

FARM INCOME, PRODUCTION AND EXPORTS

(PART 2)

This is the second of two articles which present an examination of certain aggregate data for the New Zealand pastoral sector together with a brief commentary and analysis of some of the main factors influencing farm income, investment, production and exports. The articles are based on a discussion paper prepared by Mr M. J. Walsh of the Bank's Economic Department early in 1978 which was designed to provide a monitoring frame-work and to illustrate the main economic relationships in the pastoral sector for readers not familiar with this area and also to form the basis for more detailed research.

The first article, which appeared in the June 1979 Bulletin, commented on the main economic data for the agricultural sector as a whole, including the national accounts, and briefly discussed the general nature of economic responses in the New Zealand pastoral economy. The present article takes a closer look at some economic aspects of the two main components of the pastoral sector, namely the sheep and beef farm and the factory supply dairy farm and it examines some of the main factors influencing investment in livestock. There is also a brief commentary on the linkages between export prices and farm gate prices for the main products and the relationship of farm production to export volume.

FARM SURVEYS

The most convenient and comprehensive data to illustrate many economic aspects of the two main subsectors of the pastoral sector are the annual farm surveys of the New Zealand Meat and Wool Board's Economic Service for sheep and beef farms and the New Zealand Dairy Board survey of factory supply dairy farms. These two surveys, which collect some production and physical data in addition to a large amount of financial information are widely used for policy analysis and economic research and, taken together, provide a fairly comprehensive coverage of the pastoral farm types which produce approximately 80 per cent of gross farm output (as it is now defined in the national accounts) and 70 per cent of export receipts. The following description and analysis make use of some of the average farm data from the surveys. Both organisations publish a great deal of additional information.

The survey results are used here to examine the nature of farm income and expenditure and to show trends and relationships of prices, incomes, expenditure and livestock investment responses. The data used is for the average farm in each survey and it should be treated with some care for the purposes of historical analysis because of the trend towards fewer and larger farms which has been especially marked for dairy farms, although these trends need not invalidate an analysis of year to year changes. In a number of economic studies it has been found that deflating the survey data to obtain 'per hectare' figures for the purposes of historical analysis has been less useful than converting the data, especially expenditure, to a 'per stock unit' basis. The results are for the national average farm, not the average farmer as an individual — most farms have

some form of multiple ownership rather than a single owner-operator. Results for single owner farms show a somewhat smaller scale of operations than for the national averages.

The financial data collected in the surveys is largely obtained from farm accounts and consequently there is considerable detail on the current items of income and expenditure but very little information on capital expenditures. It should be noted that several of the current expenditure items contain some expenditure which is of a capital nature but which cannot be distinguished from current expenditure on the same inputs e.g. fencing, fertilizer, seeds and cultivation, expenses which can be associated with land development and improvement or which may be maintenance expenditure in the normal sense. A further important point about the farm accounts and the results for the national average farm from each survey is that income and expenditure do not record all transactions in livestock. Rather, gross livestock trading profit is recorded on the income side; that is the balance remaining after accounting for opening and closing stocks, purchases, sales and credits for home use. Inclusion of all livestock transactions would result in a much larger turnover than shown in the survey results especially in the case of those farms which buy in store stock for fattening. (Data on gross sales and purchases on sheep and beef farms is provided in a supplement to the Economic Service Survey.) Compared with other businesses, livestock has an unusual role in the farm business in that it is at once the main productive unit and also one of the main products. (This applies to a much greater extent on the sheep/beef farm than on the dairy farm.) As pointed out in the earlier article, it is very difficult to separate the results of investment decisions from the results of production decisions when analysing the whole sector. In the following sections attention is focussed on the determinants of investment in livestock as productive units rather than attempting to isolate production responses which, especially for meat production, involve consideration of complex lagged responses.

The period chosen for the simple analysis is from the early 1960's up to the late 1970's. This period is convenient in a number of respects, largely reflecting the availability of data and the fact that it covers sufficient variation of the main factors influencing livestock investment to illustrate their impact but is not so long as to encompass substantial changes in the economic structure of farming. In particular, there appears to have been relatively little switching of land use in this period between sheep/beef farming and dairy farming unlike the 1950's when there was a significant movement in some areas between the two major farm types. However, during the 1960's and 1970's there does appear to have been a significant diversion of land use from pastoral to urban or other non-pastoral uses such as forestry. Much of this diversion has involved changed land use for whole farm units other than changed land use on some part of individual farms remaining in the surveys. The analysis will also illustrate some similarities and differences between the aggregate economic behaviour of dairy farmers and of sheep and beef farmers.

THE ECONOMIC SERVICE SURVEY

— Sheep and Beef Farms

The survey covers about 550 commercial farms comprised of eight distinct farm classes ranging from South Island high country through several classifications of North Island hill country to the South Island mixed livestock and cropping type of farms, each weighted for their approximate national importance to obtain an all classes average farm. The farms in the survey are currently estimated to be representative of about 22,000 farms carrying more than 90 per cent of the national sheep total and approximately 70 per cent of the national beef cattle herd. The survey covers farms of the general type which produce about half of total export income. Coverage of the survey has been changed from time to time to maintain its representativeness. The survey results perform well by comparison with national averages in tests for representativeness such as average prices received for meat and wool.

Approximately 75 per cent of the farms in the survey have balance dates at the end of June and most of the remainder balance at the end of March. The average farming year described by the survey results is therefore relatively close to the production year ending in June.

Table 5 shows the composition of income and expenditure of the all classes average sheep and beef farm, together with some additional financial data on the disposition of net income, for the six years to 1977/78, the latest season for which full details are available. The table also shows average proportions of income and expenditure over this period, each item as a per cent of the total.

The average survey farm in 1977/78 had an effective area of approximately 500 hectares (1,200 acres), carried approximately 3,000 stock units and employed on average 1.8 labour units. Total assets at the end of the season were valued at approximately \$380,000 of which land and buildings amounted to approximately 75 per cent. Owner's equity amounted to \$296,000 or 78 per cent of the total on average.

