OPTIONS FOR A MORE COST-EFFECTIVE SYSTEM FOR THE STORAGE, HANDLING AND TRANSPORT OF GRAIN IN NEW SOUTH WALES

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ABSTRACT: *The State Transport Study Group of the New South Wales Ministry of Transport has examined alternative investment, operational and charging strategies for the storage, handling and transport of New South Wales grain between farm and port with the objective of establishing a basis for a more cost-effective system. The options considered included reducing the period for which sites remain open during receival, reducing the number of receival sites, improving outloading rates to rail, increasing train sizes and replacing branch line rail operations with road haulage to alternative rail loading facilities. While most of these options showed promise for minor cost reductions under certain circumstances, only the substitution of road haulage for low volume branch line rail operations was found to offer the potential for substantial savings.*

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1 INTRODUCTION

The storage, handling and transport of wheat and other grains is currently the focus of considerable attention, both at the State and national levels. Vocal demands from farmers for reduced handling and transport charges have led to the establishment of a Royal Commission into Grain Storage, Handling and Transport, which is due to report by mid 1987. The attention being paid to the handling/transport system is understandable when one considers that, for Australia as a whole, the average grower return for wheat is currently approximately $126 per tonne, from which storage, handling and transport charges and farm production costs must be deducted. The average combined storage, handling and transport charges for Australia are approximately $35 per tonne, equivalent to over $20,000 per annum for a typical farm harvest of around 600 tonnes.

Investigations into the grain handling/transport system have been under way for several years in NSW. At the direction of the (then) Premier, the NSW State Transport Study Group (STSG) reported in 1984 on seaboard terminal requirements. Recommendations were made on the size and location of additional seaboard terminal capacity and the optimal allocation of grain along rail links from NSW Grain Handling Authority (GHA) districts to seaboard terminals. More recently, the STSG has been engaged on an examination of the country component of the grain handling/transport system, examining alternative investment, operational and charging strategies for the movement of grain from farm to port. This paper relates to this later work.

Given the size of the NSW wheat belt and the complexity of the handling/transport system, it was decided to focus on one GHA district on a pilot basis. District 8 in the south-west of the State was chosen for this purpose since it was seen to have a high potential for change and to offer an area in which a wide range of handling/transport options could feasibly be tested.

2 THE GRAIN STORAGE, HANDLING AND TRANSPORT SYSTEM IN NSW

The NSW wheat growing belt covers a large area of the State, extending in a band some 400 kilometres wide and 1200 kilometres long from the Queensland border to the Victorian border (Figure 1). The belt is situated to the west of the Great Divide, the eastern border being approximately 200-300 kilometres from the seaboard, and the western border some 600-700 kilometres. The study area is one of the smaller districts in the south-west of the belt, centred on the town of West Wyalong.

The Grain Handling Authority (GHA) is a statutory authority, responsible for the storage and handling of grain both within the wheat belt and at the seaboard. The GHA provides receival and storage facilities at some 270 sites throughout the wheat belt with a total storage capacity of approximately 12 million tonnes. Grain storages are of three main types: vertical silos, horizontal sheds and PVC-covered bunker (stockpile-type) storages. In this paper, the first two types are referred to as "conventional" storage to differentiate them from bunker storages, which have markedly different capital and operating cost structures.

Five country storages - Junee, Temora, Parkes, Werris Creek and Moree - have high storage capacities and are designated as sub-terminals. These perform a number of functions, the major one being to provide a "buffer" between the receival sites and the port, receiving overflow grain from the former and providing significant stocks of grain within reasonable journey time of the seaboard terminals. Unlike other states, only limited storage is provided at the two existing NSW grain export terminals, Port Waratah (Newcastle) and Rozelle (Sydney). In addition to exports from these two facilities, considerable quantities of grain from the border areas are shipped through Victorian and Queensland ports. A new terminal at Port Kembla is expected to open in 1989, whereupon the Rozelle terminal may be closed.

The wheat growing areas are serviced by an extensive network of railway lines (Figure 2) operated by the State Rail Authority (SRA) of NSW. Over 20% of the State's trackage is currently devoted exclusively to the haulage of grain. The density of the rail network, and particularly of wheat-only branch lines, is especially pronounced in the south of the State. The branch lines serving the wheat growing areas were constructed mainly between 1900 and 1930 as "pioneer" lines utilising lightweight rail and low construction standards. Maximum axleloads on many of these lines are restricted, limiting the use of higher-capacity wheat hopper wagons and mainline locomotives. Short sidings at many

