.50
Irrigation								
Water	6.90	6.90	13.80	13.80	9.00	6.90	13.80	9.00
Pumping	20.70	20.70	41.40	41.40	27.00	20.70	41.40	27.00
Harvesting	18.00	18.00	18.00	30.00	18.00	38.00	38.00	-
Freight Rail	12.60	30.88			24.70			
Road			60.00	24.00		15.00	30.00	
Levies	7.00	3.75						
VARIABLE COSTS $/ha	120.39	137.24	224.14	199.42	129.86	210.75	222.80	301.80
GROSS MARGIN $/ha	142.00	125.00	126.00	121.00	50.00	479.00	177.00	452.00

11.2.2 Gross Margins for Dryland Crops

Table 11.3

Gross Margins for Dryland Crops

Gross Margin / Crop	*Barley*	*Wheat*	*Sorghum*
Yield t/ha	1.2	1.2	1.7
Price $/t	85.00	105.00	70.00
GROSS REVENUE $/ha	102.00	126.00	119.00
Land preparation	14.00	14.00	14.00
Seed	3.50	3.50	2.00
Herbicide - 2,4-D	1.94	1.94	1.94
Insecticide - Monocrotophos			4.56
Aerial spray	3.00	3.00	6.00
Harvesting	15.00	15.00	15.00
Freight - Rail	4.32	14.82	21.00
Levies	2.40	1.80	-
VARIABLE COSTS $/ha	44.16	54.06	64.50
GROSS MARGIN $/ha	58.00	72.00	55.00

11.2.3 Lucerne Gross Margin

	$/ha
Gross Revenue $/ha:	
15 t/ha (525 bales) @ $30/t[1]	450.00
Variable Costs $/ha:	
Annual share of establishment costs[2]	15.88
Fertilizer - 125 kg/ha super @ $68.00/t	8.50
- spreading 40 c/app	0.40
Herbicide - 2.2 DPA 5.5 kg/ha @ $ 2.59/kg	14.25
- 125 ml/l wetting agent @ $1.74/l	0.22
Boom spray - 1 application @ $ 2.50	2.50
Irrigation - Water 9.2 Ml @ $ 3.00/Ml	27.60
- pumping 9.2 Ml @ $ 9.00/Ml	82.80
Harvest - 7 cuts/year	
mowing/condition @ $ 6.00/cuts	42.00
raking @ $ 1.50/cut	10.50
baling @ $ 8.00/cut	56.00
twine @ $ 0.035 /bale	18.38
Total Annual Variable Costs $/ha	279.03
GROSS MARGIN $ PER HECTARE	171.00

[1] Price quoted is on-farm price

[2] Establishment Costs of lucerne

Levelling (two operations)	5.00
Deep ripping	7.00
Discing	8.00
Chisel ploughing	3.00
Scarifying	3.00
Planting	3.00
Seed - 12 kg/ha @ $2/kg (cut seed)	24.00
Fertilizer - 250 kg/ha Mo (12) super $72/t	18.00
- spreading 40 c/operation	0.40
Weed control (mower or slasher)	2.00
Irrigation water 0.5 Ml @ $3/Ml	1.50
pumping 0.5 Ml @ $9/Ml	4.50
Total Establishment Variable Costs $/ha	79.40
Average production life of stand	5 years
Annual Share of Establishment Costs $/ha	15.88

11.2.4 Tobacco Gross Margins

INTRODUCTION

The tobacco industry in the Inglewood Shire is undergoing major changes in production methods. The cost and lack of skilled labour is the reason behind these changes. Producers are replacing the conventional curing barns with single-bay bulk curing barns and are replacing hand shift irrigation systems with solid set irrigation in an attempt to reduce the labour requirements of an otherwise labour intensive industry.

The average quota for the Shire is 11 tonnes which can be produced on six hectares.

ASSUMPTIONS

Tractors

Tractor costs are based on a 30 kW (40 D.B.H.P.) tractor. Costs include fuel and oil, repairs and maintenance.

Farm Operators

The farm operator and his family (wife and one child) provide the bulk of the labour requirements with casual labour only being employed during peak periods. The peak labour periods are:

Planting: 4 people pulling seedlings in the morning;
4 people planting in the afternoon.

Topping and Application of Suckercide: 5 people, 4 of whom operate hand guns connected to the spray boom.

Harvesting: 4 people working a 10 hour day to pick, load trailers, load bulk racks and curing barn. A barn holds 600 kg of cured leaf.

Casual Labour

Casual labour award rate is $3.30/hour (male).

Machinery

Machinery size is as outlined in the capital list.