Table 5
ALL CLASSES AVERAGE SHEEP AND BEEF FARM
INCOME AND EXPENDITURE PER FARM

	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	Income or Expenditure Proportions (percent) ¹
	\$	\$	\$	\$	\$	\$	
GROSS FARM INCOME							
Wool	15,071	14,384	9,376	16,013	22,623	19,530	39.0
Sheep & Lamb	13,189	13,424	9,384	12,888	18,368	16,877	33.9
Cattle	6,712	6,282	3,984	6,253	6,729	7,296	15.1
Other Farm Income ²	4,335	4,108	3,946	5,596	5,482	6,128	11.9
TOTAL GROSS FARM INCOME	39,307	38,198	26,690	40,750	53,202	49,831	100.0
FARM EXPENDITURE							
Wages	2,539	2,969	2,718	2,865	3,332	3,707	11.5
Animal Health, Weed & Pests	991	1,065	997	1,322	1,707	1,833	4.9
Shearing Expenses	1,356	1,534	1,557	1,700	2,083	2,671	6.8
Fertilizer, Lime & Seeds	2,325	2,942	1,481	2,547	3,195	4,362	10.3
Vehicle, Fuel & Power	1,804	1,992	2,181	2,972	3,629	4,005	10.1
Feed & Grazing	658	702	417	507	641	809	2.4
Contract	1,225	1,592	1,374	1,411	1,853	1,686	5.8
Repairs & Maintenance	2,454	2,879	2,221	2,745	3,861	3,760	11.2
Railage & Cartage	879	975	848	1,007	1,357	1,072	3.9
Administration Expenses	636	717	731	871	1,046	1,227	3.2
SUB-TOTAL WORKING EXPENSES	14,867	17,367	14,525	17,947	22,704	25,132	70.1
Insurance	272	336	432	511	646	768	1.8
Rates	613	690	745	846	991	1,160	3.1
Managerial Salaries	204	234	277	269	296	264	1.0
Interest	2,331	2,692	2,912	3,506	3,896	5,070	12.6
Rent	259	340	302	357	322	369	1.2
SUB-TOTAL STANDING CHARGES	3,679	4,292	4,668	5,489	6,151	7,631	19.8
TOTAL CASH EXPENDITURE	18,546	21,659	19,193	23,436	28,855	32,763	89.8
Book Depreciation	1,942	2,281	2,129	3,689	2,976	3,180	10.1
TOTAL FARM EXPENDITURE	20,488	23,940	21,322	27,125	31,831	35,943	100.0
NET FARM INCOME	18,819	14,258	5,368	13,625	21,371	13,888	
DISPOSITION OF NET FARM INCOME:							
Income Equalisation ³	- 3,776	- 344	+ 2,612	+ 52	- 2,014	+ 1,399	
Adjusted Net Farm Income ⁴	15,043	13,914	7,980	13,677	19,357	15,287	100.0
Personal Drawings	5,926	6,913	6,383	8,092	10,486	10,071	56.8
Taxation	3,132	4,919	2,460	2,822	5,753	5,840	28.8
'Savings'	5,985	2,082	- 863	2,763	3,118	- 624	14.4

Source: N.Z. Meat and Wool Boards' Economic Service, 'Sheep and Beef Farm Survey' and 'Supplement to Sheep and Beef Farm Survey', various issues.

Footnotes: 1 This column shows each component of Gross Farm Income, total current farm expenditure and adjusted net farm income as a proportion of the total, on average, for the six year period to 1977/78.

2 Includes Stock Retention Incentive payment of \$880 in 1972/73.

3 + = withdrawal; - = deposit. Includes deposits and withdrawals from wool income retention accounts in 1976/77 and 1977/78 respectively.

4 Net income adjusted for deposits or withdrawals from income equalisation accounts.

In the period shown sales of wool accounted for 39 per cent of gross income on average, still the largest single item but significantly lower than in the 1950's and early 1960's. Gross profit from sheep and lamb transactions accounted for one third of total income, cattle sales 15 per cent and 'other income' (income from cash crops, hay sales, other produce but excluding non-farm income) the remaining 12 per cent. The comparable average income proportions in the five seasons to 1964/65 were wool 46 per cent, sheep and lamb 32 per cent, cattle 14 per cent and other income 8 per cent. The significant changes are a fall in the relative importance of wool and a rise in other income though this item, broadly representing non-pastoral products, still only accounts for a relatively small proportion of the total. Large movements between years of the individual income items illustrate the impact on farm incomes of volatile meat and wool prices.

On the expenditure side, the table shows that current farm expenditure accounts for about two thirds of gross income. The main items of expenditure are wages, fertilizer and seeds, vehicle and fuel expenses, repairs and maintenance (includes most fencing expenses), interest and depreciation. Farm working expenses have accounted for 70 per cent of total current expenditure in recent years, a decline from nearly 75 per cent in the early 1960's. The main changes in this group were a marked fall in the proportion spent on wages as a result of a further reduction of labour intensity, and a substantial fall also in the proportion spent on fertilizer and seeds, apparently associated with a slower pace of land development. These movements within the working expenses group were partly offset by growth in the proportion of expenditure on vehicle expenses and fuel, feed and grazing and on administration. The increase in standing charges since the early 1960's to an average of 20 per cent in recent years was entirely due to higher expenditure on interest which rose from 8 per cent of total current expenditure to 12.7 per cent in the latest period.

Net income as defined for taxation purposes comprises approximately one third on average of gross income. As shown in table 5, variations between seasons are often very substantial and these are largely taken up by variations in the item called 'savings' rather than by variations in personal expenditure. 'Savings' is the

estimated surplus after meeting all current farm expenses, taxation and personal drawings, and together with depreciation represents the amount of funds generated from farming operations to meet capital expenditures such as machinery and buildings and repayments of borrowed capital. The table also shows a calculation of net income adjusted for deposits or withdrawals from the income equalisation scheme. During the period shown personal drawings have accounted for 57 per cent of adjusted net income, taxation 29 per cent and savings 14 per cent. Negative entries in the savings items in the table indicate that in some years, adjusted net income has not been sufficient to meet personal drawings and taxation.

Table 6 summarises the main components of the survey data over a longer period to illustrate aggregate income/expenditure relationships and presents a series of price indices; prices paid for current inputs, prices received for output and the terms of exchange which is a ratio of prices received to prices paid or a measure of 'real' output prices. The table also shows a series of the annual movements in the volume of farm expenditure or real expenditure and a measure of real expenditure per stock unit both in 1975/76 constant dollar terms and indexed to \$8.80 in 1975/76 dollar terms, a level which on the basis of income and expenditure patterns in recent years has been proposed by the Economic Service as an indicator of the maintenance level of farm expenditure. Changes in the volume of expenditure per stock unit will normally be a useful indicator of trends in livestock investment because much of the variation in expenditure takes place in those items which most affect livestock carrying capacity such as fertilizer and repairs and maintenance.

The main features illustrated by table 6 are as follows:

- The wide variation from year to year in gross income especially in recent years as, for example, in the estimated 71 per cent rise in 1972/73 which was followed by 30 per cent fall in 1974/75. These sort of changes are caused by large movements in prices received for output. Year to year changes in the volume of output are relatively small.
- Farmers adjust expenditure fairly quickly to changing income (or output prices) with most of the adjustment occurring in the current period except

Table 6
SHEEP AND BEEF FARM SURVEY
SUMMARY OF KEY DATA

	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79P
Gross Income (\$)	16,520	19,230	20,540	20,226	22,941	39,307	38,198	26,690	40,750	53,202	49,831	59,800
	(- 1)	(+ 16)	(+ 7)	(- 2)	(+ 13)	(+ 71)	(- 3)	(- 30)	(+ 53)	(+ 31)	(- 6)	(+ 20)
Expenditure (\$)	11,742	13,274	14,202	14,404	15,833	20,488	23,940	21,322	27,125	31,831	35,943	41,300
	(- 6)	(+ 13)	(+ 7)	(+ 1)	(+ 10)	(+ 29)	(+ 17)	(- 11)	(+ 27)	(+ 17)	(+ 13)	(+ 15)
Net Income (\$)	4,778	5,956	6,338	5,822	7,108	18,819	14,258	5,368	13,625	21,371	13,888	18,500
Prices Received Index (1975/76 = 1000)	498	543	632	594	580	940	940	669	1,000	1,261	1,202	1,480
	(- 1)	(+ 9)	(+ 16)	(- 6)	(- 2)	(+ 62)	(0)	(- 29)	(+ 50)	(+ 26)	(- 5)	(+ 23)
Prices Paid Index (1975/76 = 1000)	554	571	588	617	656	690	787	892	1,000	1,186	1,371	1,496
	(+ 4)	(+ 3)	(+ 3)	(+ 5)	(+ 6)	(+ 5)	(+ 14)	(+ 13)	(+ 12)	(+ 19)	(+ 16)	(+ 9)
Terms of Exchange Index	899	951	1,075	963	884	1,362	1,194	750	1,000	1,063	877	989
	(- 2)	(+ 6)	(+ 13)	(- 10)	(- 8)	(+ 54)	(- 12)	(- 37)	(+ 33)	(+ 6)	(- 18)	(+ 13)
Real Expenditure Real Exp./Stock unit	(- 9)	(+ 10)	(+ 4)	(- 3)	(+ 3)	(+ 26)	(+ 3)	(- 22)	(+ 13)	(- 2)	(- 2)	(+ 8)
	7.83	8.32	8.54	8.23	8.29	9.68	10.04	8.10	9.10	8.92	8.50	9.13
	(- 11)	(+ 6)	(+ 3)	(- 4)	(+ 1)	(+ 17)	(+ 4)	(- 19)	(+ 12)	(- 2)	(- 5)	(+ 7)
Index of Real Exp./Su. (\$8.80 m in 1975/76 \$ = 1000)	890	945	970	935	942	1,100	1,141	920	1,034	1,014	966	1,038

