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# A NORMATIVE APPROACH TO THE OPERATION OF THE NEW SOUTH WALES MILK BOARD

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The New South Wales Milk Board was brought into being in 1929, as a result of producer action, to bring order into a highly disorganised market situation. The retailing of milk had been extremely competitive, milk supply and hence milk price had been erratic and hygiene had been a matter of *caveat emptor*.<sup>1</sup> The Board was without effective powers until the *Milk Act*, 1931, after which prices were stabilised, inspection of dairies was introduced and in general reasonable standards of hygiene were established.

Initially whole milk quotas were allocated to factories. However, in the early 1950's it was found that despite a marked expansion of the milk zone, and despite a marked increase in price, the factory quota system still failed to produce sufficient winter milk. In 1955 individual farm quotas were introduced. A farmer's quota was determined by the zone in which he lived, and his level of winter milk production. In 1958 the quota system was altered again, in response to the discovery that a shortage of milk could occur at almost any time of the year.

We will first discuss in detail certain shortcomings of current Milk Board operations ; suggestions for improvement will be made. "Classical" and "quota" suggestions will be offered. The formal classical analysis will, of course, rely on the use of prices. The other suggestions will rely on an improved quota system supported by prices.

## *The Current Quota Scheme*

Most of the shortcomings of the present milk marketing arrangements can be directly traced to the system of production quotas now in use.

Each supplier has a *base* and a *production* quota. The base quota is the amount which the Milk Board will probably buy at whole milk prices (51 $\frac{3}{4}$ d. a gallon). The Board may in fact take more or less than the base quota, and in any case milk not sold to the Board is sold at normal manufacturing prices.

The *production* quota is the amount of milk the farmer has to produce in order to guarantee the maintenance of his base quota. Until recently individual production quotas were ignored unless the milk zone as a whole failed to produce 120% of the aggregate base quota for the zone as a whole. That is, so long as the milk zone was providing a 20% safety margin, the individual farmer could allow his production to fall below his production quota, without jeopardizing his base quota. This

1. The history of milk marketing in Australia has been described by Alan G. Lloyd, "The Marketing of Milk in New South Wales", *The Review of Marketing and Agricultural Economics*, Vol. 18, p. 205 (1950).

provision, which was almost the only element of flexibility in the whole scheme, has now been abolished following requests from producer organisations.

The milk zone is divided into four regions. In the inner zone the base and production quotas are the same (i.e., the base quota is 100% of the production quota). The other regions obtain less favourable treatment, depending on their proximity to Sydney (and hence the date they were taken into the zone). Their base quotas are 80%, 75% and 70% of their production quotas.

When a farm is purchased then the farm's quota is also passed on to the purchaser.

There is a general expectation that the more milk produced the higher will be the farmer's base quota in future years. The exact relation between current production and future quota is, however, quite unknown.

All producers are paid the same amount for milk delivered to the Board's local agent. The Board absorbs the transportation costs of milk from all parts of the zone.

Prior to November, 1959, when a farm was purchased but a new herd was brought onto the property, the new herd was allowed to establish a new base and production quota. Hence there was a general tendency for the total base quota to expand as farmers purchased run down, poorly managed properties and by feeding concentrates managed to establish new, and larger, base quotas. This inflation of the total base quota meant that from time to time it was necessary to deflate the base quotas of all suppliers. Quite apart from a supplier's ability to meet his production quota, he had to expect occasional reductions in his base quota due to the entry of new suppliers.<sup>2</sup> This method of establishing a quota has now been eliminated, thus increasing the tendency for the value of a farm's quota to be capitalised into the general value of the farm.

### *Shortcomings*

A brief summary of the shortcomings of the present Board policy would be :

1. The 20% safety margin is slightly too high.
2. Current policy results in unnecessary transport costs.
3. The Board is apparently entirely producer orientated.

Each of these shortcomings is discussed in greater detail below.

### *Safety Margin*

A safety margin may be required to compensate for fluctuations on either the demand or the supply side. Variations on the demand side are likely to be small and stochastic. The major variations on the supply side are due to seasonal influence. Unusually bad weather can reduce supply below expectations either by reducing feed supply (flood or drought) or by interfering with normal transport arrangements (flood).

