SOME NOTES ON FARM POWER USAGE AND COSTS ON DAIRY FARMS IN THE SOUTH COAST MILK BOARD AREA.

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The mechanisation of the dairy industry in New South Wales has proceeded gradually over the past fifty years; however, the rate of increase in the use of mechanised equipment during that period has been far from uniform. The introduction of milking machines at the turn of the century resulted in the first significant use of machinery in the dairy industry. Prior to 1900 the quantity and value of machinery on dairy farms was almost negligible, but by 1920 dairy machinery was valued at almost £1 million, the value having doubled between 1900 and 1910, while between 1910 and 1920 it almost doubled again. Nevertheless, during the twenties the use of machinery did not continue to expand at such a rapid rate as during the years prior to 1920, and with the onset of the depression of the early thirties there was a distinct falling off in new machinery purchases by dairy farmers. In some years of the early and mid-thirties the total value of machinery on dairy farms showed a fall, largely due, no doubt, to the fact that normal replacements were not being made owing to the depressed state of the industry.

However, with the outbreak of World War II another period of rapid mechanised expansion began, and still continues. While milk and butter prices remain high and dairy farmers continue to enjoy the present relatively prosperous conditions it is likely that the use of machinery will continue to expand at a rapid rate.

The two periods of rapidly increasing mechanisation differ, however, in at least one important respect. In the early part of the century the increased use of machinery was due primarily to the introduction of the milking machine. The present period of expansion is due in part to a further significant increase in the use of milking machines, and again this is the main factor, but also to a significant, and economically important, increase in the use of tractors by coastal dairy farmers. Prior to World War II the ownership of a tractor by the dairy farmer was rare; to-day it has become relatively common.

MACHINERY IN USE.

Table I shows the value of machinery in use on dairy farms at the end of each decade from 1900-01 to 1930-31 and for the years 1938-39 to 1940-41. The figures are as recorded by the Bureau of Census and Statistics. After 1940-41 the presentation of the statistics was altered, values no longer being shown.

TABLE I.

Value of Farm Machinery and Implements on Dairy Farms.

	£
1900-01	237,220
1910-11	534,740
1920-21	910,260
1930-31	1,171,000
1938-39	1,275,622
1939-40	1,408,270
1940-41	1,502,849

The rapid rise in costs which has taken place in recent years would, in any case, reduce the usefulness of figures showing comparable values of machinery and, in so far as both milking machines and tractors are concerned, numbers on farms give a far better indication of the increase in their use. Table II shows the number of milking machines in use at 31st March, 1939, to the same date in 1949. The figures quoted are numbers of stands. Most farms have from two to four stands.

TABLE II.

*Number of Milking Machines in Use.**

At 31st March—	
1939	8,119
1940	10,815
1941	12,881
1942	15,586
1943	18,365
1944	22,108
1945	25,177
1946	27,157
1947	28,861
1948	29,921
1949	31,305

* Number of stands.

Unfortunately, information as to the number of tractors in use on dairy farms is not available, but the number of tractors in use in coastal districts has been tabulated since 1939. Figures were also collected in 1930. Details are shown in Table III. While all tractors in this classification would not be used on dairy farms the great majority would be, and it is probable that the figures give a reasonable indication of the relative increase in tractor purchases by coastal dairy farmers which has taken place in recent years and which is continuing at the present time.

TABLE III.

Tractors in Use in Coastal Districts.

At 30th June	1930	447
At 31st March	1939	1,442
	1940	1,807
	1941	1,911
	1942	1,648
	1943	2,114
	1944	1,654
	1945	2,398
	1946	2,584
	1947	3,024
	1948	3,336
	1949	4,003

REASONS FOR INCREASED USE OF MACHINERY.

It is not intended here to examine the reasons for this great increase in tractor power on dairy farms in any detail but it is perhaps worth while mentioning some of the factors responsible:—

(i) First, and perhaps of most importance, is the fact that during recent years the dairy farmer's financial position, in common with that of other rural producers, has improved considerably. He has had more money available to invest in capital equipment.

(ii) Smaller tractors, suitable for use on dairy farms, although not necessarily an economic acquisition, have been developed only in recent years.

(iii) Labour shortages and high wages have caused some farmers to adopt labour-saving devices which they might not have been interested in, or prepared to adopt, if circumstances had remained as they were prior to World War II, when labour was cheap and easy to obtain.

(iv) The N.S.W. Farm Mechanisation Scheme, inaugurated in 1943, undoubtedly increased the dairy farmer's interest in the use of tractor power on small farms.