Source: New Zealand Meat and Wool Boards' Economic Service. (Income and expenditure data is for 'all classes average farm')
(Figures in brackets are annual percentage change).

when income movements are very large in which case there will be a significant carryover to the following period. Although it is not illustrated by this table of annual data, the extent of expenditure adjustments within a season will be influenced by the timing of output price movements, i.e. there may be a relatively small expenditure response if the output price change occurs towards the end of a season.

— Current input prices move roughly in line with the general level of inflation in the economy. The major exceptions are caused largely by the introduction and alteration of substantial input subsidies in recent years. Input price movements are much less variable than changes in output prices.

— Movements in the volume of expenditure per stock unit are fairly closely related to movements in the terms of exchange in the current period except when these are very large. The size of the response varies but disregarding the extreme movements, the size of the change in expenditure per stock unit usually averages about half the size of the change in terms of exchange. However, there are exceptions as in 1976/77 when the terms of exchange index rose by 8 per cent but the volume of expenditure per stock unit fell by 6 per cent, a negative response apparently largely because farmers changed their expenditure patterns in that year and moved quickly to take advantage of the special investment allowance introduced in the 1976 Budget by purchasing additional farm machinery.

Table 7
SHEEP AND BEEF STOCK NUMBERS/REAL EXPENDITURE/TERMS OF EXCHANGE/WEATHER

June Year	Sheep and Beef Stock Units (m.)	Terms of Exchange (1975/76 = 1000)	Real ¹ Expenditure Per Stock Unit Index (1000 = Maintenance)	Days of Soil ² Moisture Deficit
1960/61	60.1	1079	883	18.9
	(+ 4.5)	..	(+ 1)	
1961/62	61.0	940	857	34.5
	(+ 1.5)	(- 13)	(- 3)	
1962/63	62.8	1049	898	29.4
	(+ 3.0)	(+ 13)	(+ 5)	
1963/64	63.8	1214	1016	40.5
	(+ 1.6)	(+ 17)	(+ 13)	
1964/65	66.3	1064	1054	17.5
	(+ 3.9)	(- 13)	(+ 4)	
1965/66	70.7	998	1075	18.1
	(+ 6.6)	(- 9)	(+ 2)	
1966/67	74.8	918	1000	33.9
	(+ 5.8)	(- 8)	(- 7)	
1967/68	76.8	899	890	33.0
	(+ 2.7)	(- 4)	(- 11)	
1968/69	77.5	951	945	30.4
	(+ 0.9)	(+ 6)	(+ 6)	
1969/70	78.8	1075	970	34.2
	(+ 1.7)	(+ 13)	(+ 3)	
1970/71	78.6	963	935	35.5
	(- 0.3)	(- 10)	(- 4)	
1971/72	79.2	884	942	28.7
	(+ 0.8)	(- 8)	(+ 1)	
1972/73	78.4	1362	1100	57.1
	(- 1.0)	(+ 54)	(+ 17)	
1973/74	79.5	1194	1141	39.4
	(+ 1.4)	(- 12)	(+ 4)	
1974/75	80.8	750	920	28.5
	(+ 1.6)	(- 37)	(- 19)	
1975/76	82.6	1000	1034	32.8
	(+ 2.2)	(+ 33)	(+ 12)	
1976/77	84.1	1063	1014	25.7
	(+ 1.8)	(+ 6)	(- 2)	
1977/78	85.6	877	966	54.1
	(+ 1.8)	(- 18)	(- 5)	
1978/79P	85.0	989	1038	27.3
	(- 0.7)	(+ 13)	(+ 8)	

¹ Estimated from national census figures, sheep at 30th June second year, cattle at 31st January.

² N.Z. Meat and Wool Boards' Economic Service.

³ Derived from Economic Service Survey, indexed to the "maintenance" level of \$8.80 in 1975/76 \$.

⁴ Weighted average of the Meteorological Service indices for sheep and beef cattle populations (1949/50 to 1976/78 average = 32).

P Provisional.

Table 7 sets out time series for the eighteen years to 1977/78 of the national sheep and beef total measured in stock units and some of the main factors influencing investment in livestock: the terms of exchange index, real expenditure per stock unit and a climatic variable 'days of soil moisture deficit' which is the estimated number of days per season in which there was insufficient soil moisture for pasture growth. The year by year changes and levels of the data series in this table give some indication of the nature of livestock investment responses but a somewhat clearer picture can be obtained by aggregating the data into periods which have similar characteristics of terms of exchange and input volumes and examining the growth rates of livestock numbers which have resulted from the various influences. This procedure to some extent overcomes problems accounting for the effects of lags in the livestock investment response.

For the purposes of analysis it is convenient to look at three five year periods as set out below. (The period over which stock numbers is measured is lagged by one year.)

	Period 1 1962/63- 1966/67	Period 2 1967/68- 1971/72	Period 3 1972/73- 1976/77
Annual Averages			
Terms of exchange Index	1,049	954	1,074
Real Exp./SU Index	1,009	936	1,042
Days of soil moisture deficit ¹	27.9	32.4	36.7
Stock numbers (% change)	+ 4.1	+ 0.4	+ 1.4

¹ Long term average, 1949/50 to 1977/78 is approximately 33.

Periods 1 and 2 roughly correspond to conventional economic notions about the effects of relative prices on investment. In period 1, substantial growth of livestock numbers (approximately 4 per cent per annum) was associated with relatively high and stable levels of both terms of exchange and expenditure per stock unit (on average somewhat above the assumed maintenance level) and generally favourable climatic conditions. There was some carryover of the higher growth rate of stock numbers into period 2 but generally this is a period of slow growth associated with significantly lower average levels of terms of exchange and real expenditure while climatic conditions remained fairly favourable but perhaps slightly less so than in period 1.

In period 3 there was a definite recovery in the rate of growth of stock numbers but the growth was much less

than might be indicated by the high average levels of relative prices and input volumes. Both of these measures on average were as high as or higher than in former periods of rapid growth of stock numbers. There are a number of plausible explanations for this lower 'productivity' of expenditure including the following:

- Climatic constraints (drought), especially in 1972/73 but serious also in some regions in 1973/74, affected stock carrying capacity and reproductive rates in both these and subsequent seasons.
- Relatively low levels of expenditure in period 2 had a damaging effect on livestock physiology and therefore also on reproductive rates which carried over into period 3.
- It appears that growth requires stable as well as favourable terms of exchange and real expenditure. The high averages for the latest period conceal wide year to year variations.
- For much of the latest period (and part of period 2) there appears to have been a higher degree of diversion of land to non-pastoral uses such as urban growth and forestry.
- It has been suggested that there are other reasons for the lower efficiency of expenditure including labour shortages and a tendency to aim for maximisation of a cash profit nature than for growth as appeared to be the case in earlier years and a number of other factors affecting farmers' confidence.