Operation Speeds and Times

Operation speeds and times are as follows:

		km/hr	*(mph)*	*hrs/ha*
May	primary cultivation	4.8	(3)	1.07
July	disc harrows	9.6	(6)	0.70
October	soil fumigation	4.8	(3)	1.44
	rolling	9.6	(6)	0.43
	cultivation	6.4	(4)	0.71
October-November	planting			6.17
November-December	fertilizer - 1st basal	3.2	(2)	4.48
	- 2nd basal	6.4	(4)	
	- side dressing with final hilling	6.4	(4)	1.49
January-February	topping and suckercide	3.6	(2¼)	0.33
January-April	harvest (6 picks @ 2.5 hrs/ha/pick)			15.00
Planting to harvest	spraying - fungicide plus insecticide	3.2	(2)	4.44
During harvest	spraying - insecticide	3.2	(2)	2.22
TOTAL				38.48

Yield

Yield, in kilograms of cured leaf per hectare, and price in dollars per kilogram, vary; however for the purpose of this exercise average values have been used.

GROSS MARGIN

Gross Revenue $/ha

Yield	kg cured leaf/ha	1800
Price	$/kg	3.10
GROSS REVENUE	$/ha	5580

Variable Costs $/ha

Seedbed Costs - for a seedbed area to plant one hectare:

			$
Tractor running expenses	0.7 hrs	@ $ 1.93/hr	1.35
Soil fumigation - methyl bromide	2.8 kg	@ $ 2.94/kg	8.24
Fertilizer - tobacco mix 315	7.0 kg	@ $165.00/tonne	1.16
Seed	4.4 g	@ 3.6 c/g	0.16
Mulch - peatmoss	0.3 bales	@ $ 13.80/bale	4.14
Insecticide - lannate	100 gm	@ $ 27.50/kg	2.75
Fumigicide - benzol	50 l	@ 13.9 c/litre	6.95
TOTAL SEEDBED COSTS			$24.75

Field Costs:

Tractor running expenses	38.48 hrs	@ $ 1.93/hr	74.27
Soil fumigation - 15% EDB	225 litre/hr	@ 44.1 c/litre	99.23
Preemergent weedicide - nitralin	1 kg/ha	@ $ 16.09/kg	16.09
Fertilizer - basal - Tobacco mix 315	1 t/ha	@ $165.00/t	165.00
- sidedressing - potassium nitrate	124 kg/ha	@ $281.60/t	34.92
Insecticide - methomyl, 9 sprays	0.25 kg/ha spray	@ $ 27.50	51.98
Fungicide - maneb et al., 12 sprays	2.25 kg/ha spray	@ $ 3.21/kg	86.67
Suckercide - dodecanol alcohols et al.	28 litre/ha	@ $ 1.76/litre	49.28
Spray irrigation - water	6.3 Ml/ha	@ $ 3.00/Ml	18.90
- pumping	6.3 Ml/ha	@ $ 9.00/Ml	56.70
Labour - planting	26 hr/ha	@ $ 3.30/hr	85.80
- application of suckercide	16 hr/ha	@ $ 3.30/hr	52.80
- topping	10 hr/ha	@ $ 3.30/hr	33.00
TOTAL FIELD COSTS			$824.64

Harvesting and Marketing Costs:

Labour - 40 manhours (10 hours casual) are required to pick, load cart and load barn (3 barnloads per hectare)	30 hrs/ha	@ $ 3.30/hr	99.00
- bulking, grading and packing is done with family labour			
Fuel for curing - 360 litre of distillate per barnload of 600 kg 3 barnloads per hectare	1080 litre/ha	@ 10.78 c/litre	116.42
Hessian bales with string	26 bales/ha	@ $ 1.00/bale	26.00
Freight	1.8 tonne	@ $ 20.00/t	36.00
Research levy	1800 kg/ha	@ 1.1 c/kg	19.80
Warehouse levy	1800 kg/ha	@ 0.45 c/kg	8.10
Tobacco Leaf Marketing Board levy	1800 kg/ha	@ 2.0 c/kg	36.00
Commission	2.5% of gross proceeds $5580		139.50
Insurance	0.5% of gross proceeds $5580		27.90

Association levy for members of the South Queensland Tobacco Growers Cooperative is not included since this is placed in a revolving fund and the grower receives payment plus interest at the end of this period.