This rapid expansion in the use of the tractor on dairy farms is of economic significance for several reasons. The purchase of a tractor involves a considerable capital outlay, the cheapest tractor suitable for the purpose costing slightly less than £600; while implements in addition to those already owned by the farmer are also likely to be required, resulting in a probable total capital outlay of from £700 to £900.*

When it is considered that the area cropped by coastal dairy farmers rarely exceeds 40 acres per anunum and is usually less than 30 acres, it is obvious that there is a serious danger of over-capitalisation. Undoubtedly some dairy farmers crop a sufficient area or have other uses for their tractors, such as pumping water, etc., to justify the purchase of a tractor and tractor-drawn equipment on economic grounds; undoubtedly many others will find that, from an economic point of view, and even taking the present relatively high labour costs into consideration, the purchase of a tractor is not a sound proposition. Not only are capital costs high, with consequent heavy overhead costs, particularly when the tractor is relatively little used, but the cash operating expenses add significantly to the dairy farmer's total cash costs.

There is, however, every reason to believe that this already obvious trend in dairy mechanisation will continue at least while the industry enjoys its present prosperity. There is now no real shortage of the smaller type of tractor (*i.e.*, less than 20 drawbar horse-power), required by the dairy farmer, although certain well-known American makes are in short supply. There are, however, ample supplies of small

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* *The recent devalution of sterling and other currencies will undoubtedly result in some increase in tractor and implement prices. In the case of English, Australian and most European makes the increase will be small. Prices of American machinery will, however, increase substantially. Prices quoted throughout this article are the prices that were ruling prior to devaluation. At that stage small and medium sized British tractors were slightly cheaper than American tractors of equivalent power and output. When all adjustments in prices resulting from devaluation have finally been made most British tractors will be substantially cheaper than equivalent American makes.*

British tractors available, which are quite as satisfactory for the purpose for which they are required as the American product, and in the case of the most popular British make the price is lower than slightly smaller American tractors. There is then no longer any real restraining factor preventing the dairy farmer from buying a tractor if he has sufficient capital avaiable.

Under these circumstances it is particularly important that the usage and cost of operating small tractors on dairy farms should receive some attention. Tractor cost studies have been almost entirely neglected in this country in the past, in contrast to the United States in particular, and to Great Britain, in both of which countries a vast amount of work has been done and where the farmer has ample unbiassed material available to him so that he may make a reasonable estimate of his probable cash and overhead costs should he purchase a tractor or other mechanised equipment.

Until 1943, when this Division commenced an investigation into the costs of operating tractors and tractor-drawn implements by some of the co-operative pools operating under the N.S.W. Farm Mechanisation Scheme,* virtually no work of this kind had been carried out in Australia. Some valuable information has been obtained from this study† but its scope has been severely reduced by virtue of the fact that several of the pools from which information was originally obtained have ceased operations.

Under these circumstances, and particularly with a view to getting tractor costs on the farm, as distinct from pool operating costs, a survey of tractor and horse usage and costs on South Coast dairy farms was commenced in 1947. The area selected for the investigation extends from Wollongong south to Milton and includes the major part of the Southern Milk Zone. The information obtained to date is relatively meagre, nevertheless, and particularly in view of the paucity of Australian information relating to tractor usage and costs, it has been thought worth while to publish some tentative results at this stage.

Table IV shows the number of cattle and horses on farms in the South Coast Milk Zone during the years 1936-37 to 1948-49. However, it is probable that some of the horses shown in these statistics were used for commercial carting and not for farm work. Table V shows the number of holdings with tractors, the total number of tractors, the labour force and the area cropped during the same period.

It will be noted that during the thirteen-year period here reviewed the number of cattle in the district fell by over 12,000 and the number of horses by nearly 2,000. The total number of persons employed on dairy farms also fell significantly, but at the same time there was an eight-fold increase in the number of tractors in use while the area cropped also rose, by nearly 8,000 acre; and, although it fell by 2,500 acres in 1948-49, it was still over 5,000 acres greater in that year than in 1936-37. Dairying is the only type of farming of any importance

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* *See "The N.S.W. Farm Mechanisation Scheme, Its History and Future Possibilities"; "Review of Marketing and Agricultural Economics," January,* 1946.

† *See "Hourly Tractor Costs in New South Wales Coastal Districts," "Review of Marketing and Agricultural Economics," January,* 1947.

carried on in the district and consequently it can reasonably be assumed that the great majority of tractors in the district were used on dairy farms.

The increased area cropped would be accounted for, to some small extent, by increased production of vegetables as a sideline on dairy farms, particularly during the war years, but the main reason for the increase is that South Coast farmers are producing more feed on the farm than formerly.

TABLE IV.

Numbers of Cattle and Horses in the South Coast Milk Zone.