FIGURE 1: NSW WHEAT BELT

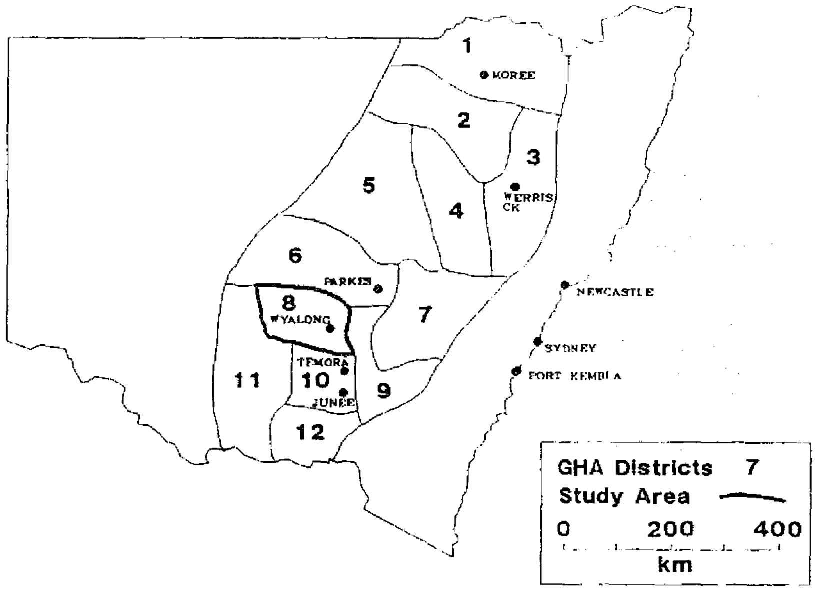
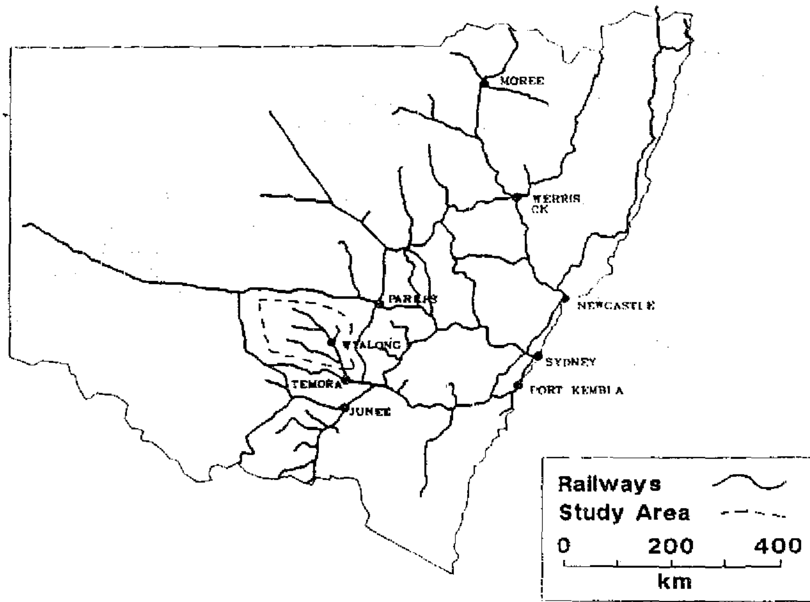


FIGURE 2: STATE RAIL AUTHORITY OF NSW RAIL SYSTEM



country storage sites limit the use of block trainloads, and the division of trains, with wagons distributed between sites, is necessary on many branch lines. A significant proportion of the grain harvest is double handled, being initially railed from receival sites to the sub-terminals where it is stored for subsequent transport to port to meet shipping demands.

At present, all grain exported through NSW ports is moved to the seaboard by rail. In other states, the proportion of grain delivered to port by road varies from around 10% (Queensland) to 50% (South Australia). The new Port Kembla terminal will include road receival facilities and its opening will change current port delivery arrangements, although it is expected that rail will continue to dominate the long-distance movement of grain to ports.

The network of storage, handling and transport infrastructure in District 8 is shown in Figure 3. There are 23 GHA receival sites in the district, with storage capacities ranging between approximately 1,700 tonnes (conventional storage only) and 159,000 tonnes (conventional plus bunker storage). Rail outloading rates of individual storages range between 60 and 400 tonnes per hour. These sites are served by 4 branch lines, all of which are used solely for grain haulage. Barmedman in the south-eastern corner of the district is 510 kilometres from Rozelle by rail and 37 kilometres from the Temora sub-terminal located in neighbouring District 10. The most distant site, Lake Cargelligo, is 653 kilometres from Rozelle.

3 STUDY APPROACH

3.1 Objectives and Methodology

The primary objective of the study was to explore alternatives for reducing aggregate storage, handling and transport costs. Timing considerations and the complexity of the system being studied motivated the choice of a modelling and scenario testing approach rather than an optimising approach such as linear programming. The elements of the system considered were:

1) truck transport of grain from farm gate to GHA site by grower or grower's contract haulier

2) storage and handling of grain by the GHA

3) Government road transfer of grain to alternative GHA sites when rail line closures are considered

4) rail transport of grain to final consumers by the SRA either direct to a seaboard terminal, or by double handling via Temora sub-terminal

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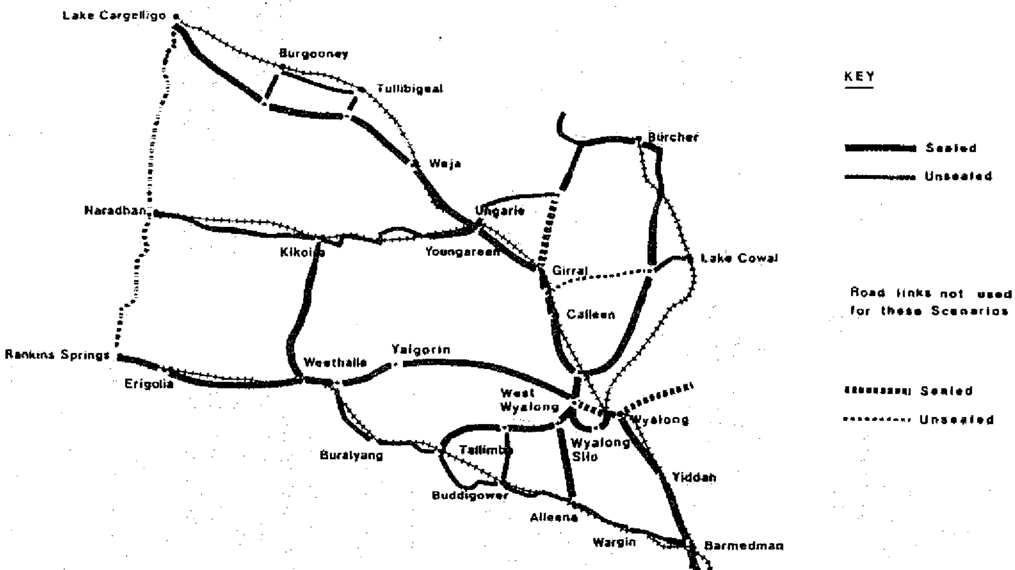
FIGURE 3: STUDY AREA SHOWING GHA SITES, RAILWAY LINES & PRIMARY ROAD NETWORK