		$
Leaf and shed fumigation - phosphine tablets	18 tablets/ha @ 7 c/tablet (10 tablets/t)	1.26
TOTAL HARVESTING AND MARKETING COSTS		509.98
TOTAL VARIABLE COSTS $/ha		1359.37
GROSS MARGIN PER HECTARE		$4221.00

CAPITAL ITEMS

Quota Size - 11 tonnes cured leaf from six hectares

	$
30 kW (40 D.B.H.P.) tractor	7 000.00
Planter (one row)	700.00
Disc harrows (1.8 metre)	800.00
Soil fumigation equipment	300.00
Roller (two metre)	200.00
Tool bar cultivator (1.8 m) - scarifier with fertilizer box	700.00
- rolling cultivators	500.00
8 row offset spray system (boom tank trailer)	2 000.00
Herbicide spray boom	30.00
2 trailers	1 600.00
3 single bay curing barns (15 racks, 600 kg)	20 000.00
Baling press (hydraulic)	1 200.00
Bulk shed	12 000.00
Irrigation equipment (solid set)	15 024.00
Sundry	1 500.00
TOTAL CAPITAL INVESTMENT (excluding land)	$63 554.00

11.3 HORTICULTURAL CROPS

Apricots and grapes are the main horticultural crops grown in the Inglewood Shire.

In calculating the gross margins the costs have been divided into three categories:

Growing Costs

These costs vary with area but are not affected by yield or price received.

Harvesting, Freight, Levies and Handling Charges

These costs vary with yield and are calculated on a case or carton basis.

Marketing Costs

These vary with gross income and include commission and sales promotion levy.

11.3.1 Apricots

Growing costs	$300/ha
Harvesting, etc.	80 c/case
Marketing costs - commission	11% of gross sales
	1 c/$2 gross sales

See also table 11.4.

Table 11.4

Gross Margin - Apricots
($/ha and $/case)

Price per Case	*Unit*	*Yield per Hectare (10 kg cases)*				
$		*250* *$*	*500* *$*	*750* *$*	*1000* *$*	*1250* *$*
2	ha	- 57.50	185	428	670	913
	case	- 0.23	0.37	0.57	0.67	0.73
3	ha	164	628	1091	1555	2019
	case	0.66	1.26	1.46	1.56	1.62
4	ha	385	1070	1755	2440	3125
	case	1.54	2.14	2.34	2.44	2.50

11.3.2 Grapes

Growing costs (includes irrigation)	$716.00/ha
Harvesting, etc.	$ 1.94/case
Marketing costs - commission	11.5% of gross sales

Table 11.5

Gross Margin - Grapes
($/ha and $/case)

Price per Case	*Unit*	*Yield per Hectare (10 kg cases)*			
$		*1000* *$*	*1250* *$*	*1500* *$*	*1750* *$*
4	ha	884	1284	1684	2084
	case	0.88	1.03	1.12	1.19
5	ha	1769	2390	3011	3633
	case	1.77	1.91	2.01	2.08
6	ha	2654	3496	4339	5181
	case	2.65	2.80	2.89	2.96
7	ha	3539	4603	5666	6730
	case	3.54	3.68	3.78	3.85
8	ha	4424	5709	6994	8279
	case	4.42	4.57	4.66	4.73
9	ha	5309	6815	8321	9828
	case	5.31	5.45	5.55	5.62

11.4 SHEEP

Merino breeding and, to a lesser extent, wether flocks dominate the sheep scene in the Inglewood Shire. Very few property owners run crossbreed sheep for fat lamb production.

