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ADOPTING NEW TECHNOLOGIES AND RAISING DAIRY PRODUCTION — A MATTER OF INCENTIVES

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INTRODUCTION

Currently the New Zealand dairy industry is earning approximately NZ\$500 m. in overseas exchange annually. Except for the 1976-7 season, milk production has remained virtually unchanged during the past 10 years. The average factory payout for butterfat has nearly doubled during this time, but farm costs have risen more than comparably, and relative net earnings of farmers are now 20% lower than they were five years ago.

Recovery of the New Zealand economy must depend heavily on the capability of the livestock production sectors to lift their earning power appreciably, but there are as yet few signs that this is occurring.

Recent projections made by the authors of *The State of the Livestock Industry* (MAF, 1976) have specified the increases which they consider can reasonably be made in each form of livestock production by 1985. They have also calculated the likely economic consequences of achieving or failing to meet these targets. As for similar exercises made in the past, the appropriate environment to encourage and facilitate these trends has not been specified, yet it is as important to describe this as to nominate targets.

The most effective means to encourage desired increases in the production of milk from dairy farms is to provide a positive and adequate financial incentive to farmers able and willing to respond to it.

If these production increases are to be achieved by 1985 within the regions specified, then it is essential that incentives be designed to appeal particularly to farmers in these locations.

The greatest potential for increases in dairy cattle numbers by 1985 is in South Auckland-Bay of Plenty-Central Plateau (+ 21.1%) and Taranaki (+ 40.2%). Currently these have much larger dairy cow populations, and higher per hectare productions than in all other regions.

To be effective, an incentive scheme must appeal to large numbers of dairy farmers whose properties are producing

at relatively low as well as at high levels of output. The main proviso is that farmers will be prepared to seek to increase production in response to the incentive. Within the limits prescribed above, the incentive should be made attainable to those who are prepared to respond, and reward those who accept the challenge.

Present schemes, because they are concerned entirely with payments for additional stock numbers, provide opportunities mainly for farmers operating at low to medium levels of intensity.

They offer least to those who are now achieving high levels of output per farm and per hectare, who are the present target setters for each locality, yet who recognize that by the application of more physical or mental work, or both, they can approach closer than at present the potential of the land they are farming.

In general, the New Zealand Dairy Board's cost of production surveys show that farmers in this élite group possess a much larger proportion of the total farm equity than those on lower producing units. Also they manage farms offering fewer opportunities for extra physical development. Thus, in present circumstances, a very large fraction of the returns from added mental and physical effort is forfeited as extra taxation. Many of these persons are prepared to produce more because they are genuinely concerned with farming, and will accept a challenge, always provided the reward for this is reasonable.

Unless an incentive scheme includes adequate opportunities for this most talented and innovative group upon whom New Zealand dairy farming relies for commercially evaluating new ideas and technology, rates of adopting new developments to improve total production and efficiency provided by both research and industry will fall substantially in the future.

Recognizing that issues affecting agricultural production and marketing of livestock products in particular are both vital to New Zealand and politically very sensitive areas internationally, any local incentive proposals aimed at encouraging increased production must be defensible and not likely to be misconstrued by other member countries of OECD and of GATT as an undesirable price-support practice.

Finally, to find general application, an incentive scheme must be relatively simple and easy to administer, and capable of inducing production increases, the value of which will exceed markedly the costs both of the incentives and of their administration.

The proposal to be outlined accommodates all of these requirements.

A BASIC INCENTIVE SCHEME

The most positive way to encourage extra production is to pay an incentive for the desired product in direct proportion to the resulting additional quantities produced.

A simple, very effective scheme of incentive payments can be based on the yield of butterfat achieved per surveyed hectare, or per unit area of grass. This has several advantages over other indexes which might be used.

- (1) It provides an accurate measure of milk yield and the efficiency with which it is produced, relating both to the single most important factor determining total milk output in New Zealand, namely land suitable for dairying. It also relates closely and positively both to net profitability per farm and per unit area, and to the level of return on investment in the farm as a going concern (see Table 1).
- (2) It converts easily to total output of milk or milk solids per farm, the measures with which most farmers are concerned.
- (3) It is preferable to total milk output per farm since increases in total yield will not necessarily result in increased production nationally, if this is achieved by fewer farmers acquiring proportionally larger farms.
- (4) Absolute yields of milkfat/ha can provide workable baselines beyond which incentives can be paid for extra productivity.