Given the need to reduce the modelling task to a tractable level, the following simplifying assumptions were adopted:

- The capital value of storage and handling infrastructure was not specifically modelled except for that added to the system under any particular scenario. Costs of non-country storage and handling operations were ignored, as were overheads for each system component. In consequence, STSG cost estimates cannot be compared directly with either service charges or accounting costs.

- Farm operations and the use of on-farm storage was not taken into account. The issue of on-farm storage is currently being examined in some detail by the NSW Department of Agriculture.

- Road transport of grain to domestic consumers was excluded since it constitutes a small proportion of the total grain transport task in NSW.

- Seaboard terminal operations were taken as given and hence the impact of country operations on terminal operations was not explicitly considered.

- Given the nature of this study, the whole question of work practices was specifically excluded.

- District 8 average site truck queueing times were established on the basis of 1984/85 site receival data. These averages were adopted for truck costing purposes in preference to introducing a queueing section into the relevant models.

- In those scenarios incorporating substitution of road haulage for rail operations, the cost of additional road maintenance (routine maintenance, resealing and rehabilitation) was included, but not the cost of road upgrading or new bridgework. The road maintenance costing philosophy which was adopted assumed that increased traffic volumes would not lead to catastrophic pavement failures but that, rather, road maintenance requirements would increase incrementally. If tonneages over particular road links in the district prove to be beyond the capabilities of existing pavements, road upgrading would be required and costs would be correspondingly higher.

- Although provision was made for the impact on storage capacity of different grain types and wheat grades, it was concluded that the additional complexity involved in modelling these factors would not offer any extra insights into the critical factors affecting costs.

- Minimum straight line travel distance was used as a surrogate for the least cost and minimum delivery time criteria adopted by farmers in deciding to which site to deliver.

In addition, in constructing the model suite the following technical issues were specifically addressed and modelled:

- Costing of GHA operations associated with changes in the daily receival rate of grain at GHA sites during the harvest period.

- Costing of SRA branch line operations.

- Road truck capital costing, in particular the attribution of capital costs to the grain task in cases in which vehicles are not used exclusively for this purpose throughout the year.

3.2 STSG Grain Transport/Handling Costing Model Suite

The model suite consists of the following modules and requires interactive use of mainframe and networked micro computers:

Grain Harvest Model: On the basis of historical data, prepares forecasts of grain harvests for specified geographic areas.

Catchment Model: For a given storage and transport strategy, prepares estimates of the flows of grain from each farm area to each storage location, taking into account factors such as storage capacities and opening strategies. This model may also be applied to pre-harvest planning of receival strategies.

Farm to GHA Truck Cost Model: Estimates the costs to growers of hauling grain to GHA storage locations by both farm and contract vehicles. This sub-model can also be used to assess the costs associated with the use of different truck types.

Government Intersite Truck Cost Model: Estimates the cost of truck haulage of grain by government-hired contractors. This occurs in cases in which GHA sites remain open even though rail branch lines are closed. Grain delivered to these off-rail GHA sites is subsequently transferred by truck to a GHA site on rail.

Road Maintenance Cost Model: Estimates changes in road maintenance costs associated with the redirection of road traffic on different types of Department of Main Roads (DMR) and shire roads. This sub-model also permits the assessment of changes in road maintenance costs resulting from different truck configurations and loading.

Storage Site Cost Model: Estimates site operating costs for the major site activities, namely inloading, outloading, pest control, maintenance and intersite transfer, for any given operating strategy and infrastructure configuration. Also estimates capital costs associated with changes to infrastructure.

Rail Costing Model: Estimates operating costs for branch line and mainline railway operations, including labour, fuel, rolling stock maintenance and track maintenance. Rolling stock capital cost requirements are also calculated. This model allows assessment of cost savings arising from branch line upgrading/closure, improved outloading rates at country silos/sub-terminals, and changes to railway operations (e.g. train sizes, speeds, etc.).

Aggregate Cost Model: Summarises individual cost components and calculates resultant total system costs.

3.3 Range of Grain Receival Levels Considered

Three District 8 grain receival levels were tested in order to establish the sensitivity of model results to different harvest levels. These levels encompass the lowest and highest projected receivals between the present and the year 2005/6. On the basis of historical data it was assumed that District 8 carryin (grain from previous receivals still left in storage at the beginning of any one season) is 100,000 tonnes. Year-end carryover (grain still in storage at the end of any one season) equals carryin except in a low receival year, in which it is less than carryin. On the basis of Australian Wheat Board (AWB) forecasts the following receival levels were adopted:

- a low level of 112,000 tonnes
- a medium level of 496,000 tonnes
- a high level of 913,000 tonnes

3.4 Study Approach in the Context of Policy Formulation

Prior to this study, there was little understanding of the cost implications of the way in which policies of the different operating authorities interact. It is therefore not surprising that isolated strategies of closing small sites and improving outloading rates were perceived to offer the greatest potential for cost reduction. However, STSG work has suggested that neither strategy results in significant aggregate savings.