11.4.1 Merino Breeding Flock on Native Pasture

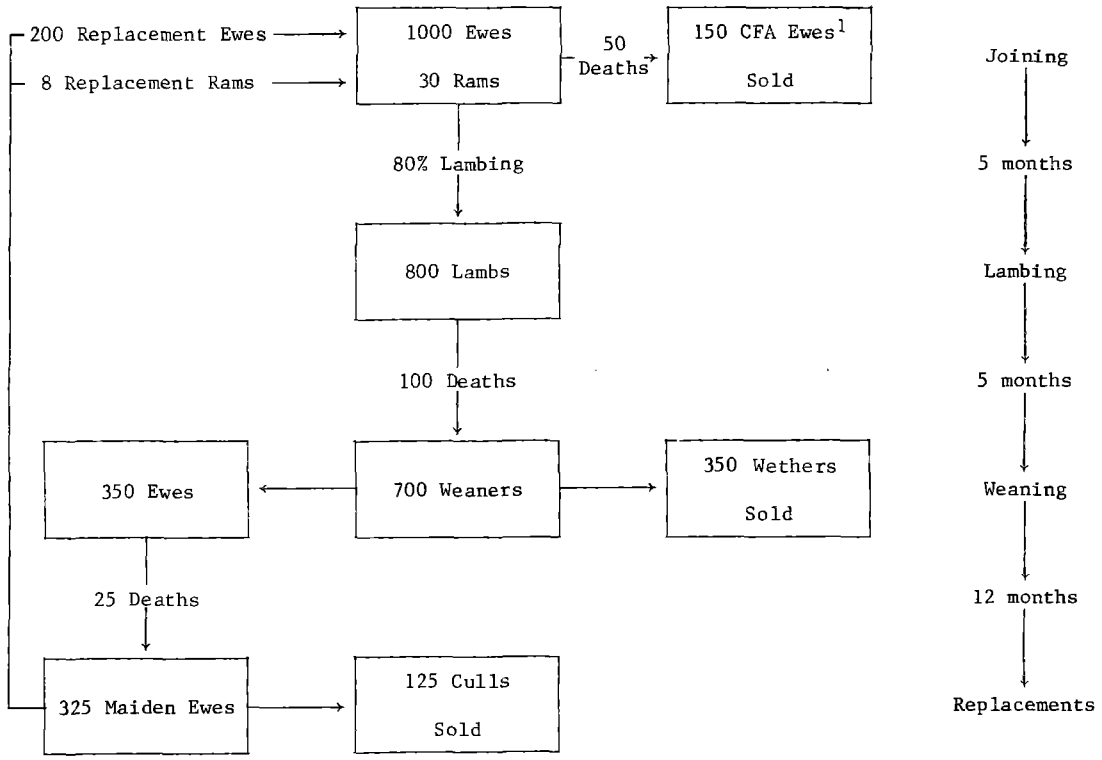
Flock Parameters

Wool Production

Stock	*Number Shorn*	*Wool Cut/Head*[1] *kg*	*Total Wool/Class kg*
Ewes	950	4	3800
Lambs (six months)	700	2	1400
Maiden ewes	325	4	1300
Rams	28	6	168

[1] Includes crutchings

Stock Flow Diagram



[1] CFA - Cast for Age

Gross Margin - 1000 ewes and followers

		$
Wool	6668 kg @ $ 1.10/kg[1]	7 334.80
CFA Ewes	150 hd @ $ 3.00/hd[2]	450.00
Cull maidens	125 hd @ $ 6.00/hd	750.00
Wether weaners	350 hd @ $ 6.00/hd	2 100.00
GROSS REVENUE		$10 634.80
Replacement rams	8 hd @ $70.00/hd	560.00
Wool selling expenses	10% gross sales + 6 c/kg	1 133.56
Stock commission	4% gross sales	132.00
Shearing	2003 hd @ $ 1.20/hd	2 403.60
Crutching	1030 hd @ 20c/hd	206.00
Lamb marking	800 hd @ $20.00/100 hd	160.00
Mulsing	400 hd @ $20.00/100 hd	80.00
Jetting	1380 hd @ 5 c/hd	69.00
Drenching	1380 hd @ 25 c/hd	345.00
Dipping	2003 hd @ 5 c/hd	100.15
Stock assessment	1380 hd @ 2 c/hd	27.60
VARIABLE COSTS		$ 5 216.91
GROSS MARGIN per 1000 ewes and followers		5 417.89
GROSS MARGIN per ewe and follower		5.42
GROSS MARGIN per hectare[3]		5.42

[1] $1.10/kg is the average wool price including skirtings, crutchings, etc.
[2] Stock prices quoted are on-farm prices
[3] Stocking rate of one ewe and follower per hectare

11.4.2 Merino Wether Flock on Native Pastures

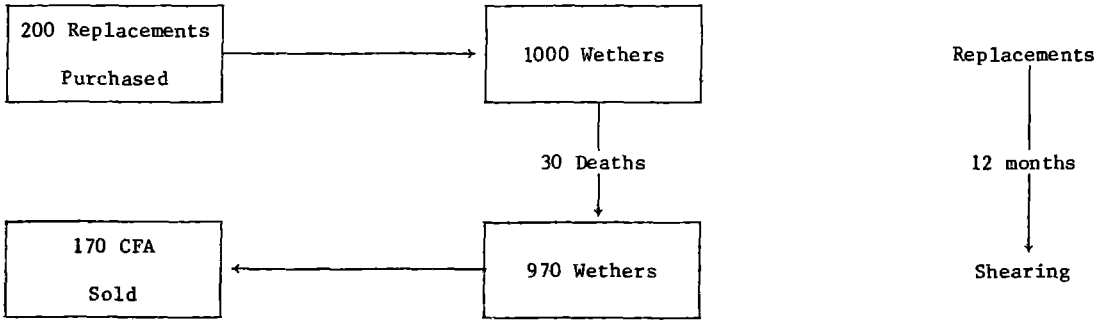
Flock Parameters

Wool Production

Stock	*Number*	*Wool Cut/Head*[1] *kg*	*Total Wool/Class kg*
Wethers	970	5.4	5238

