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MACHINERY USAGE ON WHEAT FARMS IN THE CENTRAL-WEST*

by

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There has been a significant increase in the use of mechanised equipment on all types of farms in Australia in the post-war period. Although there was widespread adoption of mechanised equipment in the wheat industry at a much earlier date than in most of the other agricultural industries, there has been a marked increase in the use of tractors and other machinery by wheat-growers since the end of World War II.

With a view to filling some of the gaps which exist in our knowledge of the usage and costs of operating machinery on wheat farms and of the existing and potential demand for wheat-growing machinery, the Division of Marketing and Agricultural Economics conducted a survey on ninety-four farms in a typical central-western wheat district during February and March, 1951.

In this article a factual picture of machinery usage on the farms included in the survey is presented. Current and potential demand for machinery used in the wheat industry is also discussed. Information collected during the course of the survey on the cost of operating tractors and selected implements will be considered in a subsequent article.

The ninety-four farms from which information was obtained were selected at random. The selected farms represent approximately eight per cent. of the wheat farms in the area in which the survey was conducted. Only farms on which wheat had been grown in recent years were included in the sample.

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1. DESCRIPTION OF THE AREA.

The survey was carried out in the adjoining Shires of Goobang and Jemalong and in the Municipalities of Parkes and Forbes. Farmers selected for interview in the Municipality of Peak Hill, which adjoins the Shire of Goobang, were unable to participate in the survey.

The Shires of Goobang and Jemalong are situated in the Central Western Slopes Division of New South Wales and are two of the major wheat-producing shires of the State. In the eastern portion of both shires the country is hilly and in parts, particularly in Goobang Shire, is suitable only for grazing. The major portion of both shires is, however, gently undulating, becoming quite flat in the western section.

Average annual rainfall varies from 22 inches in the most easterly areas to 17 inches on the western boundary. The greater part of both shires is suitable for wheat-growing. The district is considered to be typical of the central-western wheat belt.

The Lachlan River flows in a westerly direction through the centre of Jemalong Shire. There is a number of irrigation projects situated along that river. Little wheat is grown under irrigation but a variety of other crops is produced. Farms are naturally generally smaller in area along the river than in the dry, unirrigated areas. The main crops produced under irrigation are lucerne and vegetables. Dairying is also carried out on a number of irrigated farms. There is no river of any importance in Goobang Shire and consequently the type of farming carried on varies less, being restricted almost exclusively to either wheat-growing, with sheep as a major sideline, or grazing.

Properties devoted solely to grazing are found in the relatively small area of rough hilly country in the eastern section of Goobang Shire and in parts of the far-western portion of that shire, where rainfall is low. Grazing is also the main occupation in the south-western portion of Jemalong Shire. Occasional properties devoted entirely to grazing are scattered throughout the whole district. However, mixed wheat-sheep farming is the predominant type of farming in both shires, except in the immediate vicinity of the Lachlan River and in the areas where, as already indicated, grazing predominates.

Table I illustrates the importance of wheat-growing in the district, while Table II indicates the importance of the selected area as a wheat-producing district, relative to the remainder of the State. It will be noted that almost 10 per cent. of the area harvested for wheat (grain) in New South Wales in the 1949-50 season was located in the selected district. The figures quoted are the latest available but they relate to a period approximately twelve months previous to the time the survey was undertaken.

TABLE I.

Number of Holdings Growing 20 Acres or More of Grain Crops and Total Number of Holdings at 31st March, 1950.

Shire or Municipality.	Number of Holdings Growing 20 Acres or More.				Total Number of Holdings. ^a
	Wheat.	Oats.	Barley.	Sorghum.	
Goobang	694	219	24	2	838
Parkes	4	...	...	...	36
Peak Hill	20	5	...	...	28
Jemalong	466	106	2	...	638
Forbes	7	...	...	...	39
Total	1,191	330	26	2	1,579

^a A holding is defined for census purposes as any area of an acre or more used for agricultural and pastoral purposes.

Source : Bureau of Statistics and Economics.

TABLE II.

Holdings and Wheat Areas in the Selected District and the State of New South Wales, 1949-50.

Area.	Total Number of Holdings.	Percentage of Total.	Number of Holdings Growing 20 Acres or More of Wheat for Grain.	Percentage of Total.	Area of Wheat for Grain.	Percentage of Total.
New South Wales ...	73,987	Per cent. 100.0	15,594	Per cent. 100.0	Acres. 4,011,744	Per cent. 100.0
Shires of Goobang and Jemalong and three associated municipalities	1,579	2.1	1,191	7.6	385,394	9.6

Source : Bureau of Statistics and Economics.

Loams, of various textures and colour, are the predominant soil type in the two shires. The most common is a medium to heavy red loam. However, a wide variety of other soils, ranging all the way from heavy clays to sandy soils, are found throughout the district.

In view of the great variability of soil types and the fact that several types of soil were found on most farms in the sample it has not been possible to relate machinery usage or costs to soil type. It is, nevertheless, necessary to point out that not only costs but the type and size of tractor and implements used are directly affected by the soil type.

2. THE SELECTED FARMS.

Size of Farms.

Farms in the sample varied in area from 78 acres to 17,000 acres. The 78-acre property was an irrigated farm on the Lachlan River on which small areas of wheat were occasionally grown. It was worked in association with an unirrigated wheat farm some miles distant. The 17,000-acre station was a large grazing property, on which a moderately large area is usually sown to wheat. These two properties were, however, quite exceptional and are not by any means typical of the holdings in the district. Most wheat farms in the area range from 600 acres to 2,000 acres in area. Seventy-one of the ninety-four farms in the sample fell within this range. There were sixteen farms of over 2,000 acres in area and seven of less than 600 acres.