Opportunities for cost reduction in the grain storage, handling and transport system are severely curtailed by the size of existing capital infrastructure and the cost of its replacement. This constraint is especially important during times of rural economic contraction and after periods of major public capital expenditure. In NSW sizeable bunker grain storage investment was undertaken in 1983/84 following a record harvest and port throughput restrictions which combined to create an urgent need for additional short to medium term storage. In addition, in 1984 the NSW government decided to construct a new grain terminal at Port Kembla. Given the size and timing of both investments, cost reduction strategies which involve further substantial capital expenditure are unlikely to be viable in NSW. This argument applies especially to strategies which involve replacement of existing storage.

This view strongly influenced modelling work. Existing infrastructure was largely taken as given and the scenarios tested were based on modifications to this infrastructure and different operating strategies.

4 OPERATIONAL AND INVESTMENT SCENARIOS CONSIDERED

The operational and investment scenarios to be tested were defined in a series of workshops held with the GHA and the SRA. The various options incorporated in the scenarios were based on a joint assessment of potential for cost savings at various points in the handling/transport chain. The seven basic scenarios tested were as follows:

Base Case

Essentially, this comprises the physical infrastructure available for the 1985/86 harvest (23 sites plus all existing rail lines) with an additional bunker at Ungarie to accommodate the high harvest receival level. Operational procedures in general are as for 1985/86.

Fill and Close Smallest Sites

The 11 smallest sites in District 8 are operated on a "fill and close" basis whereby they remain open for grain receivals only while spare storage capacity is available. As soon as the sites are filled, receivals are directed to other sites. This obviates the transfer of grain from these sites to Temora sub-terminal and curtails the time for which they are open for receival.

Close Smallest Sites

The 11 smallest sites in the District are closed completely, with receivals directed to other sites. Five new bunker storages (including that built at Ungarie as in the Base Case) are constructed to replace the storage capacity lost. A variant of this scenario involves the closure of the 7 smallest sites, which necessitates the construction of only one additional bunker, at Ungarie.

Increased Outloading Rates to Rail at Selected Sites

Outloading rates at selected sites are upgraded by a variety of measures, including the provision of fast outloading spouts and the introduction of direct outloading from bunker storages to rail in place of outloading via conventional storage (transfer of grain from bunker to conventional storage and thence to rail).

Increased Siding Lengths at Selected Sites

Sidings are extended at selected sites to permit increased operation of block trains direct from country storage to port. Outloading rates to rail at selected storages are upgraded as in the previous scenario.

Limited Branch Line Closure

The Wyalong-Burcher railway line is closed. This line is in poor condition and carries low volumes of grain from Burcher and Lake Cowal, the only sites which it services. The two sites continue to receive grain, on a fill and close basis. This grain is transported by road to Wyalong for loading to rail in the post-harvest period.

Extensive Branch Line Closure (Road-Rail Scenario)

This is a compendium scenario combining and extending the most promising cost saving elements of other scenarios. The main feature is the closure of all railway lines in District 8 with the exception of the Temora-Wyalong link. The 7 smallest sites are closed, with all other sites receiving grain on a continuous basis. Grain is road-hauled from off-rail sites to a new fast road-rail transfer facility at Wyalong.

5 RESULTS

5.1 Capital and Operating Costs by System Component

For each of the receival levels considered, the distribution of Base Case aggregate costs over each system component is shown in Figure 4. As can be seen, rail costs constitute by far the greatest percentage of aggregate costs. Branch line costs contribute significantly to rail costs, particularly in low to medium harvests. Fixed track maintenance is a major component of branch line costs.

Capital costs are shown as a percentage of total costs for each system component in Figure 5. Since capital has an economic life in excess of one year, an estimate must be made of annual capital costs to permit comparisons with annual operating costs. This estimate is obtained by annualising the cost of each capital item included in a scenario over the economic life of that item using a 5% constant dollar interest rate. The resultant modelled annual capital costs do not reflect the actual financial commitments of the SRA and GHA, which are based on current dollar rates of interest and include loan repayments on past investments.

As receival tonneages increase, the percentage contribution of capital to aggregate costs generally decreases. This can be explained by the large fixed element in capital costs. However, modelled farm to GHA truck capital costs are not characterised by this pattern. Trucks used for hauling grain during harvest are used for other tasks throughout the remainder of the year and the problem of attributing truck capital to the grain haulage task was solved by adopting a vehicle "hiring charge" concept, with truck capital costs as one element of the charge. A corollary of this approach is that the absolute amount of "truck capital consumed" increases as harvest tonneages increase.

5.2 Cost Savings

Figure 6 shows comparative results for each scenario tested for the medium receival level. As can be seen, system changes originally thought to have potential for cost savings - closure of small sites, operation of storages on a fill and close basis, increased outloading rates and extended sidings - offer only limited savings for District 8 as a whole. Closure of small, inefficient sites and increases in outloading rates are the most promising of these strategies, but even so yield savings of only 10-30 cents per tonne on a medium receival. If passed on to growers, savings of this order would be equivalent to an increase in annual farm income of just $60-$180 for a crop of 600 tonnes.