[1] Includes crutchings

Stock Flow Diagram



Gross Margin - 1000 wethers

		$
Wool	5238 kg @ $1.10/kg[1]	5761.80
CFA wethers	170 hd @ $3.00/hd[2]	510.00
GROSS REVENUE		$6271.80
Replacements	200 hd @ $6.00/hd	1200.00
Wool selling expenses	10% gross income + 6 c/kg	890.46
Stock commission	4% gross sales	20.40
Shearing	970 hd @ $1.20/hd	1164.00
Crutching	1000 hd @ 20 c/hd	200.00
Jetting	1000 hd @ 5 c/hd	50.00
Drenching	1000 hd @ 25 c/hd	250.00
Dipping	1000 hd @ 5 c/hd	50.00
Stock assessment	1000 hd @ 2 c/hd	20.00
VARIABLE COSTS		$3844.86
GROSS MARGIN per 1000 wethers		2426.94
GROSS MARGIN per wether		2.43
GROSS MARGIN per hectare[3]		4.05

[1] $1.10/kg is the average wool price including skirtings, crutchings, etc.
[2] Stock prices quoted are on-farm prices
[3] Stocking rate is a wether to 3/5 hectare

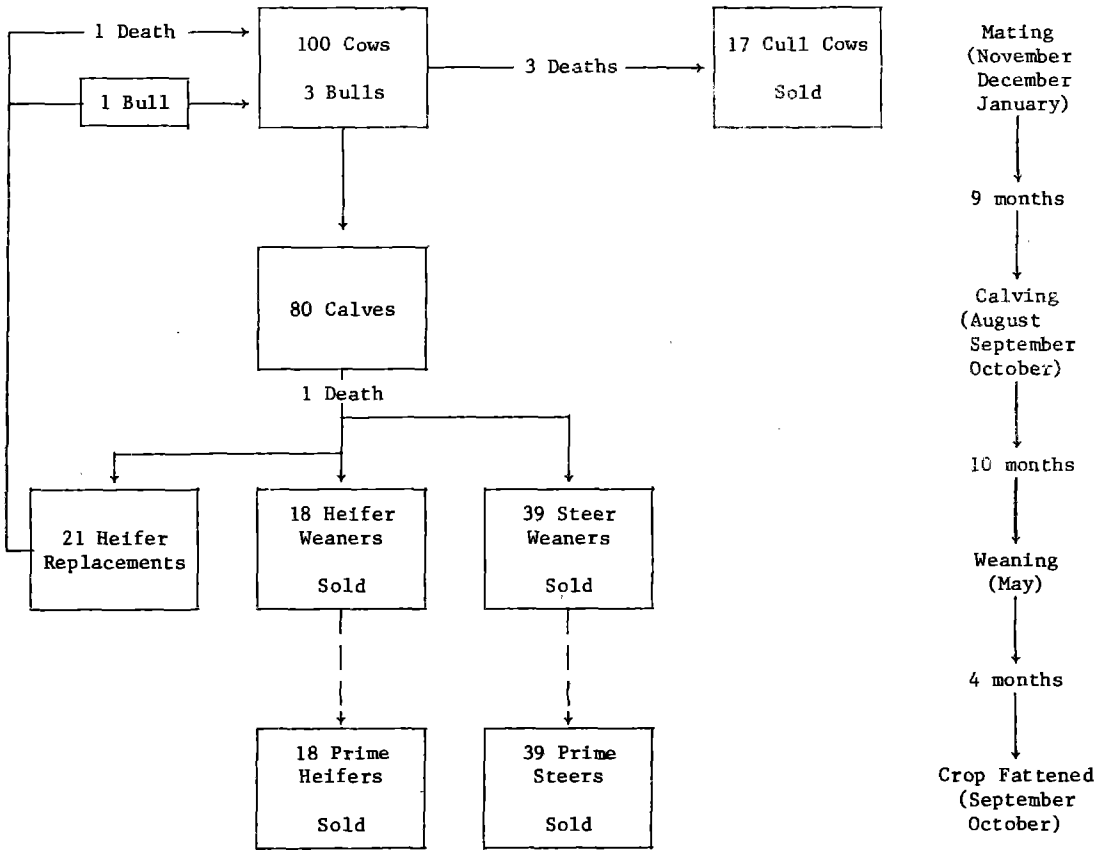
11.5 BEEF CATTLE

In this section the economics of a breeding herd turning off store weaners is compared with one turning off store yearlings. In addition, the economics of crop fattening on dryland and irrigated oats is investigated.