On all the farms included in the survey, wheat had been grown in recent years. On three, no wheat was sown in 1950, while nine farmers indicated that they did not intend sowing any wheat in 1951. However, although two farms were predominantly small mixed irrigation properties on which intensive cropping was practised, and a few of the other properties were predominantly grazing propositions, each of the ninety-four farms included in the survey normally produces some wheat. Those few farmers who did not intend planting wheat in 1951 will almost certainly revert to wheat-growing should there be any significant improvement in the price of wheat relative to the price of wool.

Frequency Distribution of Farms by Size.

Farms have been classified by size. The seven groupings used are shown in Table III. Farms of up to 600 acres would normally be too small to provide a satisfactory income from wheat and wool alone. A reasonable standard of living could be obtained on such farms by a full-time operator only if the farm were irrigated, or if pig or poultry enterprises were conducted as the main enterprise or a major sideline. It was common, on farms of the size in question, for the operator to supplement his income by undertaking contract work with his farm plant or engaging in other part-time work off his farm.

TABLE III.
Selected Farms Classified by Size.

Acreage.	Goobang.		Parkes.		Jemalong.		Forbes.		Total.		
	No.	Average Area.	No.	Average Area.	No.	Average Area.	No.	Average Area.	No.	Average Area.	
Acres.		Acres.		Acres.		Acres.		Acres.		Acres.	
1-250	...	...	...	...	1	245	1	78	2	162
251-600	4	511	...	...	1	432	...	...	5	495
601-1,000	15	806	...	...	10	835	...	...	25	818
1,001-1,500	23	1,194	1	1,050	6	1,205	...	...	30	1,195
1,501-2,000	9	1,700	...	...	7	1,662	...	...	16	1,683
2,001-3,000	5	2,725	...	...	4	2,298	...	...	9	2,536
Over 3,000	3	3,579	...	...	4	7,531	...	...	7	5,837
Total	...	59	1,358	1	1,050	33	2,037	1	78	94	1,588

Farms ranging from 601 to 1,000 acres predominate in the eastern part of the two shires, where the rainfall is relatively high. Towards the west farms are generally larger. Farms of from 1,501 to 3,000 acres predominate in the western portion of the district. It will be noted that almost one-third of the farms in the sample ranged from 1,001 to 1,500 acres, the average area of farms in that group being 1,195 acres.

The size of farms in the sample did not follow precisely the same pattern in the two shires. There was far greater variation in farm size in Jemalong than in Goobang Shire. A relatively greater number of large farms (over 2,000 acres) occur in Jemalong Shire and also a relatively larger number of farms of under 1,000 acres. The average area of farms was greater in Jemalong than in Goobang Shire.

Area Available for Cropping.

For the purpose of the present study the area available for cropping is of greater significance than the total area of the farm. Farms grouped according to area of arable land—land available for cultivation at the time the survey was undertaken, but excluding uncleared land which could be cultivated if cleared—are shown in Table IV.

TABLE IV.

Selected Farms Classified by Area of Arable Land.

Acreage.	Goobang.		Parkes.		Jemalong.		Forbes.		Total.		
	No.	Average Area.	No.	Average Area.	No.	Average Area.	No.	Average Area.	No.	Average Area.	
Acres.		Acres.		Acres.		Acres.		Acres.		Acres.	
1-250	...	...	...	...	3	192	1	78	4	163
251-600	18	493	1	600	6	473	...	...	25	492
601-1,000	26	797	...	...	13	812	...	...	39	802
1,001-1,500	11	1,282	...	...	7	1,352	...	...	18	1,309
1,501-2,000	4	1,909	...	...	4	1,832	...	...	8	1,871
Total	...	59	863	1	600	33	933	1	78	94	875

It will be noted that farms with from 601 to 1,000 acres of arable land predominate in both shires. The average area of arable land on such farms was 802 acres. On 87 per cent. of the farms in the sample the area of arable land ranged from 251 to 1,500 acres.

3. FARM MECHANISATION IN THE AREA.

Official Statistics.

In Table V the number of holdings with tractors and the number of agricultural tractors in use in the two shires and three municipalities during the period 1937 to 1950 is shown. Since 1944 the official statistics have differentiated between wheeled and crawler-type tractors. However, crawler-type tractors are relatively little used for agricultural purposes in central-western districts.

TABLE V.
Tractors in Use on Rural Holdings in the Shires of Goobang and Jemalong and the Municipalities of Parkes, Peak Hill and Forbes.

Year.	Number of Holdings with Tractors.			Number of Tractors.		
	Wheeled.	Crawler.	Total.	Wheeled.	Crawler.	Total.
1936-37	<i>a</i>	<i>a</i>	560	<i>a</i>	<i>a</i>	658
1937-38	<i>a</i>	<i>a</i>	690	<i>a</i>	<i>a</i>	803
1938-39	<i>a</i>	<i>a</i>	749	<i>a</i>	<i>a</i>	862
1939-40	<i>a</i>	<i>a</i>	768	<i>a</i>	<i>a</i>	900
1940-41	<i>a</i>	<i>a</i>	801	<i>a</i>	<i>a</i>	925
1941-42	<i>a</i>	<i>a</i>	801	<i>a</i>	<i>a</i>	907
1942-43	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1943-44	724	57	764	797	61	858
1944-45	768	56	808	850	60	910
1945-46	809	65	849	895	68	963
1946-47	874	68	920	975	69	1,044
1947-48	894	79	947	982	84	1,076
1948-49	946	64	983	1,068	66	1,134
1949-50	1,011	101	1,059	1,226	115	1,341

a Not available.

Source: Bureau of Statistics and Economics.

In Table VI the number of tractors on the sample farms is shown by shires and municipalities. Crawler-type tractors are shown separately.