FIGURE 4: BREAKDOWN OF COSTS
BASE CASE - THREE HARVEST LEVELS

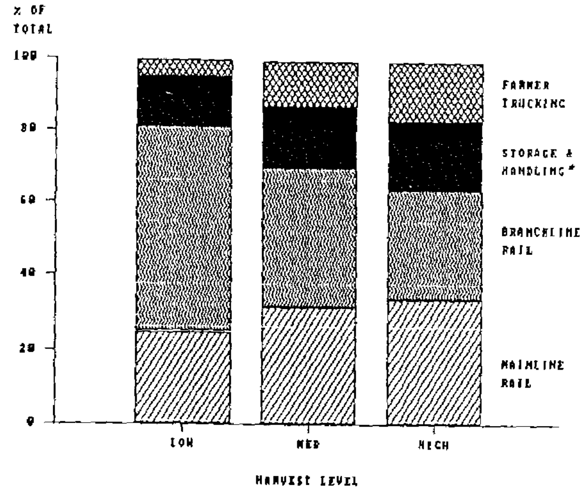
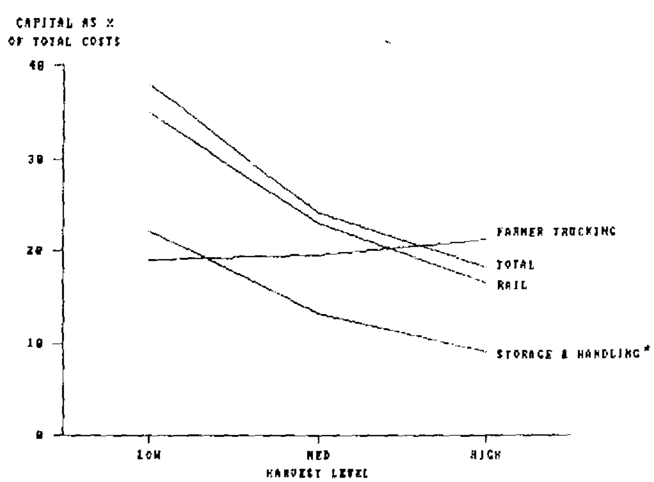


FIGURE 5: CAPITAL CONTRIBUTION TO TOTAL COSTS
BASE CASE - THREE HARVEST LEVELS



* *INCLUDES* - *Storage and Handling Operating Cost at Country Sites*
- *Annualised Capital Cost of New Infrastructure*

EXCLUDES - *G H A Overheads and Port Capital/Operating Costs*

The limited savings available from strategies such as these, implemented in isolation, can be attributed to two factors. Firstly, although relatively significant cost savings may be achieved at individual points in the system, aggregate savings are likely to be small because of the limited tonneages involved. For example, the introduction of direct bunker to rail outloading provides substantial savings in handling costs for the tonneage affected but has little effect over District 8 as a whole because only nine sites in the district lend themselves to this outloading technique.

In a similar vein, increases in outloading rates and hence reductions in loading time have only a limited effect on rail costs as loading time accounts for a very small proportion of total site-to-port cycle time due to the distances involved. Even a large reduction in loading time has only a small impact on total rail costs.

Secondly, cost savings possible in one part of the storage/handling/transport chain may be offset by increased costs in other parts. This counterbalancing may take place within one operation or across two different operations (such as transport versus handling).

One example of savings and costs offsetting each other occurs in the Site Closure Scenario in which the greater part of the tonneage diverted from the eleven closed sites is accommodated in bunker storages at the sites remaining open. The higher operating costs of bunkers relative to conventional storage partially offset the savings arising from the closure of the high cost conventional storage at the smallest sites. Moreover, the small net reduction in operating costs relative to the base case is further offset by an increase in capital costs resulting from the construction of five bunker storages to replace lost capacity. This capital impost can be alleviated by closing only the seven smallest sites, since this obviates the need for extra bunker construction save that at Ungarie, but even so the cost savings remain small.

Of the scenarios originally tested, only that involving the closure of the Burcher railway line yielded significant savings. This suggested the possibility that more extensive branch line closure could yield even greater savings. In consequence the Road-Rail Scenario was developed and tested, with the result that quite substantial cost savings of approximately $5 per tonne on a medium receival were achieved for District 8 as a whole.

FIGURE 6: OVERVIEW OF RESULTS
GHA DISTRICT 8 - MEDIUM HARVEST

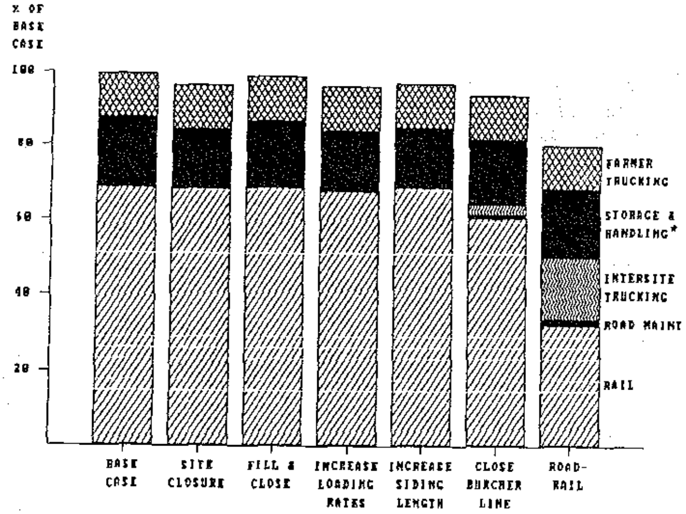
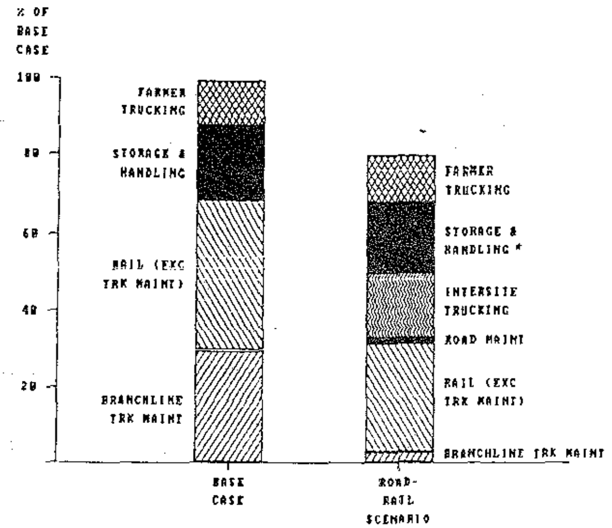