TABLE 1: INCOME AND PROFIT: NEW ZEALAND FACTORY SUPPLY DAIRY FARMS GROUPED ACCORDING TO OUTPUT OF MILKFAT/HA

<i>kg milkfat/ha</i>	< 200	200- 249	250- 299	300- 349	350- 399	400 +	Average
Gross farm income (\$'000)	21.2	24.3	26.5	27.3	28.5	33.5	24.5
Net farm income (\$'000)	6.9	9.1	10.0	10.3	12.2	14.1	9.0
Net farm income/eff. ha (\$)	75	137	166	192	239	277	124
NFI/FGC (%) ¹	7.4	9.0	9.6	9.2	10.1	10.3	8.7

$$^1 \frac{\text{Net farm income}}{\text{Capital value of farm as a going concern}} \times \frac{100}{1}$$

During the past 12 years, on average, good seasons and less satisfactory ones have alternated. Thus, seasonal effects have been shown to be self-cancelling over periods as short as 3 to 5 years. Provided incentives are applied over periods at least as long as this, the effects of variations between seasons on the aggregate yields of butterfat/ha will be small, and have little effect on total incentives paid during such periods.

Hutton (1977) used data from the then most recently published analysis by the Dairy Board of the costs of production on factory supply farms in New Zealand to demonstrate the likely consequences of using a system of incentive payments based on exceeding a minimum output of milkfat per hectare. The example used involved a threshold of 300 kg milkfat/ha, beyond which incentives would be paid and below which they would not.

The threshold level chosen should be determined in part by the extent of the response sought, in turn a function of the effect per farm and the number of farms it is desired to include, and the localities from which it is believed these changes should come. Use of the figure 300 kg milkfat/ha is merely to exemplify the proposal and to demonstrate the extent of response which could be anticipated for these circumstances. It is not proposed as the only figure which might be employed, since this will be markedly affected by the basic aims of any incentive scheme.

Assuming, however, that a threshold level of 300 kg milkfat/ha is applied, then the Dairy Board survey for the 1974-5 season (NZDB, 1977) indicates that approximately 40% of all dairy farmers should be capable of producing more than this amount in normal circumstances or given a reasonable incentive. This calculation takes no account of farms currently producing 200 to 249 kg milkfat/ha, some of which, given the necessary stimulus, should also prove capable of exceeding this threshold.

An incentive accessible to farmers on the top 40% of farms should achieve substantial production increases at reasonable cost.

LEVELS OF INCENTIVE

Levels will be conditioned by the number of farms from which production increases are sought, the extent of the increases required, and the associated costs considered reasonable to induce necessary production increases.

In the present example, a reasonable inducement would be a 15% bonus payment above a standard factory payout for every 1 kg of milkfat above the 300 kg milkfat/ha threshold proposed, up to and including 399 kg milkfat/ha. This could be increased

TABLE 2: INCENTIVE PAYMENTS PER FARM (\$) AND THEIR EFFECTS ON TAX-PAID INCOME PER FARM (\$) ACCORDING TO PRODUCTION OF MILKFAT/HA

<i>kg milkfat/ha</i>	<i>No. of Farms</i>	<i>Tax-paid Income</i> <i>(— incentive)</i>	<i>Direct Incentive</i> <i>Paid</i>	<i>Cum. Tax-paid Income</i> <i>(+ incentive)</i>	<i>Difference</i> <i>((5) — (3))</i>
<i>(1)</i>	<i>(2)</i>	<i>(\$)</i> <i>(3)</i>	<i>(\$)</i> <i>(4)</i>	<i>(\$)</i> <i>(5)</i>	<i>(\$)</i> <i>(6)</i>
250-299	2800	6600	350	7800	1200
300-349	1815	6700	700	8200	1500
350-399	1320	7700	800	8900	1200
400 +	660	8600	1700	10700	2100

by 10% incremental bonuses for each additional kilogram of milkfat within successive 100 kg milkfat/ha categories beyond this level.