TABLE VI.
Tractors in Use on Selected Farms.

Shire or Municipality.	Farms in Sample.	Number of Farms with Tractors.			Number of Tractors.		
		Wheeled.	Crawler.	Total.	Wheeled.	Crawler.	Total.
Goobang ...	59	58	6	59	72	6	78
Parkes ...	1	1	...	1	1	...	1
Jemalong ...	33	30	...	30	45	...	45
Forbes ...	1	1	...	1	1	...	1
Total ...	94	90	6	91	119	6	125

According to figures made available by the Bureau of Statistics and Economics, 56 per cent. of the tractors in the area in March, 1950, were located in the Goobang Shire, 41 per cent. in Jemalong Shire and 3 per cent. in the three municipalities. Of the 125 tractors in use on the ninety-four farms in the sample, 62.7 per cent. were located in Goobang Shire and 35.7 per cent. in Jemalong Shire, with 1.6 per cent. in the municipalities.

Intensity of Mechanisation.

Of the ninety-four farms in the sample, ninety-one had tractors at the time of the survey. Of the three farms which did not have tractors one had just been sold to a neighbour who intended to work the farm with tractor power in the future; on another the purchase of a second-hand tractor was being negotiated and it was expected that the tractor would be available within a few weeks; while on a third a tractor was on order. On this third farm, little wheat had been produced for several years, primarily owing to high wool prices. It was not the farmer's intention, at the time of the interview, to plant large areas of wheat when the tractor, which was on order, was received.

It is obvious that the change from horse to tractor power which has been in progress on wheat farms in the area for over two decades has been virtually completed. It is doubtful whether even 1 per cent. of the wheat-growers in the area now use horses as their sole source of farm power. In fact, very few farmers use horses at all in connection with their wheat-growing activities. The fact that the change to tractor power has now been completed has considerable significance in so far as the future demand for tractors in wheat-growing areas is concerned.

Horses on Farms.

Official statistics, shown in Table VII, reveal a steady decline in the horse population of the area during the past two decades. However, the decline in the use made of draught horses is undoubtedly even greater than these statistics indicate.

Many farmers, when they changed to tractor power, did not dispose of their horses, but turned them out to grass, although, in many instances, they made no further use of them. Many such horses still remain on farms. Some farmers continued to use a horse team for a time, in conjunction with their tractor. More commonly two or three horses only were retained for light work, particularly on farms on which lucerne was produced as a sideline.

TABLE VII.

Number of Horses in Goobang and Jemalong Shires, 1936-37 to 1949-50.

1936-37	..	..	..	..	..	..	..	16,006
1937-38	..	..	..	..	..	..	..	14,761
1938-39	..	..	..	..	..	..	..	14,514
1939-40	..	..	..	..	..	..	..	14,335
1940-41	..	..	..	..	..	..	..	14,311
1941-42	..	..	..	..	..	..	..	13,975
1942-43	..	..	..	..	..	..	..	12,558
1943-44	..	..	..	..	..	..	..	11,678
1944-45	..	..	..	..	..	..	..	9,988
1945-46	..	..	..	..	..	..	..	9,040
1946-47	..	..	..	..	..	..	..	8,145
1947-48	..	..	..	..	..	..	..	7,627
1948-49	..	..	..	..	..	..	..	6,817
1949-50	..	..	..	..	..	..	..	6,344

Source: Bureau of Statistics and Economics.

Horses on the Selected Farms.

On fifty-two of the sample farms there were no draught horses at all. On only ten farms were there eight or more draught horses. On the ninety-four farms there were only 184 draught horses. The average number of such horses on farms having draughts was 4.3.

Eleven farms had neither draught nor light horses. On these, and some of the other farms, operators preferred to rely entirely on tractor power and motor transport to meet their requirements.

There is virtually no demand for draught horses in the district. Sound draughts seldom realise more than £8 per head at sales and frequently sell for as low as £3 per head.

The rapid replacement of horses by tractor power in recent years has undoubtedly been influenced to a considerable extent by the high cost of labour and the difficulty experienced in obtaining men capable of and willing to work large horse-teams. High prices for wheat and wool, since the end of World War II, have also exerted an important influence in that they have enabled the smaller farmer to invest relatively large amounts of capital in farm machinery. In pre-war years most of the smaller wheat-growers were probably under-capitalised and in many instances had insufficient cash resources to enable them to invest in a tractor.

Eight-horse teams were most commonly used for wheat-growing in the district prior to the widespread introduction of tractor power, although many farmers used ten horses and occasionally larger teams.

Where horses were sold as the result of the purchase of a tractor, the average number sold was eleven. Farmers considered that an average of ten additional sheep could be run for each horse disposed of.

4. MECHANISATION ON THE SELECTED FARMS.**(a) Tractors.****Size of Tractors.**

It has already been noted that there were 125 tractors on the ninety-four farms in the sample. As might be expected, there was considerable variation in the size of the tractors in use. For the purpose of this study it has therefore been necessary to group tractors according to size.

Tractors have been classified according to their *rated drawbar horse-power* as determined by the Nebraska test or an equivalent test conducted in Australia by the Aeronautical Research Laboratories of the Commonwealth Department of Supply. In a few instances no test has yet been carried out on tractors included in the survey and in these cases the drawbar horse-power has been estimated.

All tractors included in the survey, excluding the six crawler-type tractors, have been grouped according to the rated drawbar horse-power, as follows:—

Small Tractors—Under 20 horse-power.

Medium Tractors—20 to 28 horse-power.

Large Tractors—Over 28 horse-power.