2. Such downward revisions have taken place in October, 1958 and September, 1959. The first was an aggregate reduction of  $17\frac{1}{2}\%$  in the base quota ; the latter an aggregate reduction of 15%.

The Milk Board has decided that the best way to meet these uncertainties is to insist on a 20% safety margin.

Figure 1 gives total milk production, and Milk Board intake by months for the period 1957 to 1959. Figure 2 gives the Board's actual intake, predicted intake and an upper-limit to predicted intake. The predicted

Figure 1

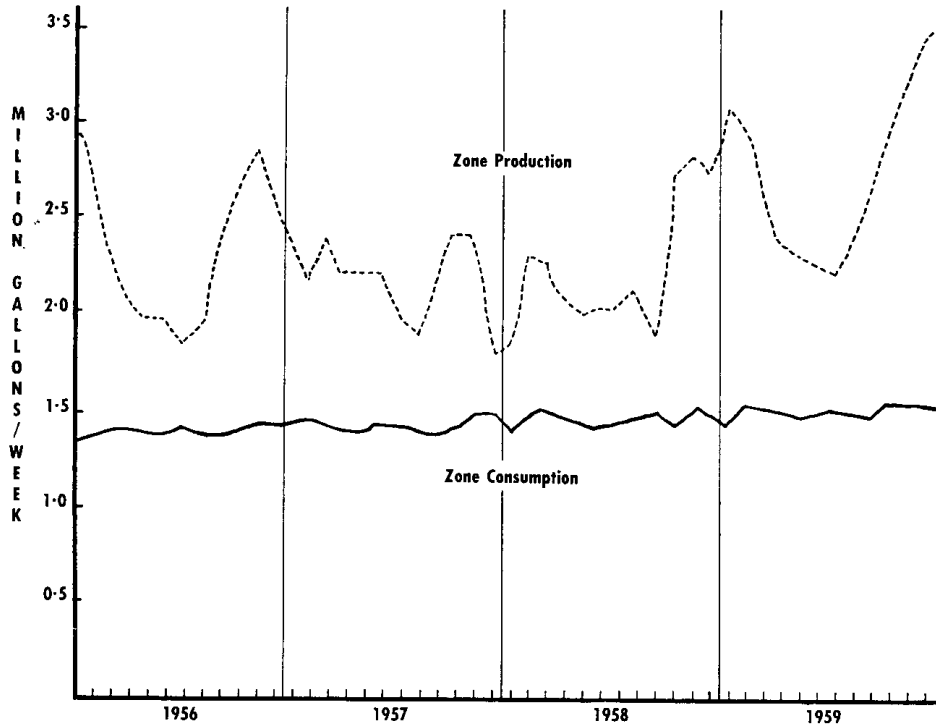
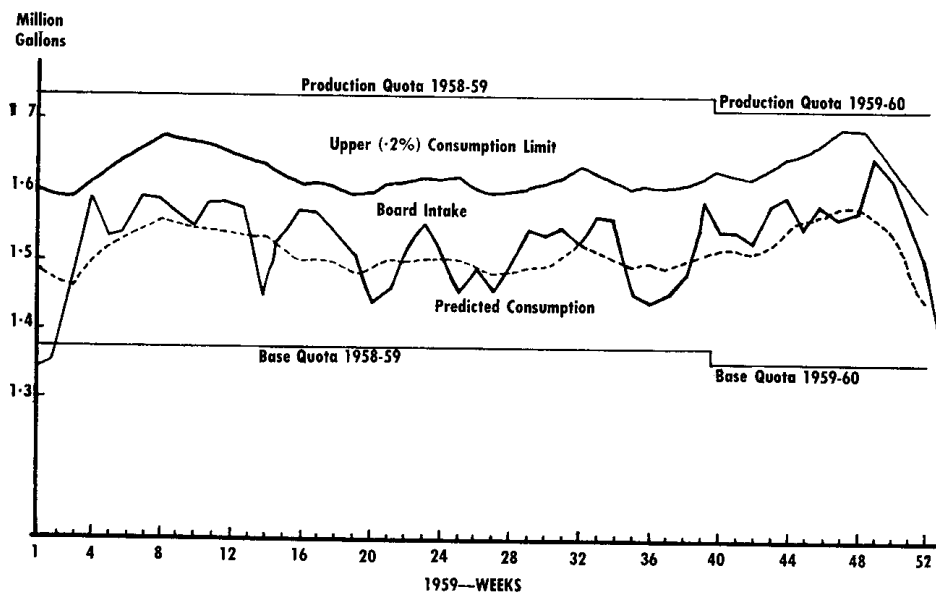