11.5.1 Store Weaner (6-10 months) Activity

Herd Parameters

Stock Flow Diagram



Gross Margin - 100 breeders and followers (stores)

		$
Cull cows	17 hd @ $ 50.00 ($30-$70)[1]	850.00
Store weaner steers	39 hd @ $ 60.00 ($30-$95)	2340.00
Store weaner heifers	18 hd @ $ 50.00 ($25-$75)	900.00
GROSS REVENUE		$4090.00
Bull replacement	1 hd @ $200.00 ($100-$500)	200.00
Vet costs	100 hd @ $ 2.00	200.00
Supplementary feed	120 hd @ $ 5.00	600.00
Stock assessment	100 hd @ 2 c	2.00
Commission	4% on gross sales	163.60
Yardage	74 hd @ 25 c	18.50
Freight[2]		
VARIABLE COSTS		$1184.00
GROSS MARGIN per 100 breeders and followers (stores)		2906.00
GROSS MARGIN per breeder and follower (store)		29.00
GROSS MARGIN per hectare[3]		3.63

[1] The figures in brackets, e.g. ($30-$70) are the range over which prices can vary for that class of stock. A simple average is used

[2] Freight costs vary from property to property, depending on distance from markets. Freight charges at the time of writing are - 3.5 c/hd/km for weaner stock; and 4.5 c/hd/km for adult stock

[3] Stocking rate is one breeder and follower to eight hectares

11.5.2 Prime Yearlings (10-14 months) Activity (Finishing Weaners)

The decision to crop fatten stock will depend on several factors, one of which will be the difference in price per kilogram between store and fat cattle.

Crop fattening assumptions for dryland and irrigated oats:

			Dryland Oats	*Irrigated Oats*
(a)	Selling Price - Steers		60 c/kg	66 c/kg
	- Heifers		55 c/kg	61 c/kg
(It is difficult to finish stock on dryland oats and the prices quoted are for forward stores)				
(b)	Stocking rate -		3 weaners/ha 57 weaners/19 ha	6 weaners/ha 57 weaners/9.5 ha
(c)	Weight gain - Rate	- Steers	0.57 kg/hd/day	0.91 kg/hd/day
		- Heifers	0.55 kg/hd/day	0.81 kg/hd/day
	- No. of days		100 days	140 days
	- Total gain	- Steers	28.5 kg dressed wt	64 kg dressed wt
		- Heifers	27.5 kg dressed wt	57 kg dressed wt

The weight gain in kilograms per head per day is an average rate for all soil types in the Inglewood Shire.

Also an allowance has been made for those years (four years out of 10) when dryland oat production fails due to adverse climatic conditions.

(d)	Value added - Steers	$17.10/hd	$42.24/hd
	- Heifers	$15.13/hd	$34.77/hd
(e)	Crop costs - 1 plough	$ 5.00	
	- 1 scarify	$ 3.00	
	- 1 plant	$ 3.00	
	Seed 25 kg/ha @ 17 c/kg	$ 4.25	
Total Costs Dryland			$15.25/ha
	Water 4.6 Ml @ $3.00/Ml	$13.80	
	Pumping 4.6 Ml @ $9.00/Ml	$41.40	
Total Costs Irrigation			$70.45/ha

Gross Margin for Dryland Oats

		$
Steers	39 hd @ $ 17.10/hd	666.90
Heifers	18 hd @ $ 15.13/hd	272.34
GROSS REVENUE		$ 939.00
Crop	19 ha @ $ 15.25/ha	289.75
Drench	57 hd @ 50 c/hd	28.50
Commission	4% of $939.24	37.57
VARIABLE COSTS		$ 356.00
GROSS MARGIN per 57 store weaners		583.00
GROSS MARGIN per hectare of dryland oats		30.68/ha
GROSS MARGIN per 100 breeders and followers (fats)		3489.00
GROSS MARGIN per breeder and follower (fats)		34.89