The selection of a lagged period for recording average livestock numbers was made in part because it gave better results but can be justified by other evidence of lagged responses and also in part, by the mid-season recording of cattle numbers. Similar results can be achieved if the periods of recording for livestock growth rates is the same as those used for the other variables. In addition, similar results can be obtained using the real value of gross income (purchasing power) per stock unit, calculated by using input prices as the deflator, in place of the terms of exchange or relative prices variable. The real value of gross income is a useful alternative to the terms of exchange index because, although it is influenced by production responses, it does account for farm income received by way of grant or subsidy such as the stock retention incentive grants.

No very precise indication emerges from the foregoing analysis of the level of terms of exchange which might, in the absence of climatic extremes, be associated with a maintenance level of expenditure but it appears that an index level of close to 1,000 on the 1975/76 base would normally produce a level of expenditure of approximately that order. It follows that terms of exchange in excess of this level would normally be necessary to produce significant growth in stock numbers.

Table 8 lists estimates of the main national performance indicators for sheep (wool production per sheep, lambing percentage, lamb slaughter weights) together with real expenditure per stock unit for sheep and beef farms and the climatic variable weighted for sheep population.

These data give some indication of the range and the causes of variations in performance. Climate and real expenditure appear to be the main influences on performance and their effect is both lagged: e.g. low wool weights and lambing percentage in 1973/74 following the drought of the previous year, and cumulative: e.g.

Table 8
LIVESTOCK PERFORMANCE — SHEEP

	Wool ¹ Weight kg/sheep	Lambing ² Per- centage	Lamb ³ Slaughter Weight (kg)	Days of ⁴ Soil* Moisture Deficit	Real ⁵ Expenditure Per Stock Unit Index
1960/61	5.66	98.0	14.3	19.5	883
1961/62	5.49	100.0	13.6	35.3	857
1962/63	5.80	99.3	13.8	29.8	898
1963/64	5.56	99.3	13.8	42.4	1,016
1964/65	5.52	97.5	13.7	18.9	1,054
1965/66	5.86	99.5	14.2	19.3	1,075
1966/67	5.61	99.2	13.7	26.7	1,000
1967/68	5.50	98.8	13.2	32.3	890
1968/69	5.49	94.8	13.5	32.7	945
1969/70	5.47	97.0	13.2	35.2	970
1970/71	5.54	93.1	13.2	39.0	935
1971/72	5.47	94.4	13.2	30.7	942
1972/73	5.07	92.0	12.7	59.7	1,100
1973/74	5.02	90.9	13.1	40.5	1,141
1974/75	5.26	92.7	12.9	30.4	920
1975/76	5.64	94.0	13.7	36.9	1,034
1976/77	5.36	96.4	13.4	27.2	1,014
1977/78	5.26	93.3	12.9	55.2	966
1978/79	5.16	90.4	13.3	27.2	1,038

1 Total production, greasy basis (slipe and shorn wool) per sheep at beginning of season.

2 Lambs tailed as percent of breeding ewes at beginning of season.

3 Lambs slaughtered for export, prior to 1969 includes kidney and channel fat (say) 0.2 kg.

4 Weighted average for sheep population 1949/50 to 1976/78 = 33.

5 Sheep and beef farms, indexed at 1000 = estimated maintenance level.

Source: N.Z. Meat and Wool Boards' Economic Service; Meteorological Service.

low real expenditure in the seasons 1967/68 to 1970/71 contributed to relatively low livestock performance from 1968/69 through to 1972/73. (The wool weight figure, calculated as it is from national wool production data, over-states the trend of fleece weights for most of this low performance period because of high sheep slaughter which caused a relatively high level of slipe wool to be included in the total wool figures.) Other factors also have some influence on performance. For example, changes in the breed composition of the national flock (the trend to easy care sheep in the second half of the period shown) have probably lowered slightly the average wool weights and lambing percentages. Also in the 1970's labour shortages have had an adverse effect on lambing percentages and grading changes have favoured leaner (lighter) lambs. Lamb slaughter weights appear to be most influenced by current period climate.

THE NEW ZEALAND DAIRY BOARD SURVEY

— Factory Supply Farms

This survey covers commercial 'factory supply' dairy farms, i.e. those that supply milk to factories for manufacture into butter, cheese, casein, milk powder and other milk products as distinct from the smaller 'town milk supply' dairy industry which supplies fresh wholemilk for domestic liquid milk consumption. (Cows in town milk supply herds in the 1977/78 season amounted to 175,000 or approximately 9 percent of the national total of 2 million cows in milk.) The survey also provides detailed data on annual income and expenditure items largely derived from farm accounts together with supplementary physical and production information. There are currently more than 300 farms

in the survey which are generally representative of approximately 15,000 factory supply farms. Survey farms are selected on the basis of uncomplicated ownership, milking 30 cows or more, which do not employ a sharemilker and derive at least 75 percent of gross income from dairying. The type of farm covered by this survey has in recent years produced approximately 17 percent of total export receipts in the form of milk products and a further 3 to 4 percent in the form of beef and animal by-product exports.

Table 9 shows the average surveyed per farm levels of income and expenditure by category for the five seasons to 1977/78. The data here is for the financial year as surveyed — most dairy farm accounts are for a financial year ending 31st May, the dairy production season, though many use a financial year ending 31st March. The Dairy Board also makes detailed estimates of per farm income for the dairy season as seasonal figures may be more relevant than financial year data for some purposes. There may be some slight differences but generally the financial year data corresponds fairly closely to developments in the production season. In the

1977/78 year the average surveyed farm milked 113 cows on 69 effective hectares and employed approximately 1.5 labour units to produce 15,300 kg of milkfat. Total capital employed at balance date was estimated to be \$187,000 at current market values of which approximately 80 percent was in land and buildings. Owners' equity was estimated at nearly \$141,000 or 75 percent of the total, on average.

Table 10 shows a longer time series of gross income expenditure and net income per farm together with indices of prices received, prices paid and the terms of exchange index with annual variations for each of these and a measure of real expenditure per cow. It should be noted that the income and expenditure series used here differ slightly from those of table 9 which come from the revised survey. Data from the old survey are used in table 10 to obtain a consistent historical time series for the purposes of analysis.

Annual variations of income and expenditure are shown by the table to be quite substantial but somewhat less than for the average sheep and beef farm due to

Table 9
AVERAGE FACTORY SUPPLY DAIRY FARM —
INCOME AND EXPENDITURE IN THE FINANCIAL YEAR (REVISED SERIES)
Returns from milk and cream suppliers. Excludes farm employing sharemilkers