Thus farms such as the top producing group in the 1974-5 Dairy Board survey which averaged 445 kg milkfat/ha would receive an average 18% bonus on each of the 145 kg milkfat produced above the specified threshold.

These bonuses should be made tax free, since this would ensure extra effort was adequately rewarded.

If it is assumed the distribution of New Zealand's 16 500 factory supply farms according to the amount of milkfat/ha is the same as for the 1151 farms surveyed in 1974-5, and that on average incentives of the order proposed will induce production increases of the order of 10% on all farms presently producing more than 250 kg milkfat/ha, total costs of an incentive scheme of the type proposed would be about \$4.35 million annually. This includes extra payments which automatically would have to be made to farms already producing more than 300 kg milkfat/ha, as well as the costs associated with increases on these and other farms qualifying for the bonuses. If fully accepted, this scheme should result in the production of 13.6 million kg additional milkfat annually from 6600 farms, equivalent to 2000 kg per farm. This target is readily achievable, given a sufficient incentive.

At current produce prices, this extra production would be worth \$24 million in overseas earnings, certainly a substantial, profitable and worthwhile addition to the nation's annual earnings.

A measure of the extent of the extra returns to individual responding farmers which finally will determine either the success or failure of the scheme is in Table 2.

The basis for the distribution pattern of farms in column (2) has been described already. Column (3) is calculated from net farm incomes recorded in the New Zealand Dairy Board's cost of production survey for 1974-5 (NZDB, 1977) to which current taxation tables have been applied. Although the data are not correct in absolute terms, they provide a useful and valid comparison of the effects of the proposed bonus incentives on resulting extra spending power available to the individuals responding to the incentives, and demonstrate the principles involved in the proposed scheme.

It will be appreciated that to the bonus payments must be added the extra tax-paid income from the standard payment for the additional butterfat produced in response to the incentive.

The cumulative effects are shown in columns (5) and (6). Expressed in relation to column (3), these show that, irrespective of the actual yield of milkfat/ha achieved, cumulative tax-paid income is expected to rise by 16 to 24% in response to the incentive, in consequence of the postulated average 10% increase in milkfat produced. The rewards should appeal, therefore, both to the individual farmer and to the nation.

Because this scheme rewards according to additional milkfat produced, it has the advantage that it does not emphasize individual inputs like stock numbers and exclude others such as genetic merit of the herd. Instead it permits the farmer to employ maximum flexibility and exert his managerial skills amongst options for raising output and profit.

Undoubtedly it favours farms in the presently highly productive dairying areas, but it is from these localities that greatest increases in milk production are likely to be obtained by 1985. Should it be considered desirable to encourage extra productivity in other areas, several options are available. The threshold beyond which production would qualify for bonus payments could be reduced in these areas.

Since the level of bonus payment is in direct proportion to output of milkfat per hectare it also encourages farmers to aspire to join the élite group of highest producers, and these to achieve levels closer than at present to the potential of the land they farm.

Administration of the scheme could be relatively simple through an extension of present payment procedures by dairy companies to suppliers. Additional data required are surveyed or effective areas owned by suppliers. Bonus entitlements would be calculated and paid at the end of each season. Data recorded on computer files could be validated readily.

Frequently the concern is expressed by some that any direct payment to encourage increased primary production will be misconstrued by other member countries of the OECD and of GATT as an undesirable price support practice. However, relative to the vast subsidies being paid to European and North American farmers, the sums proposed here are minute. The average proposed incentive payment per qualifying farm is about 2% of the gross receipts for all dairy produce per farm per year. Relative to all dairy farms it is less than half this figure.

Since 1974, the costs of goods and services imported for use by primary producers have increased by more than 25%. This imported inflation cannot be controlled except by reducing use

of these. There is strong justification therefore to cushion these effects for the benefit of the above-average producer.