Gross Margin for Irrigated Oats

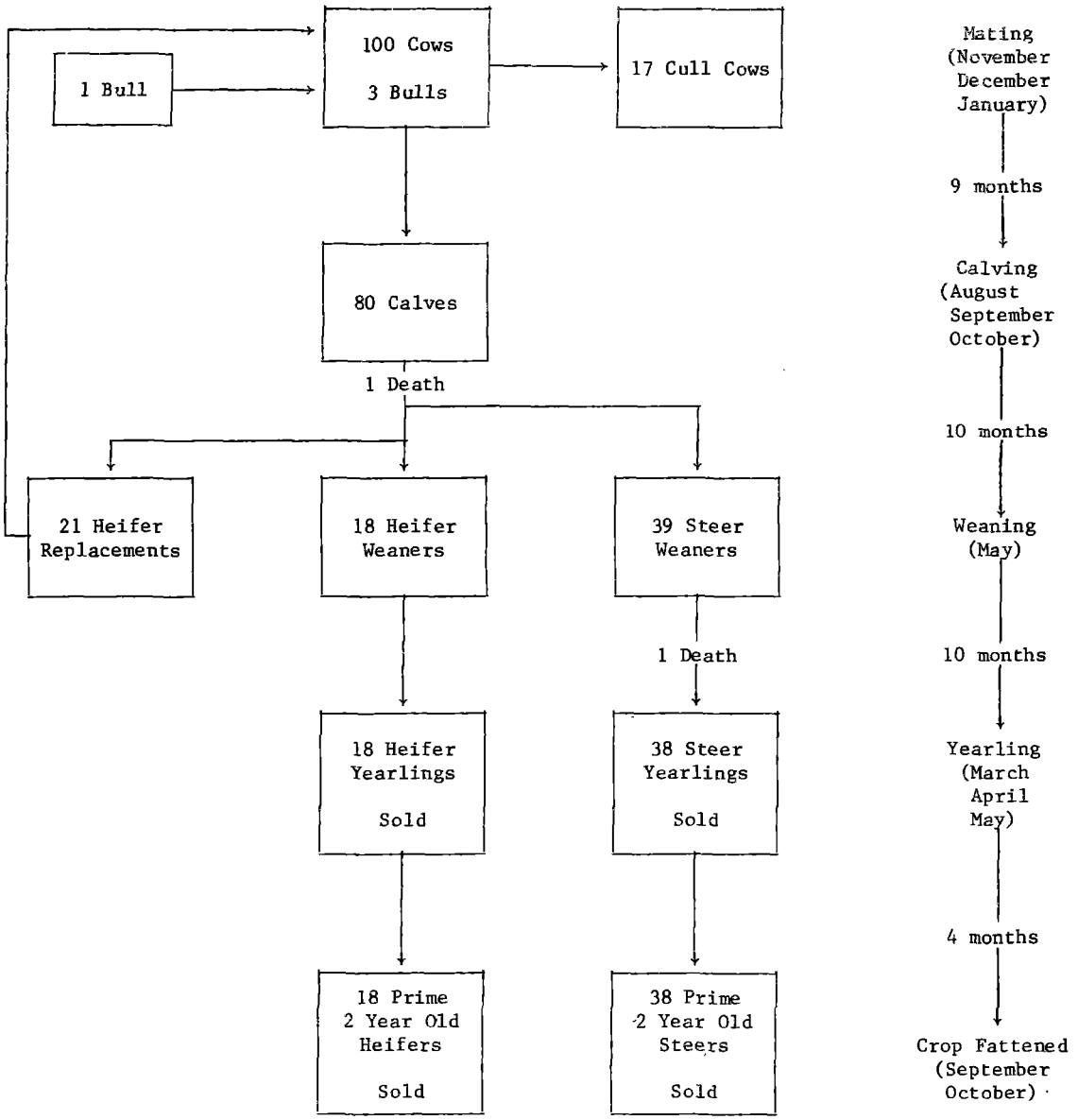
Steers	39 hd @ $42.24/hd	1647.36
Heifers	18 hd @ $34.77/hd	625.86
GROSS REVENUE		$2273.00

Costs		$
Crop	9.5 ha @ $ 70.45/ha	669.28
Drench	57 hd @ 50 c/hd	28.50
Commission	4% of $2273.22	90.89
VARIABLE COSTS		$ 789.00
GROSS MARGIN per 57 store weaners		1484.00
GROSS MARGIN per hectare of irrigated oats		156.21/ha
GROSS MARGIN per 100 breeders and followers (fats)		4390.00
GROSS MARGIN per breeder and follower (fats)		43.90

11.5.3 Store Yearling (18-22 months) Activity

Herd Parameters

Stock Flow Diagram



Gross Margin - 100 Breeders and Followers (stores)

		$
Cull cows	17 hd @ $ 50 ($30-$70)[1]	850.00
Store yearling steers	38 hd @ $ 60 ($30-$95)	2280.00
Store yearling heifers	18 hd @ $ 50 ($25-$75)	900.00
GROSS REVENUE		$4030.00
Bull replacement	1 hd @ $200.00 ($100-$500)	200.00
Vet costs	100 hd @ $ 2.25	225.00
Supplementary feed	120 hd @ $ 5.00	600.00
Stock assessment	100 hd @ 2 c	2.00
Commission	4% of gross sales	161.20
Yardage	73 hd @ 25 c	18.25
Freight[2]		
VARIABLE COSTS		$1206.00
GROSS MARGIN per 100 breeders and followers (stores)		2824.00
GROSS MARGIN per breeder and follower (stores)		28.24
GROSS MARGIN per hectare[3]		2.35