	1973/74	1974/75	1975/76	1976/77	1977/78	<i>Income and Proportions</i>
						<i>Percent</i>
INCOME						
Dairy Produce (Dairy Company payout)						
— advance for current season	12,954	15,685	18,321	20,579	20,885	67.0
— deferred from previous season	3,634	4,627	3,586	5,116	5,601	17.1
Total	16,588	20,312	21,907	25,695	26,486	84.1
Livestock Sales (Gross Profit)	4,464	2,429	3,045	3,553	3,549	13.1
Other Farm Income	701	751	702	738	876	2.9
GROSS FARM INCOME	21,953	23,492	25,654	29,986	30,911	100.0
EXPENDITURE						
Administration	457	515	552	624	742	3.4
Animal Health	466	520	583	648	714	3.5
Breeding Expenses	252	304	349	424	419	2.1
Contractors	280	347	313	271	271	1.7
Dairy Shed Expenses	204	241	291	314	355	1.7
Electricity	294	320	354	490	597	2.4
Feed & Grazing	1,061	1,171	1,043	1,227	1,458	7.0
Fertilizer & Seed	1,705	1,507	1,737	2,308	2,451	11.4
Freight	157	166	164	175	208	1.0
General, Weed & Pest Control	221	196	224	256	273	1.4
Vehicle Expenses	1,075	1,304	1,632	1,894	1,979	9.3
Repairs & Maintenance	1,484	1,628	1,630	2,322	2,171	10.9
Development Expenditure	135	150	177	194	324	1.2
Insurance, Accident Compensation	167	262	315	337	377	1.7
Rates	362	415	478	518	587	2.8
Labour & Rations	1,985	1,961	1,850	2,112	2,092	11.8
Interest	1,488	1,764	1,882	2,567	3,031	12.6
Rent & Bailment Fees	204	257	202	412	310	1.6
CASH EXPENSES	11,997	13,028	13,776	17,093	18,359	87.5
Depreciation	1,707	1,819	2,282	2,400	2,397	12.5
TOTAL CURRENT EXPENDITURE	13,704	14,847	16,058	19,493	20,756	100.0
NET FARMING INCOME	8,249	8,645	9,596	10,493	10,155	
Deferred Expenditure	- 14	- 64	- 42	- 85	- 35	
Income Equalisation	- 10	- 28	- 8	12	51	
Non Farm Income	244	262	340	211	389	
TAXABLE INCOME	8,517	8,999	9,986	10,777	10,528	

Source: N.Z. Dairy Board, 'An Economic Survey of Factory Supply Dairy Farms in New Zealand 1977-78.'

more stability in prices received as a result of the operations of the industry stabilisation scheme. Changes in current expenditures are closely related to changes in gross income, apparently more so than is the case with sheep and beef farms. This is to be expected where there is less variation of income and the industry stabilisation scheme normally gives farmers a good indication early in the season of the price they will receive for milkfat, the main component of income. However, the relationship may be weak in some years when changes in gross income are severely affected by the impact of droughts on milkfat production per cow. The long run average of expenditure as a proportion of income is 70 percent which compares with two thirds for sheep and beef farms. Variations between seasons in real expenditure per cow are also fairly closely related to (and average about half the size of) changes in the terms of exchange. There is no commonly accepted maintenance standard of real expenditure per cow but it would appear that such a measure would be in the region of \$75 per cow in milk on the 1967/68 base.

Table 11 sets out time series and annual percentage changes of livestock numbers in the national dairy herd together with data on some of the main influences on livestock investment, terms of exchange, real expenditure per cow and a climatic variable. It also includes a series of the main industry livestock performance variable, milkfat production per cow in milk.

The data in table 11 also divide conveniently into three phases of livestock response according to level of terms of exchange, real expenditure per animal and the weather variable as follows:

— Period 1 was a moderately strong growth phase of livestock investment accompanied by relatively high terms of exchange and real expenditure. Climatic conditions, as measured by the appropriately weighted soil moisture variable, and indicated by milkfat production per cow, were generally favourable with the exception of the moderately dry conditions in 1967/68.

— In Period 2 stock numbers registered quite a strong decline even though relative prices and real expenditure were high, apparently largely because of unfavourable

climatic conditions; in each year the soil moisture deficit was larger than the average for Period 1 and in three years of the five, conditions could be characterised as serious drought. Real expenditure per cow, whilst still high, is lower relative to terms of exchange than in Period 1, possibly partly due to the climatic conditions. Other factors are also likely to have had a significant influence on the trend in cow numbers in the first two or three years of this period including uncertainties related to United Kingdom entry into the E.E.C. and the official dairy beef diversification scheme.

— Period 3 is a further phase of declining cow numbers (four years only), apparently due largely to lower terms of exchange and to a lesser extent, real expenditure, while climatic conditions were somewhat improved, with the exception of the severe drought of 1977/78, though not as favourable as in Period 1.

Annual Averages	Period 1	Period 2	Period 3
	1964/65- 1968/69	1969/70- 1973/74	1974/75- 1977/78
Growth, total cows	+ 3.9%	- 2.8%	- 2.7%
Growth, cows in milk	+ 2.8%	- 1.5%	- 1.0%
Terms of exchange (index 1967/68 = 1,000)	1,045	1,104	851
Real Exp./cow (\$)	78.30	77.50	70.48
Milkfat/cow (kg)	135	125	140
Days of soil moisture deficit ¹	11.4	30.1	25.8

¹ Long-term average 1949/50 to 1977/78 is approximately 22.

Table 11 also illustrates the wide seasonal variations in milk production per cow between seasons, as much as plus or minus 8 percent in the period covered by the table, which can have a strong influence on income and expenditure. Variations in production per cow between consecutive seasons are largely caused by climatic conditions. However, it should be noted that there is a significant long-run trend increase arising from changes in the breed composition of the national herd and the impact of breeding programmes on the genetic quality of livestock.

Table 10
DAIRY FARM SURVEY — SUMMARY OF KEY DATA

	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
Gross Income (\$)	10,543	12,053	12,076	11,775	12,615	13,919	18,682	21,283	22,853	24,473	26,881	30,430
	(+ 13)	(+ 14)	(0)	(- 3)	(+ 3)	(+ 11)	(+ 34)	(+ 14)	(+ 7)	(+ 7)	(+ 10)	(+ 13)
Expenditure (\$)	6,349	7,366	7,805	7,727	8,212	9,121	11,198	12,789	14,128	15,507	17,161	19,050
	(+ 15)	(+ 15)	(+ 6)	(- 1)	(+ 6)	(+ 11)	(+ 23)	(+ 14)	(+ 11)	(+ 10)	(+ 11)	(+ 11)
Net Income (\$)	4,149	4,687	4,271	4,048	4,403	4,818	7,484	8,494	8,729	8,963	9,720	11,380
Prices Received Index ¹	1,024	1,043	1,000	1,013	1,100	1,215	1,394	1,578	1,621	1,544	1,732	1,829
	(+ 6)	(+ 2)	(- 4)	(+ 1)	(+ 9)	(+ 11)	(+ 15)	(+ 13)	(+ 3)	(- 5)	(+ 12)	(+ 6)
Prices Paid Index ¹	932	963	1,000	1,025	1,080	1,149	1,204	1,302	1,509	1,717	1,964	2,233
	(+ 2)	(+ 3)	(+ 4)	(+ 3)	(+ 6)	(+ 6)	(+ 5)	(+ 8)	(+ 16)	(+ 14)	(+ 14)	(+ 14)
Terms of Exchange Index ¹	1,099	1,083	1,000	988	1,018	1,057	1,159	1,216	1,075	899	882	819
	(+ 4)	(- 2)	(- 8.3)	(- 1)	(+ 3)	(+ 4)	(+ 10)	(+ 5)	(- 12)	(- 16)	(- 2)	(- 7)
Real Expenditure	(+ 12)	(+ 12)	(+ 2)	(- 3)	(+ 1)	(+ 4)	(+ 17)	(+ 6)	(- 4)	(- 4)	(- 3)	(- 2)
Real Exp./Stock Unit (1967/68 \$ basis)	80.10	82.20	78.80	72.50	70.40	71.50	82.40	84.00	79.40	75.30	71.60	69.40
	(+ 3)	(+ 3)	(- 4)	(- 9)	(- 2)	(+ 2)	(+ 15)	(- 12)	(- 5)	(- 5)	(- 5)	(- 3)

Source: NZ Dairy Board Annual Survey of Factory Supply Farms. (Survey of milk and cream suppliers, excluding farms employing sharemilkers.)