Year.	Horses.	Dairy Cattle in Registered Dairies.				Other Milking Cows.	Other Cattle.	Total Cattle
		Cows Milking.	Cows Dry.	Heifers 1 year and over.	All Other.			
	No.	No.	No.	No.	No.	No.	No.	No.
1936–37	8,401	36,982	10,601	11,261	.....	2,200	17,498	78,542
1937–38	8,342	34,426	12,181	10,426	.....	2,304	16,754	76,091
1938–39	8,673	35,928	9,346	10,079	.....	2,223	16,000	73,585
1939–40	8,855	31,447	13,023	9,740	.....	2,063	15,759	72,032
1940–41	9,181	32,563	9,889	10,830	.....	2,042	17,813	71,137
1941–42	9,001	31,852	10,851	12,054	.....	1,892	17,093	73,732
1942–43	7,289	30,943	9,930	11,536	8,554	1,672	5,393	68,028
1943–44	7,077	30,319	10,769	10,246	9,406	2,209	5,328	68,277
1944–45	6,899	31,156	9,960	11,839	9,438	1,905	6,117	70,415
1945–46	6,667	29,083	9,914	12,246	7,585	1,768	6,046	66,642
1946–47	6,558	28,204	9,460	11,876	7,587	1,748	5,242	64,117
1947–48	6,517	28,458	8,840	10,251	7,630	2,220	5,323	62,722
1948–49	6,433	29,489	8,875	11,425	8,371	2,334	5,613	66,107

TABLE V.

Tractors, Labour and Area Cropped.

South Coast Milk Zone.

Year.	Holdings with Tractors.	Tractors.	Persons Permanently Employed.*			Paid Employees.			Area Cropped
			Male.	Female.	Total.	Male.	Female.	Total.	
	No.	No.	No.	No.	No.	No.	No.	No.	Acres.
1936–37... ...	22	23	2,593	207	2,790	874	37	911	15,373
1937–38... ...	24	24	2,465	156	2,621	829	15	844	15,842
1938–39... ...	42	42	2,402	126	2,528	879	19	898	16,217
1939–40... ...	57	57	2,397	190	2,587	916	49	965	15,975
1940–41... ...	64	78	2,336	163	2,499	765	28	793	18,660
1941–42... ...	58	59	1,991	275	2,266	490	67	557	16,967
1942–43... ...	74	77	2,079	214	2,293	452	51	503	20,172
1943–44... ...	63	66	1,890	282	2,172	357	45	402	20,117
1944–45... ...	96	96	2,001	231	2,232	341	36	377	21,698
1945–46... ...	109	113	1,964	230	2,194	371	46	417	21,397
1946–47... ...	128	131	2,033	225	2,258	389	52	441	23,231
1947–48... ...	144	147	2,020	220	2,240	427	53	381	23,132
1948–49... ...	190	192	1,951	195	2,146	473	72	545	20,606

* Total paid labour force, including owner but excluding unpaid labour.

The Present Survey.

The survey now in progress is being conducted primarily by the co-operation of farmers in the district who are keeping detailed power cost records. Such records were kept by a small number of farmers during the 1947-48 and 1948-49 financial years and are being continued during the current year. However, prior to the commencement of the 1947-48 financial year a detailed questionnaire was posted to 350 dairy farmers in the district, while 50 additional copies were later distributed

by personal contact with farmers in the area. This questionnaire related specifically to the 1946-47 financial year. Only 71 questionnaires were returned and a number of these were far from complete so that relatively little useful information was obtained from this source. Of those questionnaires returned, 20 were received from farmers using tractors and 51 from farmers using horses as their sole source of power (apart from the possible occasional use of contractors' or machinery pool services).

Horses on Farms.

One significant fact emerging from the questionnaires is that the ownership of a tractor does not appear to result in the use or ownership of fewer horses than when no tractor is owned.

Farmers were asked to state the number of draught horses on their farm; whether they consider they were all essential and, if not, the minimum number required. The number of horses on tractor farms varied from one to seven and on horse farms from one to four. It is significant that only two tractor farmers stated that they could dispense with horses entirely (they nevertheless retained one horse each). No other tractor farmer who answered the question considered he could work his farm with less than two horses, but although the average number of horses on tractor farms was slightly higher than on horse farms the average minimum requirements were stated to be slightly lower. Average figures are shown in Table VI.

The average total area of tractor farms was 301 acres and the average area cropped in 1946-47 was 38.9 acres. The area cropped varied from eight acres to 100 acres; however, the farmer who cropped 100 acres had a considerable area under vegetables, mainly peas and potatoes. The average area of horse farms was 180 acres, with 17.4 acres under crop in 1946-47. The area under crop in 1946-47 varied from 4 to 50 acres, only three farms having more than 30 acres under crop and 37 having less than 20 acres.

TABLE VI.

Average Areas and Numbers of Horses on 71 Farms from which Questionnaires were received.