Tractors under 20 horse-power are not suited for use in wheat production. There were only four such tractors on the ninety-four farms. These “small” tractors were located on three farms with an arable area of from 1,501 to 2,000 acres and were used as a subsidiary source of farm power. A small tractor of about 15 horse-power will frequently be found of considerable value on farms on which lucerne is a significant sideline. However, generally, farmers in the district still use horses for their lucerne work.

In view of the small number of tractors of less than 20 horse-power in the sample this group of tractors will not be further considered in this article except when discussing the potential demand for farm tractors. For the same reason crawler-type tractors will not receive the same detailed consideration as will be devoted to wheeled-type tractors.

All the tractors used in wheat-growing were over 20 horse-power, current models in common use ranging from 21.2 horse-power to 37.12 horse-power. Most farmers interviewed regarded tractors of under 25 horse-power as too small to be fully satisfactory.

A moderate number of farmers considered that tractors of from 25 to 28 horse-power were satisfactory for wheat-growing purposes. However, as will be seen from the detailed figures which follow, the majority were firmly of the opinion that the only tractors suitable for use on wheat farms (as the prime source of power) are those classified for the purpose of this study as “large,” that is, having a rating in excess of 28 horse-power.

Despite farmers’ expressed preference for “large” tractors, “medium” tractors predominated on the selected farms. The relatively large number of tractors of less than 25 horse-power at present in use in the district is mainly due to the fact that relatively heavy supplies of such tractors have been available since 1945, during which period there has been an acute shortage of “large” tractors, particularly tractors of over 28 horse-power. However, on many wheat farms, tractors of from 25 to 28 horse-power meet all demands made on them.

Table VIII shows the distribution of “large,” “medium,” “small” and crawler-type tractors according to the area available for cropping. Also the number of farms with one, two or three tractors are tabulated. No farms had more than three tractors, but twenty-eight of the ninety-four farms had two tractors. As might be expected, “large” tractors predominate on the farms with over 1,500 acres of arable land but “medium” tractors predominate in all other groups.

TABLE VIII.
*Distribution of Tractors According to the Area of Arable Land on
 Selected Farms.*

Classification.	Area of Arable Land in Acres.					Total
	1-250	251-600	601-1,000	1,001-1,500	1,501-2,000	
<i>Number of Tractors by Types.</i>						
Wheeled—						
“ Large ” ...	1	7	17	10	7	42
“ Medium ” ...	2	22	30	16	3	73
“ Small ” ...	...	...	...	...	4	4
Sub-Total ...	3	29	47	26	14	119
Crawler ...	...	1	2	3	...	6
Total ...	3	30	49	29	14	125

<i>Number of Tractors by Fuel Used.</i>						
Kerosene—						
Wheeled ^a ...	3	22	38	23	11	97
Crawler ...	...	...	...	...	...	...
Total ...	3	22	38	23	11	97
Diesel—						
Wheeled ...	...	7	9	3	3	22
Crawler ...	...	1	2	3	...	6
Total ...	...	8	11	6	3	28

<i>Number of Farms Having Tractors.</i>						
Number of Tractors—						
Nil ...	1	1	1	...	...	3
1 ...	3	18	27	9	3	60
2 ...	...	6	11	7	4	28
3 ...	...	...	...	2	1	3

^a Includes one petrol tractor.

Area Cropped by Tractors and Horses.

The area available for cropping assumes particular significance when considered in relation to the potential area which can be cropped with tractor power. Farmers were asked to indicate the maximum area of crop they could handle annually with their existing tractor and without engaging in shift work. Naturally there was considerable variation in farmers' estimates, depending, *inter alia*, upon the size of the tractor and the type of soil worked.

Answers to this question, when averaged, indicate that, with a "large" tractor a farmer, who does not engage in shift work can, if his farm is large enough, crop approximately 650 acres per annum, unless conditions are particularly difficult. A farmer using a "medium" tractor can crop approximately 500 acres annually, under similar circumstances.

It was considered that the area which could be cropped annually with a horse-team would average 300 acres. Here again there was great variation in the answers given, depending on the size of the team used, the type of soil worked and the farmer's attitude towards hours worked during busy periods. It was almost universally agreed that the farmer would have to work appreciably longer hours to crop 300 acres with horses than to crop 500 acres with a "medium" tractor or 650 acres with a "large" tractor.

On only eight of the ninety-four farms in the sample did the arable area exceed 1,500 acres. It is apparent, therefore, that even a "medium" tractor cannot be used to its full capacity on the majority of farms in the district, assuming a three-year rotation is followed, unless very substantial use is made of the tractor for work other than cropping. Evidence gained during the course of the survey suggests that tractors are not used for belt or pasture work to any considerable extent. The fact is, then, that the majority of farms in the district are too small to enable modern machinery to be used to the greatest advantage. This would apply even if a two-year rotation were practised.

At the present time there is little incentive to sow large areas of wheat. High wool prices have resulted in a reduction in wheat areas in recent years, operators preferring to divert some of their resources, at least, to wool and fat lamb production. In 1950 the average area cropped on the selected farms was 294 acres. On only ten farms was an area of 500 acres or more cropped.

The fact that most tractors are not utilised to their full capacity does not necessarily mean that smaller tractors than are in general use would prove satisfactory for wheat-growing in the district. In many instances "large" tractors are necessary to cope adequately with the heavy soil found in parts of the district. While frequently the time saved by using a "large" tractor, with implements of proportionate size, will more than offset the additional capital investment required for such equipment, by comparison with lighter, less powerful machinery.

Makes of Tractors.

In Table IX the 125 tractors included in the survey are classified according to make.

TABLE IX.
Classification of Tractors According to Make.