Figure 2



intake (consumption) is based on a five week moving average of consumption in the same period, the previous year. The exact equation is :

$$\hat{Y}_i = 281,763 + 0.8312 X_i \quad (1)$$

where

$\hat{Y}_i$  is predicted Board intake in week  $i$  and

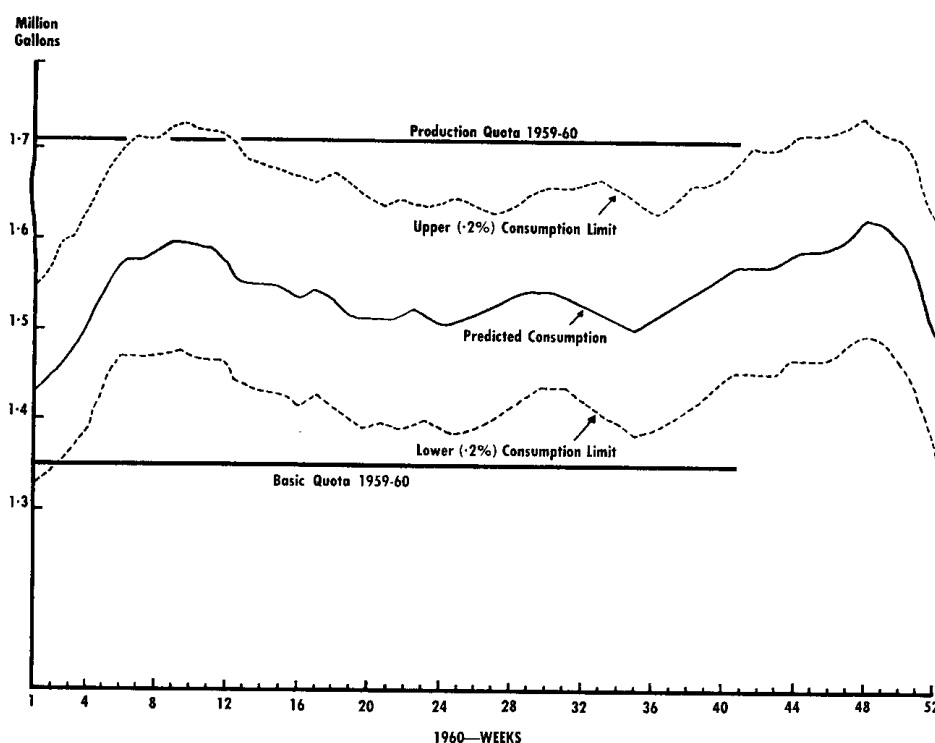
$X_i$  is a five week moving average of Board intake centred on week  $i$  of the previous year.

Equation (1) was calculated at the end of 1958. The predicted consumptions for 1959 were extrapolation beyond information then available. They appear nevertheless to be reasonably reliable. The coefficient of determination for (1) is : 0.6002 and is highly significant. The .2% confidence limit is the predicted demand plus three standard errors, (111,359 gallons). It should be exceeded 1 time in 500 (or once every 10 years).

It is quite possible that "Board intake" overstates consumption variability. Board intake refers to the amount of milk purchased for human consumption by the Board, in any week. Since there is some carry-over from one week to the next, some of the apparent week to week variability in Figure 1 may in fact be due to accumulation and liquidation of stocks.<sup>3</sup>

Figure 3 gives the Board's aggregate production and basic quotas for 1960, together with predicted consumption and the upper and lower

Figure 3



3. Alternatively, of course, these stocks may buffer much wider variations in demand.

(.2%) confidence limits on consumption. It is obvious from this figure that the Board's *basic quota* approximates *the minimum quantity* which will be required in any week.<sup>4</sup> The production quota is slightly above the maximum quantity which is likely to be wanted in any week.