	Horse Farms. (51 farms.)	Tractor Farms. (20 farms.)
Horses on farm	2.56	2.72
Minimum horse requirements.	2.45	2.28
Area of farm	180 acres.	274 acres.
Area cropped 1946–47 ...	17.4 acres.	35.4 acres.

Insufficient questionnaires were completed in detail to enable any estimate of tractor or horse operating costs to be obtained, however, in some cases where tractor records are now being kept questionnaires provided a useful summary of tractor and horse work and costs prior to the commencement of the 1947-48 financial year when detailed records were first kept.

The 1947-48 Records.

Only 13 records were finally completed of which nine related to tractor farms and four to horse farms. The average area of the tractor farms was 283 acres and of horse farms 286 acres. The average area cropped was 29 acres on the tractor farms and 19 acres on the horse farms.

Unfortunately farmers in the district have not, with some notable exceptions, shown any ready co-operation in the project, with the result that only the small number of completed records indicated above was received at the end of the 1947-48 financial year. Nor is the number completed for 1948-49 any larger. Consequently it is not possible to make any valid comparisons between horse and tractor farms, nor are the figures obtained necessarily representative of all farms in the district in so far as total areas, crop areas, etc., are concerned. However, some useful information, particularly as regards cash operating costs of tractors has been obtained. It is hoped that at a later stage it will be possible to expand the project considerably, eventually obtaining records from 50 to 100 farms annually.

Annual Tractor Usage.

Of the nine farms on which tractors were used only one farmer obtained over 400 hours of work from his tractor while three worked their tractors for less than 200 hours during the year. The average time for which the tractor was used was 281 hours—varying from 151 hours to 595 hours. The tractor which was operated for 595 hours was used for 320 hours for pumping water. The tractors were used with various implements and, in addition, for pumping water on two farms and for carting feed and milk on five farms. Every farm used the tractor for harrowing, and seven used it for ploughing (various types of ploughs being used). One of the farmers who did no ploughing made extensive use of a tandem disc.

Fifty four different implements were drawn by the tractors on the nine farms, the average number per farm being six, with the maximum on any one farm eight and the minimum four. It is significant that 17 of the 54 implements were used for less than ten hours during the year.

Size of Tractors.

There was naturally some variation in the size of tractors in use, as there was also in make, age and condition. For the purposes of these notes tractors have been classified, by size, into two groups.

(i) Small—Drawbar horsepower under 20.

(ii) Medium—Drawbar horsepower 20-29.

Two tractors, which have been included in the small group, were considerably smaller than the remainder, being of approximately 12 drawbar horsepower. In the last few years tractors of about this size, and slightly larger, have become particularly popular in the dairy industry. Medium-sized tractors (of 20-29 drawbar horsepower) are unnecessarily large for the type of work performed. Five of the tractors for which records were obtained have been classified as small and four as medium.

Cash Operating Costs.

Cash operating costs incurred during the year were recorded by all tractor owners. As might have been expected costs varied very greatly, both in so far as fuel consumption and repairs were concerned. The repairs costs quoted below are the actual figures recorded, but as they were obtained from only nine tractors, although of various ages, and in varying mechanical condition, the average hourly repair figure may be misleading, particularly in view of the fact that three tractors required extensive repairs during the year. On four other tractors, however, repairs costs amounted to less than £10. Only further experience will indicate whether the average repair figures shown here are representative.

The average cost of repairs for all tractors was 2s. per hour, total repairs costs per tractor varying from £1 to £61. The average repairs cost for the small tractors was 1s. 8d. per hour, and for the medium tractors was 2s. 5d. However, owing to the small number of tractor records available for study no significance can be attached to the variation in repairs costs as between the two groups of tractors.

Fuel Costs.

As might be expected fuel consumption varied considerably. Average figures are shown in Table VII.

TABLE VII.

Fuel Consumption per Hour.

Size of Tractor.	Kerosene.	Petrol.	Oil.	Grease.
	gals.	gals.	gals.	lb.
Small	1.22	.18	.05	.05
Medium	1.61	.15	.16	.07

Note.—All tractors for which records were received were kerosene-operated units.

In terms of current prices for fuels (bulk prices at oil companies' depots in the district) average costs per hour are set out in Table VIII.

TABLE VIII.

*Fuel Costs per Hour.**

Size of Tractor.	Kerosene.	Petrol.	Oil.	Grease.	Total.
	s. d.	s. d.	s. d.	s. d.	s. d.
Small	2 1.6	0 5.8	0 5.1	0 0.6	3 1.6
Medium	2 9.8	0 4.8	1 4.3	0 0.8	4 7.7

* *Based on the following prices.—Kerosene, 1s. 9d. per gallon; petrol, 2s. 8d. per gallon; oil, 8s. 6d. per gallon; grease, 1s. per lb.*