Make.	Number of Tractors.			Percentage of Total.
	Kerosene.	Diesel.	Total.	
				Per cent.
McCormick-International ...	33	5 ^a	38 ^a	30.4
Oliver (Hart-Parr) ...	16	...	16	12.8
Case ...	14	...	14	11.2
Fordson ...	10	2	12	9.6
John Deere ...	7	...	7	5.6
Massey Harris ...	7	...	7	5.6
Field Marshall ...	...	6	6	4.8
Bulldog-Lanz and K.L. ...	...	5 ^a	5 ^a	4.0
Caterpillar ...	...	4 ^b	4 ^b	3.2
M-M Twin City ...	4	...	4	3.2
Nuffield ...	3	...	3	2.4
Allis Chalmers ...	2	...	2	1.6
Hanomag ...	...	2	2	1.6
David Brown ...	1	...	1	0.8
Ferguson ...	1 ^c	...	1 ^c	0.8
H.S.C.S.-Steel Horse ...	...	1	1	0.8
McDonald Imperial ...	...	1	1	0.8
Sift ...	...	1	1	0.8
Total ...	98 ^d	27	125 ^e	100.0

^a Includes one crawler-type.

^b All crawler-type.

^c Petrol.

^d Includes one petrol wheeled-type tractor.

^e Includes six crawler-type diesel tractors.

Table X shows tractors by area of origin. Tractors of North American origin predominate. They accounted for approximately 70 per cent. of the 115 wheeled-type "medium" and "large" tractors in use. They would undoubtedly have comprised a larger proportion of the total if all makes of tractors had been freely available in recent years. Tractors manufactured in the United Kingdom accounted for 19 per cent. of the tractors in use. The remainder were of European and local manufacture.

TABLE X.
Tractors by Area of Origin.

Area of Origin.	Wheeled-type.			Crawler-type Diesel.	All Types.
	Kerosene.	Diesel.	Petrol.		
North America ...	79	4	...	5	88
United Kingdom ...	14	8	1	...	23
Europe ...	...	7	...	1	8
Australia ...	4	2	...	...	6
Total ...	97	21	1	6	125

The Farmer's Preference for Types, Sizes and Makes of Tractor.

Type and Size.—The predominance of tractors of North American manufacture has already been noted. The farmer's preference for the American machine is probably even greater than the figures in Table X would indicate, except in so far as "small" tractors are concerned. This preference for American tractors is dependent to some extent on the marked preference shown for kerosene-operated tractors as compared with those operated on one or other of the various diesel fuels, combined with the fact that the majority of farmers prefer tractors of over 28 horsepower.

In so far as is known, British and European manufacturers do not market any kerosene-operated tractors of over 28 horsepower in Australia, whereas each of the major American tractor manufacturers has a range of machines, including at least one machine in the particular category indicated. While there is a general preference for American diesel tractors as compared with British and European machines, the preference is not as marked as in the case of kerosene-operated machines.

All farmers were asked to indicate their preference for tractors by size, type (whether kerosene or diesel, wheeled or crawler-type) and make. A few did not answer the question, while a number indicated that they preferred to express no opinion in regard to make, or had no particular preference in this respect. The answers to this question are summarised in the following diagram:

Number of Farmers Preferring Tractors of Various Types.

	Type.	Size.	Fuel.
91 Farmers' Preferences	Wheeled 85	" Large " 52	Kerosene ... 38
			Diesel ... 12
			No Preference ... 2
		" Medium " 33	Kerosene ... 24
			Diesel ... 6
			No Preference ... 3
	Crawler 6		

Of those who expressed an opinion with regard to tractor size, 61 per cent. indicated a preference for the "large" tractor. Of those who expressed an opinion with regard to the relative merits of diesel and kerosene tractors, 77.5 per cent. favoured kerosene tractors.

It is apparent that the demand for diesel tractors is increasing relative to kerosene-operated machines. Of the "large" and "medium" wheeled-type tractors in use, only 18 per cent. were diesels, while 22.5 per cent. of the farmers questioned expressed a preference for the diesel tractor. The general impression formed by the enumerators was that the preference for diesel tractors is increasing to a greater extent than the foregoing figures indicate.

Several farmers stated that they would prefer a diesel machine if it were operated exclusively by themselves but as they employed labour they recorded a preference for the kerosene-operated machine because they did not consider that, except in exceptional circumstances, employees were competent or sufficiently conscientious to operate diesel machines. This viewpoint may have a considerable bearing on the demand for diesel tractors in the future, particularly on the larger farms.

In the author's opinion the demand for diesel tractors is likely to show a marked increase in the future, particularly as diesel servicing facilities improve.

Lack of interest in crawler-type tractors was significant. Less than 7 per cent. of the farmers questioned expressed a preference for that type of tractor.

Makes.—Seventy of the ninety-four farmers interviewed indicated a definite preference for a particular make of tractor. The remainder did not answer this question. In the majority of instances where the question was not answered, the farmer indicated that he thought any of the well-known American makes satisfactory but had no particular preference for any one make.

It was fairly usual for the farmer to express a preference for the make of tractor he was already using, but this tendency was by no means universal as the figures in Table XI indicate.

TABLE XI.
Stated Preference for Tractors by Make.

Make.	Farmers Expressing Preference for Make.	Percentage of Total.	Percentage of Make in Use on 94 Farms.
	No.	Per cent.	Per cent.
McCormick-International ...	18	25.7	30.4
Oliver	14	20.0	12.8
Case	9	12.9	11.2
Massey Harris	5	7.1	5.6
Caterpillar	4	5.7	3.2
Bulldog-Lanz	4	5.7	3.2
Fordson	4	5.7	9.6
John Deere	3	4.3	5.6
Field Marshall	2	2.9	4.8
Nuffield	2	2.9	2.4
M-M Twin City	2	2.9	3.2
Allis Chalmers	1	1.4	1.6
McDonald Imperial ...	1	1.4	0.8
Sift	1	1.4	0.8
Others ... ..	...	...	4.8
Total	70	100.0	100.0

It would probably be unwise to attach overmuch significance to the farmers' stated preferences for tractors by make, as most farmers were not fully informed, at the time they indicated their preference, of the current prices of the various machines. There can be little doubt that the purchase price is one of the major factors, possibly the major factor, in determining the make actually selected for purchase, particularly when ample supplies are available.