FIGURE 7: BASE CASE vs ROAD RAIL SCENARIO
GHA DISTRICT 8 - MEDIUM HARVEST



* *INCLUDES - Storage and Handling Operating Cost at Country Sites*
- Annualised Capital Cost of New infrastructure
EXCLUDES - G H A Overheads and Port Capital/Operating Costs

The Road-Rail Scenario has been described briefly above, but a fuller description is perhaps appropriate in view of the significance of the results. The rail network west of Wyalong is eliminated by the closure of the Burcher, Naradhan, Rankins Springs and Wyalong-Lake Cargelligo lines. The seven smallest sites in the district are closed. A government-organised trucking operation is employed to transport grain from all off-rail receival sites to a new road-rail transfer facility at Wyalong. This facility has buffer storage of 15,000 tonnes and a rail outloading rate of 500 tonnes per hour. Unit trains of 39 wagons (60-tonne net wagon capacity) operate directly from this facility to the seaboard. Approximately 4 unit train movements are required per week under the medium receival level.

Comparative results for the Base Case and the Road-Rail scenario are shown in Figure 7, for the medium receival level. The cost savings achieved under the Road-Rail Scenario are dependent on the high level of rail-related savings possible, especially those associated with fixed track maintenance. While these savings are offset to some extent by intersite trucking costs, additional road maintenance and the costs of constructing the Wyalong transfer facility, the net savings possible under this scenario are still significant. Net savings would be increased if the costs of the transfer facility were lower than those assumed or if the construction of such a facility could be avoided entirely. However, in the absence of such a facility it is probable that handling and rail costs would increase and that the efficiency of intersite trucking operations would be reduced. It should be noted that the estimated savings are exclusive of the cost of any additional sidings at the transfer facility and track upgrading required between Wyalong and Temora to cater for unit train operation.

A variant of the Road-Rail Scenario was tested, with the main transfer facility located at Ungarie, north-west of Wyalong. The net savings achieved were marginally lower than those resulting from siting the rail transfer facility at Wyalong.

6 IMPLICATIONS FOR POLICY

6.1 Rail Operations

District 8 results suggest that significant savings in costs are likely only through the closure of low volume branch lines and the substitution of road haulage. The savings arising from such a policy result primarily not from reductions in avoidable operating costs (labour, fuel, maintenance), nor from rolling stock capital costs, but rather from the elimination of track maintenance costs.

Track maintenance costs can be considered to have two components: a fixed component, which does not vary with the tonneage traversing the line, and a variable component, which is influenced by tonneage. At higher volumes, as on main lines, the fixed component is relatively insignificant in per tonne terms and track maintenance costs are largely tonneage-dependent. On low volume lines, however, the costs of fixed track maintenance must be spread over fewer tonnes and the cost per tonne is inevitably high.

Fixed track maintenance costs in NSW were given as approximately $7,500 per track kilometre in the SRA's submission to the Grains Royal Commission dated February 1987. This is comparable to the figure of $6,300 per kilometre per annum quoted for the Victorian rail system in the CANAC Review of March 1984, equivalent to approximately $7,700 at February 1987 values. To give a simple example of the significance of track maintenance costs, an 80 kilometre branch line carrying 50,000 tonnes per year would cost approximately $600,000 per annum to maintain, or $12 per tonne in track maintenance costs alone.

Extensive closure of rail branch lines, supported by sufficient rail outloading capacity at the road-rail transfer facility, has been assessed to be cost-effective in District 8. However, it should be noted that opportunities for low volume branch line closure are more limited elsewhere in NSW, particularly in the northern areas of the State where the rail network is less dense and branch line tonneages are typically significantly higher than in the south. Moreover, if branch lines could be maintained at a lower cost than assumed in the modelling exercise then the cost advantages of a Road-Rail Scenario would be reduced.

Measures such as improving rail loading rates or extending sidings at country storage sites, although possibly yielding considerable savings for individual sites, do not offer potential for significant system-wide savings. In addition, at many sites there are limited opportunities for increasing loading rates or siding lengths at reasonable cost. Consideration should be given to introducing these measures at sites at which it is feasible to do so, but the District 8 results suggest that their cost impact should not be overstated.

6.2 Storage and Handling Operations

The potential for achieving significant savings through changes to infrastructure or operational strategies in the storage and handling network appears to be much more limited than for rail. At best, storage and handling cost savings of approximately 10 cents per tonne were achieved in District 8 under the scenarios tested, for a medium receival. This represents only a small proportion of storage and handling costs and, correspondingly, an even smaller proportion of total costs. Moreover, such savings as can be achieved may be offset to some extent by increases in the costs of other operations.