Clearly, the production quotas are about the right level, *but they are about the right level because they are 10%, not 20%, above likely average consumption.*

Figure 1 shows that the only period when demand is likely to exceed supply is from May to September. During this period for 1960 demand would be very unlikely to exceed 1,680,000 gallons a week. The total production the Board is attempting to maintain is 1,710,000 gallons. In order to ensure that everybody who is likely to want an *extra* bottle of milk could get it, supply would have to be kept in excess of 1,680,000 gallons. To ensure that everybody could purchase their *normal* order, supply would need to be kept above 1,560,000 gallons.<sup>5</sup> Thus in order to ensure that the stochastic elements of demand should be met, the Board needs a safety margin of 8%.

The difference between the Board's 1,710,000 gallons, and the upper demand limit of 1,680,000 is too small to be worth quibbling about. However, in 1959, the predicted upper limit to winter demand was 1,625,000 gallons per week, while the Board's aggregate production quota was 1,730,000 gallons. The effect of this difference of 100,000 gallons per week, however, is worth studying. The margin could be explained as insurance against variations in supply. But maintenance of a margin of 100,000 gallons in good seasons and bad is an extremely inefficient way of ensuring continuity of supply.

Where supply variability is likely to be caused by flash flood or drought cutting the farm's feed supply, the appropriate form of insurance is a fodder reserve. Obviously adverse weather conditions, if not counteracted by additional feeding, can cut production by much more than 20%. At the same time adequate feed reserves would allow production to continue in even the most climatically unfavourable periods.

The other source of supply variability is the interruption of communications. Where this interruption will only take place for one, or at most, two days it is probably not too serious since supplies can be maintained by running down distributors' stocks and only supplying normal milk requirements. Where the interruption is likely to be prolonged, the 20% margin of 1959, or the 10% margin of 1960 provides little protection. In this connection it is instructive to quote the Producer Representative's comments on the 1950 floods :

4. In fact the basic quota is *intended* to approximate the Board's *average* intake. Thus in the September issue of the Milk Board Journal, F. Sedgwick, the Producers' Representative on the Board wrote :

"After quotas for 1959/60 were determined, it was realised that in order that dairymen would be able to supply their base quotas on an average over the year to the Board, it would be necessary to reduce the aggregate of all quotas to a figure approximating the Board's average sales. An examination of quota figures revealed that a cut of 15% was necessary and, accordingly, this reduction has been applied."

5. These two quantities are taken as the highest point on the .2% confidence and predicted consumption lines.

“The disastrous June floods occasioned serious losses and brought hardship to many dairymen throughout the milk zone—indeed, throughout the State. In the Hunter Valley the damage was greatest. For a long time the flood waters covered the main Northern railway lines beyond Newcastle, thus isolating from Sydney all railway connection with the North Coast and the Hunter Valley districts. On the South Coast, too, landslides resulted in intermittent interruptions to rail traffic.

“In association with the Railway Department, the Board effected what emergency transport arrangements were possible. Milk from Singleton and Muswellbrook was brought to Sydney via Werris Creek, Mudgee and the Western Line. Milk from some North Coast areas (Gloucester, Dungog, etc.) was transported by road to Hexham and thence railed to Sydney.

*“Notwithstanding all these emergency measures, however, not more than half Sydney’s normal milk supplies were received during this unfortunate period, and the aggregate losses cannot be ascertained until the flood waters have subsided.”*<sup>6</sup>

In such cases a frank admission of “emergency” should be made. The only practical defence is a supply of skim milk powder and vegetable oils available in Sydney to provide filled milk for the duration of the emergency. This would be much cheaper than the cost to the dairying industry of a “safety margin” of 100 to 200% of normal needs so that a 100% of requirements could be accessible in times of chronic flooding.

#### *Cost of the 1959 “Safety Margin”*

It has been shown above that in 1959 the Board’s policy attempted to stabilise weekly milk production at least 100,000 gallons above maximum requirements for consumption.<sup>7</sup>

This Board-encouraged surplus depressed the incomes of milk-zone farmers, Australian butter producers, and eventually the incomes of butter producers in all parts of the world.