Preference by Country of Manufacture.—The marked preference for tractors of North American manufacture, already referred to, is apparent from the preference for makes shown in Table XI. The position may be summarised as follows:

Percentage of farmers preferring tractors manufactured in—						Per cent.
(a)	North America	..	..	..	..	65.7
(b)	Australia (by North American maker)	..	..	..	..	14.3
(c)	United Kingdom	..	..	..	..	11.4
(d)	Europe	..	..	..	..	7.1
(e)	Australia (by local maker)	..	..	..	..	1.5
Total						100.0

It may be, of course, that in indicating a preference for the medium-sized tractor marketed by the International Harvester Company, farmers were not always aware that this machine is now manufactured in Australia. Whether awareness of this fact would alter preferences is, however, doubtful.

Four of the five farmers indicating a preference for tractors of European origin favoured the single-cylinder diesel. Despite certain disadvantages the single-cylinder diesel tractor appears to be increasing in popularity, largely due, no doubt, to the relatively low initial cost and marked economy in fuel consumption. Single-cylinder diesel tractors available on the Australian market are manufactured in Europe, the United Kingdom and Australia. Farmers generally appear to prefer the European and British products.

Current and Potential Demand for Tractors.

Fifteen of the farmers interviewed had tractors on order. Two farmers had two tractors on order. In one case two tractors of different types were on order, both being required; in the other case the two tractors ordered were identical machines, and one only was required. One farmer had four makes on order, only one of which was required. In all, sixteen tractors were required, but not necessarily immediately. Orders classified by size were as follows:

Wheeled-type—

"Large"—kerosene	..	..	..	..	..	7
diesel	..	..	..	..	..	3
"Medium"—kerosene	..	..	..	..	..	3
"Small"—kerosene	..	..	..	..	..	1

Crawler-type—

Diesel	..	..	..	..	..	2
Total	..	..	..	..	..	16

At least three of the sixteen tractors on order were not required for several years and were ordered purely because of the anticipated delay in delivery and in the knowledge that a new tractor would be required at a later date.

"Large" kerosene tractors and crawler-type tractors had been on order, in some cases, for over four years. Delivery of two of the three "large" diesels on order was expected almost immediately. Except in one case, where the tractor was not really required, the "medium" tractors had been on order only a short period. The "small" tractor was required for lucerne work.

Including the duplicate orders, twenty tractors were on order. Two of the "large" diesels on order were of British manufacture, while two of the "medium" kerosene tractors were of Australian manufacture; the remainder of the tractors on order were of North American origin.

Makes of tractors on order were as follows:—

McCormick-International	..	..	..	..	..	6
Massey Harris	..	..	..	..	..	4
Oliver	..	..	..	..	..	4
Case	..	..	..	..	..	2
Caterpillar	..	..	..	..	..	2
M-M Twin City	..	..	..	..	..	2
Total	..	..	..	..	..	20

None of the farmers interviewed was in urgent need of a new tractor but several were anxious to obtain delivery within a reasonable period. In no case did any farmer anticipate difficulty in carrying out his cropping programme due to his inability to obtain immediate delivery of a new tractor.

If allowance is made for those farmers who did not desire immediate delivery of the tractor on order, it appears that only 2 per cent. of the farmers in the district were in immediate need of "medium" tractors, while only 1 per cent. required immediate delivery of crawler-type tractors.

The only type of tractor for which there was still a substantial lag in deliveries was the "large" tractor, particularly the "large" kerosene tractor of 30 horse-power or over. Approximately 9 per cent. of the farmers in the sample required early delivery of this type of tractor. It would appear then that the effective demand for "large" tractors (kerosene and diesel) by wheat-growers in the two shires at the time the survey was conducted did not exceed 110 units, while the effective demand for "medium" tractors at the time did not exceed twenty-five units, nor for agricultural crawlers twelve units. No doubt, orders by machinery agents would indicate a much greater demand than that suggested above, but many orders are duplicated, while immediate delivery is frequently not desired.

For several years after the end of World War II there was an acute shortage of tractors suitable for wheatgrowing. During this period machinery distributors in wheat districts meet with little, if any, difficulty in disposing of any tractor of over 20 horse-power. It is quite evident that this period is over.

In contrast to the situation at the end of the War virtually all wheat farms in the district now have at least one tractor in use. Approximately 85 per cent. of the farmers in the sample were satisfied with their existing tractor, both in respect to its suitability and condition.

In so far as the "medium" tractors are concerned, future demand is likely to amount to little more than normal replacement demand. There is still a significant demand for "large" tractors, particularly kerosene tractors of North American manufacture. But, as has already been pointed out, slightly over 100 such tractors would probably fill all immediate requirements in the Shires of Goobang and Jemalong.

The only foreseeable expansion in demand for tractors on wheat farms in the area in which the survey was carried out would appear to be for the "small" tractor for use as a subsidiary source of power, particularly on farms where lucerne is a major sideline. There is little evidence of any significant trend in this direction at the present time, but a few farmers intimated that they were considering the purchase of a "small" tractor for light jobs, while three of the selected farms already had such tractors.

It is estimated that there were approximately 1,550 tractors in use on wheat farms in the area at the time the survey was conducted. Further work remains to be carried out before a firm estimate of the average life of a tractor used for wheat production in the area can be given, but it appears probable that the average life is in the vicinity of fifteen years. If this figure proves correct it would appear that replacement demand for tractors on wheat farms in the two shires and three municipalities will average just over 100 tractors per annum. This estimate is exclusive of demand for tractors on farms other than wheat farms.