¹ Indices with a base of 1967/68 = 1000

(Figures in brackets represent annual percentage changes)

Note: The income and prices received data used in this table have been superseded by the results of a revised survey shown in detail in table 9. The results of the new survey are available only from 1972/73 which means the time series of that data is rather too brief for the purposes of a historical analysis of income responses.

Table 11
DAIRY CATTLE NUMBERS/REAL EXPENDITURE/TERMS OF EXCHANGE

	<i>Total Dairy¹ Cattle (M)</i>	<i>Cows in¹ Milk (M)</i>	<i>Milkfat Production Per Cow (kg)</i>	<i>Real Expenditure² Per Milk Cow</i>	<i>Terms of Exchange Index</i>	<i>Days of Soil Moisture Deficit</i>
1963/64	3.13 (-0.2)	2.01 (+0.7)	131 (+4.0)	74.66 ..	972 (+ 4.6)	26.4
1964/65	3.17 (+ 1.4)	2.03 (+ 1.0)	138 (+ 5.3)	77.76 (+ 4.1)	1053 (+ 8.3)	4.8
1965/66	3.36 (+ 5.9)	2.09 (+ 2.8)	140 (+ 1.4)	80.14 (+ 3.1)	1099 (+ 4.4)	4.6
1966/67	3.51 (+ 4.3)	2.13 (+ 2.1)	138 (- 1.4)	82.24 (+ 2.6)	1083 (- 1.5)	5.8
1967/68	3.70 (+ 5.4)	2.23 (+ 4.7)	128 (- 7.2)	78.84 (- 4.1)	1000 (- 8.3)	29.1
1968/69	3.79 (+ 2.6)	2.30 (+ 3.2)	129 (+ 0.6)	72.49 (- 8.0)	988 (- 1.2)	12.8
1969/70	3.73 (- 1.7)	2.32 (+ 0.7)	119 (- 8.1)	70.40 (- 2.8)	1018 (+ 3.0)	34.4
1970/71	3.54 (- 5.0)	2.24 (- 3.5)	123 (+ 4.0)	71.51 (+ 1.6)	1057 (+ 3.8)	16.4
1971/72	3.36 (- 5.0)	2.20 (- 1.7)	133 (+ 7.3)	82.37 (+ 15.1)	1159 (+ 9.6)	19.1
1972/73	3.36 (- 0.1)	2.19 (- 0.5)	128 (- 3.4)	83.95 (+ 1.9)	1212 (+ 4.6)	45.4
1973/74	3.27 (- 2.4)	2.14 (- 2.3)	122 (- 4.8)	79.40 (- 5.7)	1075 (- 11.3)	35.1
1974/75	3.13 (- 4.5)	2.08 (- 2.8)	131 (+ 7.8)	75.26 (- 5.2)	899 (- 16.4)	17.1
1975/76	3.01 (- 3.7)	2.09 (+ 0.6)	143 (+ 7.8)	71.62 (- 4.8)	882 (- 1.2)	20.8
1976/77	2.97 (- 1.4)	2.07 (- 0.9)	148 (+ 3.0)	69.35 (- 3.2)	819 (- 7.1)	24.1
1977/78	2.93 (- 1.1)	2.05 (- 1.0)	137 (- 7.1)			41.3

¹ At 31st January.

² Dairy Board Survey, base = 1967/68.

Figures in brackets are annual percentage change.

Source: Department of Statistics; New Zealand Dairy Board; Meteorological Service.

General Comment on Livestock Investment Analysis

Most analyses of farmers' livestock investment responses in New Zealand, usually employing much more sophisticated methodology than used here, have normally given rise to less than satisfactory results. It is a difficult area of investigation for a number of reasons including data problems, lags in responses and the impact of climate on a biological system. The analysis above, whilst very simple and partial, does appear to illustrate some aspects of livestock investment behaviour. Observations on the data as presented here tend to show a significant positive expenditure response to changes in real output prices (or gross income) and a positive relationship between the volume of expenditure and changes in livestock numbers. The evidence of a positive price response presented here appears to be strong enough at least to refute the suggestion occasionally made that farmers have a negative economic response to changes in output prices. (Suggestions of this nature have often arisen from problems of distinguishing between the investment response and the production response.) Nor is there any obvious evidence in observed responses to output price changes, of a significant degree of 'money illusion' i.e. an inability to distinguish between price changes in money terms and real terms. The analysis focuses attention on the impact of climate and indicates that there is a significant livestock investment response also to changes in climatic conditions.

The analysis has a number of limitations probably the most important of which are as follows: The quality of data used is mixed, in particular the data on livestock numbers is not considered to be reliable over the whole period and the climatic variable is best suited for illustrating the impact of widespread drought; the analysis relies largely on assessing the impact of two factors, relative prices and climate which appear to be the most significant. The analysis does not attempt to examine the impact of other factors such as technical change, the diversion of land use, social factors and availability of credit to the extent that these factors are not related to relative prices. (There is evidence to suggest, for example, that in the decade up to 1977 diversion of pastoral land to other uses, largely forestry and urban sprawl, reduced livestock carrying capacity by something in the order of 1 per cent per annum on average through this period.) In addition there has not been any attempt in this exercise to assess the impact (size or direction) of capital gains on farmers' production and investment decisions. This aspect could be significant because it appears that general inflation of land prices has in recent years contributed an increasing proportion of farmers' annual total income if this is expressed as capital gain plus taxable income. Another factor which appears to have become significant in recent years is the shift in emphasis of official incentives towards those which are directly linked to increased livestock numbers.

OUTPUT: FARM PRODUCTION TO EXPORT VOLUME

The output of pastoral farms is a function of live-stock numbers, livestock performance and the slaughter rate. This section does not attempt to examine farmers' short-term production responses (largely factors influencing the slaughter rate) but looks rather at some of the important aggregate linkages and relationships which follow after farm production decisions have been made.

The volume of farm products exported is the sum of:
 farm production
 less domestic consumption
 plus or minus stock changes.

Due to lack of data, timing differences in recording and changes in the nature of products between farm gate and export, it is not possible to specify this identity exactly for each major product but reasonable approximations can be made.

As indicated by the table, the wide swings in the overall volume of pastoral exports in the recent past have been largely due to stock changes. (Coverage of the indices from which these movements are calculated is not identical.)

can have a significant impact on export availability of the major products though changes have tended to be more in the nature of long-term trends than substantial year to year variations.

Commercial stockholding behaviour varies from product to product but export stocks generally reach a peak soon after the seasonal peak of production, at about March or April for most products. At the peak, stocks in aggregate may be up to one-third of production for the season. The low point of the stock cycle is usually reached just prior to the upturn of the next season's production, generally around October. The normal pattern of stocks does not therefore follow the June export year and there can be substantial variations of stock levels at the end of June. Commercial stockholding behaviour is usually largely related to price trends, stocks building up in periods of declining prices and vice-versa but forward sale commitments, other marketing considerations and shipping schedules can also have significant effects. Stocks acquired by the Meat and Wool Boards by market intervention generally reflect price trends. Both the Dairy Board, and to a lesser extent the meat exporting companies, will allow stocks to build to fairly high levels in pursuit of marketing objectives. In the case of the meat exporters, credit conditions can significantly alter stock-holding

(Year ended June)	(Annual % Changes)							
	1972	1973	1974	1975	1976	1977	1978	1979
Volume of Pastoral Exports	+4.1	+0.5	-15.0	-0.9	+17.3	+5.3	-6.9	+6.5
Volume of Total Agricultural Production	+2.8	-3.4	-2.7	+1.1	+6.9	+1.0	+1.5	-2.9P
Implied contribution of Stock Change to Change in Export Volume ¹	+1	+4	-12	-2	+11	+4	-9	+10

¹ This item is an approximate indication only of the contribution of stock change to changes in the volume of pastoral exports.
 P Provisional.