The surplus was 100,000 gallons per week, over a period of about 20 weeks, or a total surplus production of 2,000,000 gallons.<sup>8</sup> The farmer receives 51.75d. per gallon for milk used for human consumption and about 24.5d. a gallon for factory production. Since winter is the time when production is difficult, and supplementary feed has to be used, we may take 51.75d. as a reasonable estimate of the marginal production costs.<sup>9</sup> The farmer is only paid factory prices for his surplus milk, hence on the surplus of 2,000,000 gallons the milk zone dairymen can be said to be paid 27.25d. a gallon less than their marginal costs. Thus the direct cost to milk zone dairymen of the Board’s policy in 1959 could be put at £227,000 per year.

The surplus of 2,000,000 gallons will produce 760,000 lbs. of com-

6. F. J. Sedgwick : “The June Floods”, *Milk Board Journal*, 15th July, 1950, p. 338. Our italics.

7. In fact, the likelihood that high production this year will lead to a higher base quota next year, means that the individual farmer has an ill-defined incentive to keep his actual production well above his production quota. This, of course, accentuates the surplus problem. In absolute terms the surplus demanded grows as population (and Board intake) grow from year to year.

8. Management practices ensuring this surplus over winter may mean increased production in summer. It is assumed that since producers plan to supply cream during the summer months the marginal cost of this production is something less than 24.5d.

9. If in fact the marginal cost of *winter* production is less than 51.75d. this would seem to be an argument for *reducing* the price of milk. The profits made on summer production should meet any overheads required for whole milk production.

mercial butter.<sup>10</sup> Since Australia's home consumption requirements have already been met this extra production has to be added to the export surplus. The equalised price paid for this butter was about 44d. lb. The average export price for this butter was about 38d. lb. c.b. The difference of 6d. a lb. is found by reducing slightly the Australia-wide equalised price. 6d. a lb. on 760,000 lbs. is an annual sum of £19,000 by which the Milk Board's insurance margin reduced the total incomes of all Australian butter producers. In a year when the average price for butter was 300/- a cwt. in England, the cost would be £47,500.

This is not the end. The extra 760,000 lbs. of butter has to be dumped on the United Kingdom market which has in recent years shown signs of being markedly inelastic. Even this increase in the supply available could depress the world price for butter.

In short, a decision by the Milk Board that, for administrative purposes, it would be convenient to have a 20% surplus is an altogether too narrow view of the issues at stake.

#### *Transportation Costs*

At the present time the Board physically accepts from 100% to 70% of the production quota for sale in Sydney as whole milk. The remainder, 0%, 20%, 25% or 30% is used for manufacturing.

This policy results in some milk being carried 280 miles, while milk within 40 miles of Sydney (produced on farms suitable for whole milk production) is used for manufacturing. This results in inflated transportation costs, and high overheads for those factories forced to operate on only a small volume of milk.

#### *Producer Orientation*

The Board has a "consumer representative", appointed by the State Government, but he is not a member of the Housewives' Association, nor have any of his published statements shown a great desire for cheaper and more palatable milk. He was not, for instance, in the forefront of those advocating the introduction of filled milk into Australia.

The general lack of regard for the consumer is shown by the Board's failure to encourage the sale of homogenized and skim milk, its failure to reduce the price of cream, and its unwillingness to acknowledge that the high prices paid for quotas and milk delivery routes indicates that Sydney's milk supply would be forthcoming even if returns to producers and vendors were lowered.

The failure to lower cream prices is particularly short-sighted.\* An expansion in cream consumption would increase returns to producers *and provide another form of insurance against adverse weather conditions.* No one could seriously object to a curtailment of cream supplies during drought or flood. But the milk so released would provide a valuable addition to the supply available for consumption.

Probably the main criticism of the past working of the Board should be that there has been no attempt to minimise the cost of milk to the consumer. Instead the Board has preferred to allow marked income

10. Assuming half has a B.F. content at the Board minimum (3.5%) and half at the Australian average (4.1%).

\*Since this article was written the price of sweet cream has been reduced from 3/7 to 2/5½ per half pint; consumption is reported to have doubled.—*Editor.*



differentials to develop between milk-zone and non-zone dairy farmers. This policy has, in turn, resulted in the "extension of the zone" being considered to be a "political" question. Whereas, in fact, the arguments for and against extension of the zone are essentially economic arguments.