Naturally the actual replacement demand for tractors will vary considerably from year to year. The extent to which replacements are required will depend both on the age of existing tractors and on variations in economic conditions.

A significant improvement in the price of wheat relative to wool would probably result in a temporary increase in demand for "large" tractors, due to the fact that many farmers now have "medium" tractors which at present are satisfactory but which might not be considered sufficiently powerful if it were desired to sow substantially increased wheat acreages.

(b) Farm Implements.**Implements in Use.**

Although nearly thirty different tractor or horse-drawn implements were found on the ninety-four farms, only six different implements were widely used for wheat-growing. These were the header, the combine, the twin-disc plough (usually referred to as the "sundercut", tyne-harrows (of various types), the reaper and binder (found on a large number of farms, but now used for only a few hours each year at the most) and the scarifier.

In Table XII the number of farms having the major implements used in wheat-growing together with the total number of such implements in use on the ninety-four farms is shown.

TABLE XII.
Implements on Selected Farms.

Implement.	Number of Farms Having Implement.	Percentage of Total Farms (94) Having Implement.	Number of Implements.
	No.	Per cent.	No.
Ploughs—			
Twin-Disc	84	89	96
Mouldboard	41	44	48
Disc	24	25	26
Scarifier	70	75	72
Disc-Harrows	11	12	12
Tyne-Harrows	75	80	81
Combine	94	100	114
Reaper and Binder	72	77	75
Header	94	100	100

It will be noted that a large number of farms have mouldboard and disc ploughs. However, such ploughs are now relatively little used in the district. In many instances such ploughs have not been extensively used for many years but are retained by the farmer for occasional use or because the re-sale value, particularly of the smaller horse-drawn ploughs, is almost negligible.

Disc harrows have been included in the table because, although there is only a relatively small number in use, it is an implement which appears to be increasing in importance.

The proportion of each implement supplied by leading manufacturers is shown in Table XIII. It is evident that the market for wheat-growing equipment in the area is supplied largely by four firms, one of which appears in the past to have supplied approximately 48 per cent. of total requirements.

TABLE XIII.

Number of Implements of Various Makes as a Percentage of the Total Number of Implements of a Given Type in Use on the Selected Farms.

Manufacturer.	Implement.									
	Twin-Disc Plough.	Mouldboard Plough.	Disc Plough.	Scarifier.	Disc-Harrows.	Tyne-Harrows.	Combine.	Reaper and Binder.	Header.	Total.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
"Sunshine" H. V. McKay-Massey Harris ...	52.1	20.8	53.8	23.6	33.3	40.7	43.0	68.0	70.0	47.8
Mitchell-Shearer ...	16.7	33.3	11.5	40.3	16.7	25.9	30.7	...	5.0	20.4
McCormick-International ...	8.3	27.1	3.1	6.9	25.0	8.6	16.7	28.0	5.0	13.1
Horwood-Bagshaw ...	15.6	...	7.7	9.7	...	6.2	6.1	...	13.0	7.9
Others ...	3.1	14.6	19.2	19.5	16.7	9.9	...	...	7.0	7.4
No Make Stated ...	4.2	4.2	3.1	...	8.3	8.7	3.5	4.0	...	3.4
Total ...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Demand for Farm Implements.

In contrast to the tractor supply position, there is an acute shortage of all implements used in wheat production. The shortage is particularly severe in so far as headers are concerned, but the demand for all implements is greatly in excess of the supply.

Ninety-eight implements were on order on the ninety-four farms. In all, fifteen different implements were on order. Demand was greatest for headers (35), twin-disc ploughs (18), scarifiers (10), combines (8), and disc-harrows (5).

The average delay in the delivery of headers appeared to be approximately five years. In the case of most other implements the delay was almost as great.

Orders classified by makes are shown in Table XIV. It will be noted that 60 per cent. of the orders were for the product of one manufacturer.

TABLE XIV.

Number of Implements of Various Makes as a Percentage of the Total Number of Implements of a Given Type on Order on the Selected Farms.

Manufacturer.	Implement.									
	Twin-Disc Plough.	Mouldboard Plough.	Disc Plough.	Scarifier.	Disc-Harrows.	Tyne-Harrows.	Combine.	Reaper and Binder.	Header.	Total.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
"Sunshine" H. V. McKay-Massey										
Harris ...	66.6	...	...	20.0	40.0	100.0	37.5	100.0	88.6	62.9
Mitchell-Shearer ...	22.2	100.0	66.7	30.0	...	...	25.0	...	...	16.9
McCormick-International ...	5.6	...	...	...	60.0	...	...	...	8.5	7.9
Horwood-Bagshaw ...	5.6	...	33.3	10.0	...	...	25.0	...	2.9	6.7
Others ...	...	...	...	10.0	...	...	...	...	...	1.1
No Make Stated ...	...	...	...	30.0	...	...	12.5	...	...	4.5
Total ...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In addition to being questioned regarding orders actually placed, farmers were asked whether they considered any further machinery was necessary for the efficient working of their farm. In answer to this question many farmers stated that they were contemplating the purchase of additional machinery which they considered would increase farm efficiency. In some cases the additional machinery was required simply to replace existing machinery, while in other cases the implement under consideration was of a type not previously used on the farm.

It is doubtful whether any great significance can be attached to the answers to this question, but it is nevertheless worth noting the implements being widely considered for purchase.