[1] The figures in brackets, e.g. ($30-$70) are the range over which prices can vary for that class of stock

[2] Freight costs vary from property to property depending on the distance from markets. Freight charges at the time of writing are: 4.5 c/hd/km for adult stock

[3] Stocking rate is one breeder and follower to 12 hectares

11.5.4 Prime Two-Year-Old (22-26 months) Activity (Finishing Yearlings)

Crop fattening assumption for dryland and irrigated oats:

		Dryland Oats	*Irrigated Oats*
(a)	Selling price - Steers	60 c/kg	62 c/kg
	- Heifers	55 c/kg	57 c/kg

It is difficult to finish stock on dryland oats and the prices quoted are for forward stores. There is a greater demand for younger stock, therefore the price for prime two-year-olds is slightly lower than the price for prime yearlings.

(b)	Stocking rate		2.5 yearlings/ha 56 yearlings/22.4 ha	5 yearlings/ha 56 yearlings/11.2 ha
(c)	Weight gain - Rate	- Steers	0.64 kg/hd/day	1.0 kg/hd/day
		- Heifers	0.62 kg/hd/day	0.9 kg/hd/day
	- No. of days		100 days	140 days
	- Total gain	- Steers	32 kg dressed wt	70 kg dressed wt
		- Heifers	31 kg dressed wt	63 kg dressed wt
(d)	Value added - Steers		$19.20/hd	$43.30/hd
	- Heifers		$17.05/hd	$35.91/hd
(e)	Crops costs		$15.25/ha	$70.45/ha

(See Section 11.5.2)

Gross Margin for Dryland Oats

		$
Steers	38 hd @ $ 19.20/hd (for wt added)	729.60
Heifers	18 hd @ $ 17.05/hd (for wt added)	306.90
GROSS REVENUE		$1037.00

Costs			$
Crop	22.4 ha	@ $ 15.25/ha	341.60
Drench	56 hd	@ 50 c/hd	28.00
Commission	4% of	@ $1036.50	41.46
VARIABLE COSTS			$ 411.00
GROSS MARGIN per 56 fat yearlings			626.00
GROSS MARGIN per hectare of dryland oats			27.95
GROSS MARGIN per 100 breeders and followers (fats)			3450.00
GROSS MARGIN per breeder and follower (fat)			34.50

Gross Margin for Irrigated Oats

Steers	38 hd	@ $ 43.40	1649.20
Heifers	18 hd	@ $ 35.91	646.38
GROSS REVENUE			$2296.00
Crop	11.2 ha	@ $ 70.45/ha	789.04
Drench	56 hd	@ 50 c/hd	28.00
Commission	4% of	$2295.58	91.82
VARIABLE COSTS			$ 909.00
GROSS MARGIN per 56 fat yearlings			1387.00
GROSS MARGIN per hectare of irrigated oats			123.84
GROSS MARGIN per 100 breeders and followers (fats)			4211.00
GROSS MARGIN per breeder and follower (fat)			42.11

Costs			$
Crop	22.4 ha	@ $ 15.25/ha	341.60
Drench	56 hd	@ 50 c/hd	28.00
Commission	4% of	@ $1036.50	41.46
VARIABLE COSTS			$ 411.00
GROSS MARGIN per 56 fat yearlings			626.00
GROSS MARGIN per hectare of dryland oats			27.95
GROSS MARGIN per 100 breeders and followers (fats)			3450.00
GROSS MARGIN per breeder and follower (fat)			34.50

Gross Margin for Irrigated Oats

Steers	38 hd	@ $ 43.40	1649.20
Heifers	18 hd	@ $ 35.91	646.38
GROSS REVENUE			$2296.00
Crop	11.2 ha	@ $ 70.45/ha	789.04
Drench	56 hd	@ 50 c/hd	28.00
Commission	4% of	$2295.58	91.82
VARIABLE COSTS			$ 909.00
GROSS MARGIN per 56 fat yearlings			1387.00
GROSS MARGIN per hectare of irrigated oats			123.84
GROSS MARGIN per 100 breeders and followers (fats)			4211.00
GROSS MARGIN per breeder and follower (fat)			42.11

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S. Mill, Economic Services Branch, Goondiwindi	Section 11

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A.S. Greasley, Agriculture Branch, Brisbane
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