### *Classical Analysis*

The classical analysis of the Milk Board's problems is, as with most problems, fairly straightforward. Milk price should be raised in the winter to compensate for the high cost of winter milk production, and lowered in the summer. These price alterations should be passed on to the consumer to encourage consumption in summer and restrict it in winter. The offer of substantially more than the required amount of milk should be taken as *prima facie* evidence that milk price has been set too high; shortage of milk as evidence that the milk price was too low. Some adjustment of the winter price might be made to compensate for a good or poor season. Farmers should be paid a "Sydney" price less cost of transportation to Sydney.

If it is objected that price fluctuations tend to reduce total consumption it would still be possible to keep price to the consumer constant, while varying the price to the producer.<sup>11</sup> In any case, the Board would have an important part to play in inspecting dairies and ensuring the maintenance of reasonable levels of hygiene at all stages. Hygiene is an obvious situation in which private and social net product are widely divergent.

### *Quota Analysis*

If the Board refuses to alter the price to the producer, then some form of quota scheme is almost inevitable. The price fixed will almost surely be attractive in summer and unattractive in winter. There will be windfall gains in summer and losses in winter. The only way to ensure that winter production is maintained is to say that maintenance of winter production entitles the producer to a share of the windfall gains the following summer; that is, a quota scheme.

One major disadvantage of a quota scheme is that the quota tends to become associated with some resource, a man, a herd, or an area of land. More importantly, it tends to become associated with what the resource did several years previously. To overcome this difficulty quotas should be freely traded, probably in units of "the right to supply 10 or 20 gallons per week". The trade in quotas would be facilitated by quoting selling and buying prices in the newspaper; transfers could be registered with the Milk Board.

If the quota market was at all responsive to the real life situation quotas would be most expensive in spring and least expensive in autumn. Milk Board suppliers would be paid a Sydney price, less cost of transport.

The Milk Board would continue to be responsible for policing the cleanliness of production. Hence before a farmer could purchase quota units he would have to get his dairy approved by officers of the Milk Board.

11. While maximisation of consumption at an attractive price is an obvious goal for a producer organisation, it is not necessarily an important goal for a *consumer* organisation.

Similarly adequate transportation arrangements would need to be made. Factories would still continue as agents for the Milk Board, but the general body of producers would have to decide whether they wished their factory to make the small investment necessary for the assembly of milk for the Board.

Thus a farmer whose dairy was substandard, or who supplied a factory without provision for the collection of Board milk, would be unable to buy quota units.

The Milk Board would also likely refuse to accept milk from regions likely to be frequently isolated for more than two days by flood.

Since insurance against *demand fluctuations* is an inevitable Board function, quota units should be made available up to the upper limit of predicted demand. The Board would realise that in almost all weeks some fraction of the quota milk purchased would have to be resold to factories for manufacturing purposes. The loss on this fraction of the milk would need to be absorbed in the Board's general price structure. However, the Board would be able to resell, for manufacturing purposes, the milk furthest from Sydney, thus minimising transport costs.

Only if the individual farmer has incentive to maintain production will aggregate production be maintained, hence prices would need to be set so that quotas had some value at all times of year, and even during drought or flood. Farmers would be warned when total supplies from quota producers fell below 110% of total quota requirements. When it fell to 100% of requirements an "emergency" would be declared. Any suppliers who failed to meet his quota production during the emergency would sacrifice quota units equal to the average difference during the emergency between his production and his quota. These quota units would then be sold by the Board to the highest bidder.

The price of quotas would be a guide as to whether milk price should be raised or lowered. When quota prices exceeded one limit milk price should be lowered, when they fell below another price, milk price should be increased.

Similarly milk runs would be bought and sold in a well regulated market. The market price established would indicate whether vendor's margins should be increased or decreased.<sup>12</sup>

The above quota scheme would ensure a constant supply of milk to Sydney at minimum cost. It would also facilitate the transfer of whole milk production to those areas having a real cost advantage—a real advantage in view of transport costs.

12. This suggestion was originally brought to our attention by Alan G. Lloyd. Our whole quota scheme can be considered as a logical extension of his original idea.