Annual production variations are rarely more than 5 percent in the aggregate but can be higher for the individual major products, often due more to changes in livestock performance than to numbers of sheep shorn or slaughtered. For individual dairy products there can be big year to year changes in the product mix as for example, between casein and skim milk powder.

Production available for export can differ from total production according to the proportions of domestic consumption which in recent years have been approximately as follows:

	% Domestic Consumption
Total milk	23
— milkfat processed by dairy factories	13
Wool (domestic consumption and sheepskins)	8
Total meat	30
— beef	33
— lamb	10
— mutton	45
Estimated average of all pastoral products	20

Thus a 5 percent rise in total production, for example, will give rise to a 5.4 percent increase in production available for export for wool and a 9 percent increase in the case of mutton, assuming a constant volume for domestic consumption. Changes in domestic production

policies. Although no official data is available there do not appear to be large end of season volume changes in commercial wool stocks i.e. stocks owned by the trade. However, changes in Wool Board stocks can have a significant effect on the volume of wool exports.

PRICES — EXPORT TO FARM GATE

This final section examines some of the factors which affect the transmission of product prices from the international market to the farm gate. It also looks at some of the aggregate data with a view to illustrating these linkages and the main considerations in analysing developments in this area.

New Zealand farm gate prices for exportable products are largely determined by export prices. The domestic market of its own accord rarely produces a significant price premium or results in a discount when supplies are more than sufficient for domestic consumption. However, premiums on export prices are often paid at the seasonal low point of production as, for example, in the case of prime beef and mutton, and at other times there may be a temporary distortion of the usual price relationships for small quantities of product.

The relationship between export price and farm gate price will be more or less direct depending on the operation of price stabilisation and support schemes, the timing of purchase from farms in relation to the time of export, the type of export purchase and sale

arrangements, and movements of intervening costs between farm gate and overseas buyers.

Intervening costs between farm gate and f.o.b. which include processing and handling charges, and overseas freight charges have escalated at a much faster rate than domestic or overseas rates of inflation in recent years due largely to changes in hygiene regulations, steep fuel price rises and low productivity, thus eroding farm gate returns. A distinction should be made between further processing, which adds value in terms of overseas returns such as wool scouring and lamb cutting, and the standard processing charges involved in converting the product to saleable form and which together with other handling charges, are costs to the farmer.

Table 12 trends in some of the main aggregate price indicators for the pastoral industry which are shown in the form of indices of the average price level for June years with 1970/71 as a base of 1000, together with annual percentage changes up to 1978/79. (It should be noted that coverage of the indices shown is not the same in all cases but the impact of the differences appear to be relatively minor. 1970/71 was chosen as the starting point as it was the first year in which official data is available for the aggregate export and input prices indices.)

Item 1 on the table, the world price, is an estimate of the average export price index for pastoral products in foreign currency terms. It provides an estimate of world price trends on average after taking out the impact of exchange rate changes and shows that even with annual average data there were very substantial price variations in estimated overseas prices for pastoral exports during this period, slightly more so in fact than in the export prices measured in NZ\$ terms. Export prices in foreign currency terms more than doubled in the four years to 1973/74, but fell sharply in the following year in the wake of the widespread international recession.

A further useful adjustment can be made to a world price index such as the one shown here and that is adjusting or deflating by the appropriate overseas index of inflation to show export price trends in real foreign currency price terms. This sort of index then shows the impact of the various components of supply and demand from year to year or over a period. For example, the foreign currency export price reduction of 19 percent calculated for 1974/75 becomes a reduction

in real terms of 38 percent if it is deflated by the average inflation rate of our trading partners which peaked at around 16 percent at that time, illustrating the very substantial impact supply and demand factors can have on world prices. It is also interesting to note that the average world price as shown here rose by 162 percent in the eight years 1971 to 1979, while the average inflation rate of our main trading partners rose by approximately 105 percent indicating a very substantial (nearly 60 percent) increase in real terms. However, these sort of calculations should not be used to indicate long-term trends in a period as short as this unless it can be established where the starting and end price indices are in relation to the long-term trend, i.e. whether they are cyclically low or high.

Item 2, the exchange rate variable used here, is the Reserve Bank exchange rate index expressed in terms of NZ\$ per unit of foreign currency which is the inverse of the conventional presentation of exchange rates or the exchange rate index, (foreign currency per unit of NZ\$) but which is the appropriate presentation to provide an indication of exchange rate changes on export prices during this period. The Reserve Bank exchange rate index is a measure of the average level of exchange rate, relative to a base period with each exchange rate in the basket or group of currencies in the index weighted according to the relative importance of that country in total current account transactions. This index was used largely for convenience but it may be more appropriate to construct an index of an average or effective exchange rate specific to pastoral exports weighted according to the estimated importance of various markets on prices for these products.

As shown in the table, exchange rate movements have generally tended to have a stabilising effect on pastoral export prices — the revaluations of 1972/73 and 1973/74 reducing the impact of rapidly rising world prices and the devaluations of 1974/75 and 1975/76 working in the opposite direction. These were followed by three years of stability in the overall or average level of the exchange rate.

(The 5 percent devaluation announced in the 1979 Budget and the introduction of the new flexible exchange rate system occurred at the end of June 1979 and therefore have no impact in the period shown in the table.)

Table 12
EVOLUTION OF PASTORAL EXPORT AND FARM GATE PRICES

(Index numbers each with the base 1970-71 = 1000;
Annual percentage changes in brackets)

Year ending June	1972	1973	1974	1975	1976	1977	1978	1979
1. Estimated world price	1,168 (+ 17)	1,618 (+ 39)	2,031 (+ 26)	1,649 (- 19)	1,717 (+ 4)	2,137 (+ 25)	2,234 (+ 5)	2,618 (+ 17)
2. Exchange rate index (NZ\$/unit foreign currency)	1,003 —	961 (- 4)	851 (- 12)	892 (+ 5)	1,047 (+ 17)	1,070 (+ 2)	1,071 —	1,071 —
3. Pastoral export price index	1,172 (+ 17)	1,555 (+ 33)	1,729 (+ 11)	1,471 (- 15)	1,798 (+ 22)	2,287 (+ 27)	2,393 (+ 5)	2,805 (+ 17)
4. Farm gate product prices	1,091 (+ 9)	1,474 (+ 35)	1,747 (+ 19)	1,354 (- 23)	1,597 (+ 18)	2,055 (+ 29)	2,117+ (+ 3)	2,582+ (+ 22)
5. All farming input price index	1,058 (+ 6)	1,140 (+ 8)	1,295 (+ 14)	1,439 (+ 11)	1,593 (+ 11)	1,865 (+ 17)	2,105 (+ 13)	2,330P (+ 11)
6. Terms of exchange index	1,031 (+ 3)	1,292 (+ 25)	1,349 (+ 4)	941 (- 30)	1,003 (+ 7)	1,102 (+ 10)	994 (- 10)	1,108 (+ 11)

+ Estimated.

P Provisional.

Sources: Item 2 is the inverse of the Reserve Bank exchange rate index and together with item 3 is used to calculate item 1.

Items, 3, 4 and 5 are Department of Statistics data; Item 6 is derived from items 4 and 5; Refer to text for further comments on each of the series.