In fact, policies which yield the greatest savings in overall terms - closure of branch lines and substitution of trucking for rail operations - may actually increase storage and handling costs to some degree. All grain delivered to off-rail sites and subsequently transferred to a railhead for final outloading is double handled. This adds to operating costs. A capital cost impost exists in those situations in which construction of a road-rail transfer facility is also required. Whether or not the net effect is an increase or decrease in storage and handling costs is determined by the extent and cost of double handling which takes place under current operational procedures (for example, double handling via a sub-terminal and bunker outloading via conventional storage) and the capital cost of any new transfer facility. In the Road-Rail Scenario tested for District 8, under a medium receival, storage and handling costs increase by 24 cents per tonne over a situation of minimal double handling via Temora sub-terminal. In contrast, again under a medium receival, these costs decrease by 40 cents per tonne over a situation in which approximately 50% of District 8 grain is double handled via Temora.

The results of the Road-Rail Scenario for District 8 suggest that the construction of a road-rail transfer facility is warranted where existing railhead facilities do not provide for rapid rail loading or for sufficient buffer storage to prevent rail delays. Capital costs can be supported from the overall system savings which stem from the closure of low volume branch lines.

6.3 Intersite Trucking

The Road-Rail Scenario is based on intensive-utilisation trucking operations for movement of grain from GHA sites to the fast transfer facility at the railhead. If the trucking operation assumed is not possible in reality, the benefits of these scenarios may be substantially lessened.

The truck fleet required to service District 8 under branch line closure operating conditions is quite small. A peak fleet of about 50 vehicles (articulated tri-axle semi-trailer rigs with a Gross Combination Mass of 38.4 tonnes) would be required for all intersite movements of grain in high harvest years (913,000 tonnes receival). In low harvest years, fleet requirements are correspondingly lower. Use of larger rigs, such as B-doubles (Gross Combination Mass of 54 tonnes) would reduce the number of vehicles required significantly. In other districts, fleet size would have to be established on the basis of haul distance and trucking efficiency.

Analysis also indicates that where trucks are used to replace rail haulage, the use of large, efficiently scheduled trucks is necessary in order to achieve savings. Were the haulage task to be undertaken by smaller farm vehicles, savings would be eroded by lower trucking efficiency (tonnes per hour), potentially higher road maintenance costs and longer loading and unloading times due to queueing congestion. Similarly, any additional site infrastructure investment aimed at avoiding delays would also reduce potential savings.

6.4 <u>Farm to GHA Trucking</u>

District 8 results indicate that the closure of selected small sites has little impact on the growers' trucking costs. This may not necessarily be the case in other areas of the State, particularly in those districts in which GHA sites are further apart than in District 8.

6.5 <u>Road Maintenance/Upgrading</u>

In District 8, the cost of additional road maintenance arising from the substitution of road haulage for branch line rail operations was found to be marginal. However, it should be stressed that road maintenance and upgrading requirements could be different in other districts and that hence their cost could vary markedly across the State.

The analysis undertaken for District 8 indicated that a number of factors affect road maintenance costs, including the type of truck used, the degree of overloading which occurs and base traffic levels.

An Equivalent Standard Axle (ESA) is defined as a dual-tyred axle supporting a load of 8.2 tonnes and is a measure which allows different truck configurations and loadings to be standardised. Of all traffic on a road section, it is only heavy vehicles which cause substantial pavement damage and thus estimates of the distribution of total ESAs over the number of years of pavement design life can be used as a costing base against which to assess increases in truck traffic levels. In modelling road maintenance costs, it was assumed that the DMR and relevant Local Councils have appropriate ongoing maintenance programmes.

In situations where actual ESAs are greater than expected, design life is reduced and pavement maintenance programmes must be accelerated. If ESAs are to be kept within planned levels, the following road usage policies are required:

- Routeing strategies which impose a different traffic impact on selected road sections. Such strategies can also be used to shift the road maintenance cost burden from one funding authority to another and from one road to another.

- Vehicle loading control. This is a critical policy variable as different vehicle configurations and loading levels can result in dramatically different levels of pavement damage, (and hence different costs for maintenance authorities).

Throughout the study it was clear that base traffic levels are a key determinant of marginal road maintenance costs. Typically, the higher the base traffic levels, the lower the marginal maintenance costs attributable to grain traffic.

It was recognised that changes in road maintenance costs could have important budgetary implications for specific Local Councils even though, when viewed in relation to aggregate costs, road maintenance costs are relatively small. This assessment has been confirmed by the current industry debate about closure of branch lines under SRA Option 3 proposals (discussed below). Policies which aim to limit intersite grain truck traffic to specific routes have become a focus of the debate, largely because of different impacts on Local Council and DMR budgets.

In District 8, two-axle rigid trucks with a tare weight of 7 tonnes are frequently employed for moving grain from farm to GHA sites and, typically, these vehicles are overloaded by an average of about 30% (4 tonnes). When compared to a similar vehicle, legally loaded, these overloaded vehicles approximately <u>double</u> road pavement damage levels. Similarly, movement of 30,000 tonnes of grain from bunker storage, when undertaken by legally-loaded standard tri-axle semi trailer rigs, imposes nearly 50% less pavement damage than the same task undertaken by the above overloaded two-axle rigid vehicles When compared with the use of legally loaded two-axle rigid vehicles, movement of the bunker tonneage by legally-loaded semi trailers imposes approximately 25% less damage.

It is therefore clear that the current country practice of truck overloading during the harvest period can impose a dramatically greater cost burden on Local Council budgets than the more intensive road-based transport required when rail branch lines are closed. Although policing of truck overloading on shire roads is primarily a Local Council responsibility, there are often considered to be good local reasons for allowing overloading during the harvest period. From a road maintenance perspective, however, such a policy is not without cost.