The scheme outlined is simple, potentially easy to administer, relatively inexpensive, and has the capacity to satisfy both the national need and the justifiable aspirations of individual producers who are prepared to respond to this need. In these respects, it is preferable to any other incentive scheme presently being used, or about which information is available.

THE ROLE OF THE PRODUCTION TECHNOLOGIST

Periodically the view is expressed that production technologists should not voice publicly their opinions on economic issues likely to affect farmers' reaction to change, or responsiveness to increasing the output of their farms. The author differs, but considers it is important when expressing such opinions to present the rationale for these, and whatever substantive data are available.

The most powerful medium for linking the production technologist with his farmer client is the increased opportunity this association will provide for raising farm tax-paid profit. It, more than any other factor, will determine whether new or different practices or technologies are acceptable, their degree of acceptance and thus the rate and nature of flow of production technology on to farms.

Production technologists and the New Zealand Society of Animal Production should make their views heard on economic matters about which they have knowledge and experience, and should not abdicate a vital national responsibility to other organizations and individuals less well informed, less closely involved, and hence less able to exert the necessary leadership. This is essential for ensuring in the immediate future that important past and present developments in animal production will find more ready acceptance and adoption than has occurred during the past decade.

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COMMENTS BY J. G. PRYDE, LINCOLN COLLEGE, IN
LEADING THE DISCUSSION OF THE PAPERS BY TAYLOR
AND HUTTON ON PRODUCTION INCENTIVES

These two papers deal with the subject of incentives in distinctly different ways. Hutton, although not an economist, recommends the use of monetary incentives to achieve an expansion of output from the dairy industry. Taylor adopts a much more general approach: he reviews the range of current incentives and the problems at present affecting the livestock industry, suggests guidelines for formulating assistance to the industry, and concludes by listing some of the current disincentives to production.

In advocating "output" subsidies, both papers claim that they are more effective than input subsidies in achieving the aim of increased output. Dr Hutton in his paper recognizes that, while we may in implementing his proposals be violating our international obligations, relative to what some countries do, it would constitute a mild form of sin. The Taylor advocacy of output subsidies is more vague and, other than endorsing the current Livestock Incentive Scheme, the author leaves us guessing after his comments, "If the need is for increased output then any scheme which ties the assistance to increased output tends to be an effective way of administering limited assistance. . . ."

Taylor emphasizes the importance of increased stock performance and suggests that if the Livestock Incentive Scheme could be amended to take account of this factor it would be even more welcome. He quotes telling examples of how a small increase in wool yields and lambing percentages could give the economy substantially more in foreign exchange earnings.

Both papers assume that farmers will respond to higher monetary rewards, although Taylor does concede that "some farmers will increase production with other objectives in mind though these tend to be in the minority". My own view is that to an increasing number of farmers the non-monetary factors are assuming importance. When farmers achieve a certain level of equity and income they tend to pay greater attention to these "non-monetary" factors when making their crucial production decisions. Of course, a relatively simple incentive may not have universal appeal. For example, it is too often assumed that New Zealand farmers are a homogeneous group. This is not so. The dairy farmer in Northland has very different problems from the fat lamb farmer in Southland. That hill country farmer in the

East Coast of the North Island does not face the same problems as those arable farmers in Canterbury. Too often it is assumed they are identical throughout New Zealand whereas their conditions vary considerably. If, however, a simple type of incentive is sought there is none better than an exchange rate alteration. Too often in the past have the interests of farmers been overlooked when instruments of monetary policy are being discussed. Provided government precedes and follows an exchange depreciation with appropriate policies, such a simple move could provide an effective stimulus to farm income, investment and, in due course, output.

Can New Zealand risk adopting output subsidies that run counter to international obligations? It would be foolish to rush headlong into trouble especially when variations on the same theme of output subsidies could be evolved and applied. In any case, if, as Taylor points out, we get "hooked" on input subsidies, does not the same risk apply with other types of incentives, especially if they are long term? Also could the government be persuaded to exempt Hutton's incentives from taxation when other subsidies and grants have been taxable in the hands of recipients in the past?

The two authors are to be thanked for their papers. They will stimulate considerable thought on a subject that is of great importance to the future of New Zealand agriculture.