Note: An increase in the exchange rate index as expressed here indicates a devaluation i.e. the opposite to the published Reserve Bank exchange rate index.

As shown in later tables, the margin between farm gate is quite substantial (currently about one third of f.o.b. value for pastoral products overall) and export price changes tend to be magnified at the farm gate. This effect is not so obvious in the aggregate June year indices of f.o.b. export and farm gate prices shown below because of the other factors, but the farm gate index tends to be more volatile than the export price index.

There is no index of intervening costs from farm gate to f.o.b. However, the pastoral export price index rose by 181 percent in the period shown whereas the farm gate prices received index rose by only 158 percent. Differences in coverage and the operations of the stabilisation schemes mean that the difference in the growth of two indices cannot be precisely attributed to the growth of intervening costs. However, it is clear that the intervening costs rose by more than the 181 percent increase in the pastoral export price index, apparently by about 15 percent more as implied by the lower growth rate of the prices received index, i.e. an increase for intervening costs in the region of 210 percent. By comparison, the New Zealand consumers' price index on the same base rose by 144 percent over this period to an index level of 2440 for the 1978/79 June year whereas the all farm cost price index (item 5), which is a measure of prices for current inputs, rose by slightly less, 133 percent. (The aggregate price movements quoted here for the eight years to 1978/79 should be treated as approximate only because of the nature of the indices used.)

One final general observation can be made on the basis of data contained in table 12 and the foregoing paragraphs. As indicated in earlier sections of this article, much of the problem of stagnant output of New Zealand agriculture over the past decade can be attributed to an unsatisfactory level of farm gate prices in real terms — the terms of exchange. It appears from the data presented here that the problem is due more to the effects of internal inflation, especially inflation of intervening costs from farm gate to f.o.b., than to the level of export prices.

The following sections briefly illustrate the price structure for the major pastoral products on a standard product basis.

DAIRY

Value added from farm gate to f.o.b. or the cost of converting milk to the final product is currently about one-third of farm gate price. Cost and price movements aside, the proportion can change slightly from year to year according to changes in the product mix. Recent trends in the farm gate payout, that is total payout relating to each season's production, and the official dairy products export price index are as follows:

	<i>Annual % Changes</i>							
	1972	1973	1974	1975	1976	1977	1978	1979
Export price index (June year 1971 = 1000)	1,646	1,536	1,508	1,730	2,003	2,123	2,342	2,572
	+65	-7	-2	+15	+16	+6	+10	+8
Wholemilk payout c/kg ¹ (fat in milk at farm gate, season ending May)	122.0	109.9	131.8	129.6	140.8	152.7	168.7	185.3
	+40	-10	+20	-2	+9	+6	+11	+10

¹ Estimated from Dairy Board payments to companies — actual distributions vary according to the circumstances of each company.

WOOL

Stabilisation and support operations aside, the relationship between farm gate prices for wool (auction less on costs from farm gate or private sale price) and export prices is more direct than for most exports. The costs from farm gate to f.o.b. are small by comparison with most other exports because no manufacturing process is necessary, and in recent years have averaged in the region of 12 percent of the farm gate price.

The major components of the wool export price/cost structure, in cents per kilo greasy basis for auction sold wool for two recent seasons, as shown in the table.

<i>Season</i>	<i>Cents Per Kilogram</i>	
	1974/75	1978/79
Estimated farm gate price	83.9	197.6
Transport, insurance, brokers' charges, Wool Board levy	(7.9)	(21.3)
Auction Price (season average)	91.8	218.9
Delivery and pre-shipment charges, plus buyers' commission	(3.9)	(8.8)
Estimated f.o.b. value	95.7	257.7
Ocean freight and marine insurance	(10.6)	(25.9)
Estimated c.i.f. value	106.3	253.5
Port charges and transport to mill	(2.0)	(2.3)
Estimated land cost at overseas mill	108.3	270.7
Total Costs, Farm Gate to Overseas Mill:	24.4	51.8

Source: New Zealand Wool Board.

It appears that the cost/price structure for wool sold by private treaty (approximately one-quarter of total sales) is similar in its main components to that shown above for auction sold wool.

MEAT

Meat is largely purchased by the exporters according to prices set out in the 'schedule', the weekly list of prices for bare meat at export works offered by the processing and exporting companies, which is based on expected realisations on the overseas market less estimated costs of processing, transport, storage and sale. Because of transport times, shipping availability and storage, sales in overseas markets can be up to five months or more after purchase of livestock in New Zealand, but the time is generally less, usually in the range of one to three months. The major element of on-costs from farm gate to f.o.b. is the processing charge which is calculated on the basis of estimated processing costs less estimated realisations for the by-products such as tallow, offals, etc., although a separate skin (pelt and wool) price is made on the sheepmeat schedule. Some farmers sell on their own account or through producer co-operative and pooling systems, and the companies themselves and other exporters also buy stock on the farm or in stock sales at prices usually close to schedule prices. Exporters, who include trading intermediaries as well as processors, also buy from freezing company stocks. At most times of the year prices offered for the same grades of meat to be sold on the local market will be close to the schedule or equivalent export price. Slaughter of animals for export is very seasonal which means that prices paid for stock purchases concentrated

in a few months of the season may bear little obvious relationship to returns from meat sales spread over most or all of the season. Prices for by-products can also significantly affect the bare meat or farm gate price for stock.

The main elements of the export price/cost structure for lamb and beef in two recent seasons are set out in the tables.

The growth of killing and processing charges in the freezing industry has been the largest element in the rapid escalation of intervening costs from farm gate to f.o.b. though other items such as internal transport have also contributed. The impact on farm gate prices is

BONELESS COW BEEF — UNITED STATES
(M grade cow 160kg \$/head)

<i>Season</i>	<i>1975/76</i>	<i>1978/79</i>
Estimated farm gate	71.64	182.99
Transport to works	(2.94)	(4.70)
Schedule (season average on a per head basis)	74.58	187.69
Works to f.o.b.	(42.35)	(57.87)
Estimated f.o.b. value	102.40	250.00
F.o.b. to c.i.f. New York	(21.04)	(29.56)
Estimated c.i.f. value	123.44	279.86
Total charges farm gate to c.i.f. New York	(66.33)	(92.13)

Source: New Zealand Meat Producers Board for charges at 31st January in each season; average values at schedule and f.o.b. are estimates from various sources and are indicative only. Trading profits or losses are not shown. 1.

illustrated by the growth of costs from farm gate to f.o.b. for lamb which doubled in the four years covered by the table above and rose by an estimated 274 percent in the eight years covered by table 12 as compared with 144 percent for inflation in general as measured by the consumers price index. The rapid escalation of killing and processing charges in recent years has been largely attributed to the impact of hygiene regulations imposed by overseas market countries which have had a dual impact, firstly via the need to rebuild or substantially alter freezing works and secondly, as a result of increased manning requirements for many industry processes. The additional costs arising from both of these influences are recovered largely by means of higher killing and processing charges.

LAMB — UNITED KINGDOM
(PM grade, 14.2kg, cents/kg)

<i>Season</i>	<i>1974/75</i>	<i>1978/79</i>
Estimated farm gate	38.4	74.0
Transport to works	(1.7)	(2.7)
Estimated Schedule (season average)	40.6	76.7
Works to f.o.b. (mostly processing charges)	(21.0)	(48.1)
Estimated f.o.b. value	66.4	121.2
Freight, insurance, U.K. levies, and landing costs	(44.3)	(92.0)
Estimated Ex-hooks Smithfield	110.7	213.2

Source: As for Beef table opposite.