7 DIFFERENTIAL PRICING AND THE "OPTION 3" DEBATE

The State Rail Authority (and most other railways in Australia and around the world) have traditionally adopted distance-based pricing structures for all traffics - freight and passenger - which do not necessarily reflect the variations in costs involved in serving particular locations. Similarly, for any one grain type (for example, wheat and barley) the GHA charges uniform rates for each tonne of handled, regardless of the cost variations between different sites. This is, at least in part, a reflection of the fact that the SRA and GHA have developed as service-driven rather than market-driven organisations. It can be argued, in economic terms, that charges for goods and services should reflect their costs of provision to encourage an efficient distribution of resources (unless particular goods and services are to be subsidised on social grounds)

The SRA's traditional rating structure for grain haulage is sharply tapered with distance and, beyond about 400 kilometres from the point of origin, charges increase relatively slowly with increasing distance. Analysis of rail costs and charges for District 8 suggest that SRA charges beyond Temora approximately cover rail avoidable operating costs, but do not cover the costs of fixed track maintenance. The divergence between costs and charges for each branch line in District 8 becomes greater with increasing distance from the seaboard as fixed track maintenance costs are spread over progressively fewer tonnes It was concluded that, for District 8 at least, the (then) current SRA freight rate structure did not reflect the actual costs of rail operations, and that in effect low volume branch line operations were being subsidised by other elements of the rail task to the detriment of the efficiency of the overall grain storage/handling/transport system.

The SRA's own assessment of its competitive edge over road transport, combined with demands from grain growers for reductions in freight rates, have led the SRA to examine cost-based rating structures as a way to offer rate reductions to the majority of growers. Subsequently, the Authority presented three grain freight rate options to the industry.

Option 1 involves retention of a distance-based rating structure and some across-the-board rate reductions to reflect increasing railway efficiencies.

Option 2 is a cost-based rating structure, reflecting the cost variations which exist in serving different sites. Under this option, all growers who deliver to mainline sites are offered substantial rate reductions. However, charges on lower volume branch lines would rise markedly. There would thus be a financial incentive for many growers located on branch lines to truck grain to sites with lower freight rates, for example, those on a main line. As a result, many branch lines could be expected to close by default. At this stage, the industry indicated its desire to be given a firm indication by the SRA of the branch lines which the SRA intended to close.

Option 3 was developed in response to the industry's request and branch lines which the SRA proposes to close have been specified. This proposal is essentially a variation of Option 2. The freight rates applicable to sites which are located on the closed branch lines cover the cost of Government-controlled intersite movements of grain to railheads together with rail movement to port. The combined road-rail freight rates for sites affected are lower than the rail-only rates proposed under Option 2. Under Option 3, the industry would receive average rate reductions of 25% in real terms over two years. This is equivalent to an increase in average farm incomes of approximately $3500 for a crop of 600 tonnes. Minimum reductions of 15% would apply to <u>all</u> growers, while growers delivering to mainline sites would receive reductions of up to 40% in real terms.

The STSG assisted in the initial evaluation and development of these freight rate proposals, particularly with regard to the way in which branch line track maintenance costs should be reflected in the rating structure and the financial impact on growers, given current delivery patterns. The SRA originally favoured allocating track maintenance costs on a whole-line basis, so that all sites on a branch line would be charged the same track maintenance levy. Such an approach would, in effect, have led to cross-subsidisation of sites towards the ends of branch lines, where per tonne track maintenance costs are often very high due to the limited tonneages traversing the track. Alternatively, it was argued that a cumulative site-by-site allocation of track maintenance costs would be preferable. Adoption of a cumulative approach led to truncation of the outer ends of many branches apparent under the Option 3 proposals.

The GHA has also canvassed the development of a cost-based pricing structure to reflect the significant variations in storage and handling costs which occur between different sites. These proposals are still under development, although it is understood that the concept of differential pricing has met with some resistance from within the rural sector.

8 CONCLUDING REMARKS

The existing system of grain storage, handling and transport in NSW does not offer easy opportunities for achieving savings, so that radical changes are required to yield substantial cost reductions. While operating cost savings might be achieved if much of the existing infrastructure were to be replaced, new investment on such a scale would be difficult to justify given the relatively low tonneages which are handled through most of the State's facilities.

Of the scenarios tested in District 8, only the substitution of road haulage for branch line rail operations offers the potential for significant savings in costs - about $4 to $5 per tonne for the district as a whole. While this is a modest amount in relation to a grower's total costs it nonetheless represents some 15% or so of transport and country handling charges. These savings are far more substantial those estimated to flow from the other changes to the system canvassed - for example, a reduction in the period for which sites are open during receival, the closure of low-capacity sites, and increases in rail loading rates. The savings gained flow mainly from the elimination of railway fixed track maintenance costs on branches to be closed. Broadly speaking, road transport is competitive with branch line rail where railway tonneages are low and the cost per tonne of fixed track maintenance is high. Road is unlikely to be competitive with rail for the long-distance high-tonneage mainline haul to the port. The "threshold tonneage" at which road will be cheaper than rail is a matter for further study: this threshold is likely to be dependent upon the level of fixed track maintenance costs per kilometre of track relative to the marginal road maintenance/upgrading cost per additional tonne of grain.

The current Royal Commission Inquiry, the economic downturn in the grain growing industry, and various reviews of international marketing and protection arrangements collectively create a climate in which significant change can be achieved. SRA and GHA assessments of their charging policies represent important steps in this direction. In such a climate, further research work and recommendations which promise improved economic performance in the rural sector could make a significant impact.

The STSG study did not include a systematic review of current work practices and industrial awards nor did it focus on administrative arrangements and overheads within the two operating authorities. However, changes to labour requirements and work practices might be expected to follow naturally from changes to infrastructure operating arrangements and pricing policies. The impact which such changes could have on system costs is again a matter for further study.

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