Twenty implements in all were mentioned. Those in which a number of farmers displayed interest were:—

Trailing rotary hoe ..	..	..	..	..	..	..	21
Disc harrows ..	..	..	..	..	..	..	14
Twin-disc plough ..	..	..	..	..	..	..	10
Twin-disc plough with seeding attachment ("sunder-seeder") ..	..	..	..	..	..	..	6
Scarifier ..	..	..	..	..	..	..	6

Considerable interest was displayed in the trailing rotary hoe. Twenty-one farmers indicated that they were considering purchasing the implement. Most of those considering the purchase of this relatively new implement did not, however, feel disposed to place an order for it until it had proved itself to their satisfaction in the district. Very few of these implements have yet been sold in the area. However, if they prove successful in the hands of the few farmers who have purchased them, a substantial demand may develop, particularly if, in addition to the current 9 ft. model, a cheaper 7 ft. machine were also manufactured.

However, demand may be affected by seasonal conditions. It is probable that the interest displayed in this implement at the time the survey was undertaken was due in part to the heavy weed growth experienced during 1949 and 1950.

It has already been noted that disc harrows are increasing in popularity. In addition to the five actually on order, a further fourteen farmers were considering placing an order. A number of farmers were also considering the purchase of twin-disc ploughs, with or without seeding attachments (almost universally referred to in the district by the H. V. McKay-Massey Harris trade names—"sundercut" and "sunderseeder") and scarifiers.

The reasons given by farmers as to why they had not placed orders for the machines they listed as being necessary to increase farm efficiency included:—

- (i) Waiting until proved satisfactory (trailing rotary hoe only).
- (ii) Lack of cash resources (unable to afford at present).
- (iii) Price too high.
- (iv) Delay in delivery too long.
- (v) Wheat price too low at present to justify expenditure.
- (vi) No opportunity (intend ordering as soon as circumstances permit).

(c) Spare Parts.

Farmers were questioned with regard to supplies of spare parts both for tractors and implements. Their answers reveal a continuation of the unsatisfactory position which has existed for nearly a decade. However, there does appear to have been some improvement, in regard to most parts, in the past two to three years.

The supply of parts is such that local agents are generally unable to maintain stocks, with the result that long delays are frequently encountered when a new part is required. To meet this situation many of the farmers interviewed attempted to carry a stock of parts for tractors, headers (in particular) and other implements. Plough discs and parts for headers appear to be particularly difficult to obtain. Most farmers interviewed complained on this account.

Despite general complaints regarding difficulties experienced in obtaining parts when required, in only four instances did farmers report any serious delay in their work in the previous twelve months, due to the fact that parts were not immediately available.

The shortage of parts is serious rather because of the worry involved and the additional time spent in searching and obtaining them than because of its direct effect on cropping operations. This applies particularly in the case of header parts. The majority of headers in use are relatively old, the average age being twelve years. Numerous repairs and parts are necessary almost every season. The effect of a header breakdown is likely to prove more serious, in so far as possible financial loss is concerned, than is a breakage in any other farm implement. Increased production of headers and header parts is an urgent requirement.

One other matter is worthy of mention and it applies primarily to tractor parts. Numerous complaints were made by farmers to the effect that Australian-made parts did not give satisfactory service by comparison with parts of North American manufacture. Farmers were generally prepared to pay substantially more for American parts than for

equivalent parts made in this country. There is no reliable evidence as to whether this widespread attitude is justified. The fact that the attitude in question is so widespread does, however, merit attention by Australian manufacturers.

(d) Rubber Tyres.

All tractors found on the ninety-four farms were equipped with rubber tyres except one tractor which was equipped with steel front wheels. Many of the tractors purchased prior to 1945 were originally equipped with steel wheels and had been converted to rubbers by their owners. Since 1945 the sale of wheeled-type tractors equipped with steel wheels has almost ceased. Every tractor purchased since 1945 was fitted with rubbers on front and back wheels as original equipment.

A trend towards the use of rubber tyres on a wide range of tractor-drawn implements, particularly headers, appears to be developing. Difficulty in obtaining rubber tyres with which to convert steel-wheeled machinery to rubbers and the shortage of new machinery equipped with rubber tyres is a restricting influence at present. However, it would appear that the demand for tractor-drawn machinery equipped with rubber tyres will increase appreciably in the future. It is also probable that there will be an increasing tendency on the part of farmers, as tyres become available, to convert much of their existing machinery to rubbers.

Seventeen of the 100 headers on the ninety-four farms were equipped with rubber tyres. Most of the headers so equipped had either been purchased within the last four years or had been converted to rubbers during that period.

The increasing use of rubber in the rural industries, which must result from the trend referred to, is of considerable significance from a national and defence viewpoint.

(e) Age and Annual Usage of Farm Machinery.

The average annual use made of farm tractors and the major wheat-growing implements is given in Table XV, together with the average age of implements in use.

TABLE XV.

Average Age and Usage of Machinery in 1950 on Selected Farms.

Machine.	Average Age.	Average Time Worked in 1950.	Machine.	Average Age.	Average Time Worked in 1950.
	Years.	Hours.		Years.	Hours.
TRACTORS—			IMPLEMENTS—		
“ Large ” ...	9	535	Ploughs—Twin-disc...	14	200
“ Medium ” ...	8	593	Mould-		
“ Small ” ...	2	...	board ...	20	40
Crawler-type ...	9	393	Disc ...	22	52
All Tractors ...	8	573	Scarifiers	12	164
			Harrows—Tyne ...	13	29
			Disc ...	2	69
			Combines	13	133
			Headers	12	131
			Reaper and Binders	16	7

In so far as average age is concerned the figures must be qualified to the extent that in a relatively few cases farmers were unable to give the age of implements. In such instances the implements in use were usually particularly old. Consequently the average age of most types of implements in use on the ninety-four farms would probably be found to be slightly greater than the figures shown here. This qualification does not apply to tractors or disc harrows.
